

The
Coastal
Resources
Management
Plan for
South Johore,
Malaysia

MALAYSIAN COASTAL RESOURCES STUDY TEAM
MINISTRY OF SCIENCE, TECHNOLOGY AND
THE ENVIRONMENT, MALAYSIA

**THE COASTAL RESOURCES MANAGEMENT PLAN
FOR SOUTH JOHORE, MALAYSIA**

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**Malaysian Coastal Resources Study Team,
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LIST OF ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BOD	biological oxygen demand
CECU	coastal erosion control unit
CETC	Coastal Engineering Technical Centre
COD	chemical oxygen demand
CRC	Coastal Resources Committee
CRM	coastal resources management
CRMP	Coastal Resources Management Project
CZM	coastal zone management
dbh	diameter at breast height
DDI	Department of Drainage and Irrigation
DGS	Department of Geological Survey
DO	dissolved oxygen
DOA	Department of Agriculture
DOE	Department of Environment
DOF	Department of Fisheries
DOFor	Department of Forestry
DOH	Department of Health
DOM	Department of Mapping
DOWW	Department of Waterworks
DPW	Department of Public Works
DSM	Department of Survey and Mapping
DTCP	Department of Town and Country Planning
DVS	Department of Veterinary Services
EAMF	East Asian Marine Farms
EIA	environmental impact assessment
EU	Environment Unit
FC	fecal coliform
FCLP	Fisheries Comprehensive Licensing Policy
FDLM	Federal Department of Land and Mines
FELCRA	Federal Land Consolidation and Rehabilitation Authority
FELDA	Federal Land Development Authority
FEPU	Federal Economic Planning Unit
FRI	Fisheries Research Institute
FRIM	Forest Research Institute of Malaysia
GAA	group aquaculture area
GIS	geographic information system
GRT	gross registered ton
INWQS	Interim National Water Quality Standards
J-F MPMC	Johore-Federal Marine Park Management Committee

List of Acronyms and Abbreviations

JICA	Japan International Cooperation Agency
JPA	Johore Port Authority
Kg.	<i>Kampung</i>
KEJORA	Lembaga Kemajuan Johor Tenggara (Southeast Johore Development Authority)
LKIM	Lembaga Kemajuan Ikan Malaysia (Fisheries Development Authority)
LLS	license limitation scheme
MCRST	Malaysian Coastal Resources Study Team
MD	Marine Department
MDC	Mersing District Council
MDLO	Mersing District Land Office
MHLG	Ministry of Housing and Local Government
MHWS	mean high water spring
MIC	Malaysian Institute of Chemistry
MLCD	Ministry of Land and Cooperative Development
MOA	Ministry of Agriculture
MOD	Ministry of Defense
MOSTE	Ministry of Science, Technology and the Environment
MPJB	Majlis Perbandaran Johor Bahru (Johore Bahru Municipal Council)
mpn	most probable number
MSY	maximum sustainable yield
NATMANCOM	Malaysian National Mangrove Committee
NCECC	National Coastal Erosion Control Council
NGO	nongovernmental organization
NH ₃ -N	ammonia nitrogen
NPJC	National Parks-Johor Corporation
NSRC	National Scientific Research Council
P.	<i>Pulau</i>
PUB	Public Utilities Board
PMD	Prime Minister's Department
SDLM	State Department of Land and Mines
SEC	State Executive Council
SEDC	State Economic Development Corporation
SEPU	State Economic Planning Unit
Sg.	<i>Sungai</i>
SIDC	State Industrial Development Committee
SMRC	State Mineral Resources Committee
SNRC	State Natural Resources Committee
SS	suspended solids
SSCT	State Special Committee on Tourism
SSDTC	State Social Development and Tourism Committee
SSMM	Subcommittee on Sand Mining Management
TDC	Tourism Development Corporation

List of Acronyms and Abbreviations

Tg.	<i>Tanjung</i>
TOL	Temporary Occupation License
TOR	terms of reference
UNEP	United Nations Environment Programme
UPM	Universiti Pertanian Malaysia
USAID	United States Agency for International Development
USEPA	United States Environmental Protection Agency
USM	Universiti Sains Malaysia
WQMS	water quality monitoring station

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PREFACE

The coastal waters of Southeast Asian countries have some of the world's richest ecosystems characterized by extensive coral reefs and dense mangrove forests. Blessed with warm tropical climate and high rainfall, these waters are further enriched with nutrients from the land that enable them to support a wide diversity of marine life. Because economic benefits could be derived from them, the coastal zones in these countries teem with human settlements. Over 70% of the population in the region lives in coastal areas where resources have been heavily exploited. This situation became apparent between the 1960s and 1970s when socioeconomic pressures increased. Large-scale destruction of the region's valuable resources has caused serious degradation of the environment, thus affecting the economic life of the coastal inhabitants. This lamentable situation is mainly the result of ineffective or poor management of the coastal resources.

Coastal resources are valuable assets that should be utilized on a sustainable basis. Unisectoral overuse of some resources has caused grave problems. Indiscriminate logging and mining in upland areas might have brought large economic benefits to companies undertaking these activities and, to a certain extent, increased government revenues, but could prove detrimental to lowland activities such as fisheries, aquaculture and coastal tourism-dependent industries. Similarly, unregulated fishing effort and the use of destructive fishing methods, such as mechanized push-nets and dynamiting, have seriously destroyed fish habitats and reduced fish stocks. Indiscriminate cutting of mangroves for aquaculture, fuel wood, timber and the like has brought temporary gains in fish production, fuel wood and timber supply but losses in nursery areas of commercially important fish and shrimp, coastal erosion and land accretion.

The coastal zones of most nations in the Association of Southeast Asian Nations (ASEAN) are subjected to increasing population and economic pressures manifested by a variety of coastal activities, notably, fishing, coastal aquaculture, waste disposal, tin mining, oil drilling, tanker traffic, construction and industrialization. This situation is aggravated by the expanding economic activities attempting to uplift the standard of living of coastal people, the majority of whom live below the official poverty line.

Some ASEAN nations have formulated regulatory measures for coastal resources management (CRM) such as the issuance of permits for fishing, logging, mangrove harvesting, etc. However, most of these measures have not proven effective due partly to enforcement failure and largely to lack of support for the communities concerned.

Preface

Experiences in CRM in developed nations suggest the need for an integrated, interdisciplinary and multisectoral approach in developing management plans that will provide a course of action usable for the daily management of the coastal areas.

The ASEAN/United States (US) Coastal Resources Management Project (CRMP) arose from the existing CRM problems. Its goal is to increase existing capabilities within ASEAN nations for developing and implementing CRM strategies. The project, which is funded by the US Agency for International Development (USAID) and executed by the International Center for Living Aquatic Resources Management (ICLARM) in cooperation with ASEAN institutions, attempts to attain its goals through these activities:

- analyzing, documenting and disseminating information on trends in coastal resources development;
- increasing awareness of the importance of CRM policies and identifying, and where possible, strengthening existing management capabilities;
- providing technical solutions to coastal resource-use conflicts; and
- promoting institutional arrangements that bring multisectoral planning to coastal resources development.

In addition to implementing training and information dissemination programs, CRMP also developed site-specific CRM plans containing integrated strategies that are appropriate to the prevailing conditions in each nation.

South Johore was designated as the pilot site for CRMP-Malaysia, for several reasons. It has the longest coastline in the country, and a good portion of its population depends on coastal resources for food and employment. The area is also currently experiencing rapid industrialization, a major factor in the increasing deterioration of its coastal environment. Moreover, South Johore shares with Singapore the Johore Strait, which experiences impacts from development in both areas.

The preparation of *The coastal resources management plan for South Johore, Malaysia* is the culminating point of the CRMP planning process toward an integrated coastal zone management. A profile of the site has earlier been published as the initial phase of the planning process.

An executive summary of the basic issues and problems in CRM, and of the general recommendations for the improvement of overall planning and management, is included in this plan. The first chapter is an introduction to

Preface

Chapters 2 to 11, which are the individual management plans for the various sectors that utilize the coastal environment and also for major CRM problem areas. The specific guidelines recommended in these schemes are aimed at directing management in its quest for sustainable coastal resources development or utilization, and at addressing institutional/legal issues in CRM as well. It is hoped that all levels of government—local, state and federal—work hand in hand with the private sector so that this integrated plan, and any necessary revisions thereof, are fully implemented.

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FOREWORD



The successful completion of the national component of the ASEAN/US CRMP is to be commended. The outputs of the project, *The coastal resources management plan for South, Johore, Malaysia*, and its supporting document, *The coastal environmental profile of South Johore, Malaysia*, will be very helpful in the State's overall development efforts. This plan is useful and timely not only for South Johore, but also for the other states in Malaysia that face similar problems in coastal area management.

We are indeed honored to have been part of this regional effort to promote sustainable development in coastal areas in ASEAN. Malaysian scientists have gained substantially from the experience of working with other ASEAN experts on coastal issues common to our region.

Congratulations for a job well done to all the CRMP-Malaysia team members who participated in the project, especially the National Steering Committee and the National Coordinator. We wish to thank USAID for their financial support and the Coastal Area Management Program of ICLARM for technical assistance and coordination.

Tan Sri Dato' Haji Muhyiddin bin Haji Mohd. Yassin
PSM, SPMJ, PIS, BSI,
Chief Minister
State Government of Johor

EXECUTIVE SUMMARY

INTRODUCTION

Of all the states in Peninsular Malaysia, Johore has the longest coastline (Fig. A.1). The coastal area of South Johore contains diverse, productive ecosystems that include coral reefs, seagrass beds, forests and offshore islands on the east, and muddy shorelines, mangroves and several river basins on the west (Fig. A.2). These coastal ecosystems sustain various economic activities such as agriculture, capture fisheries, aquaculture, tourism, transportation, industry and commerce. In turn, these activities contribute largely to employment, the provision of basic necessities and the generation of valuable exports. They also help diversify and expand the domestic economy.

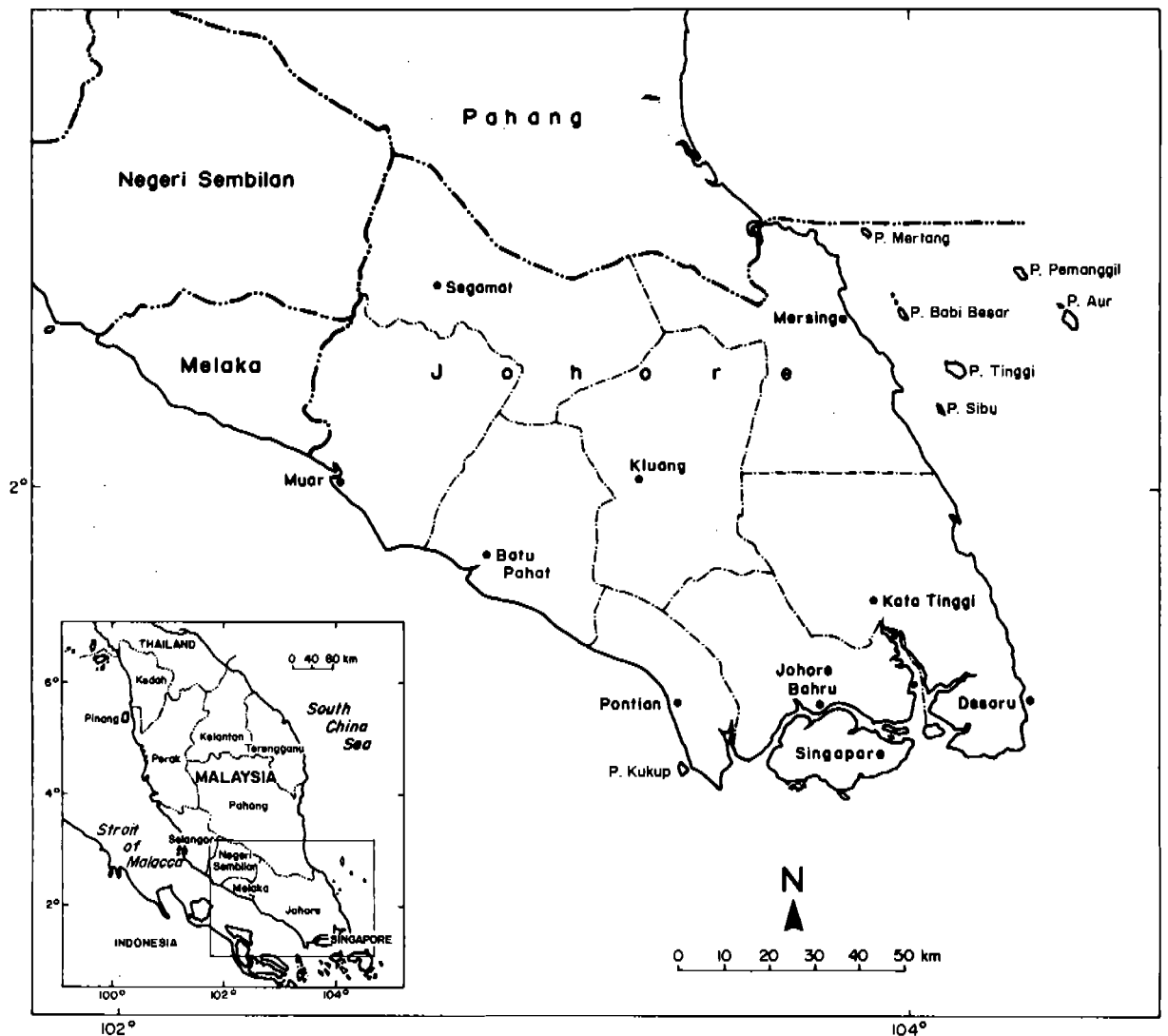


Fig. A.1. South Johore, the CRMP pilot site, in its regional setting.

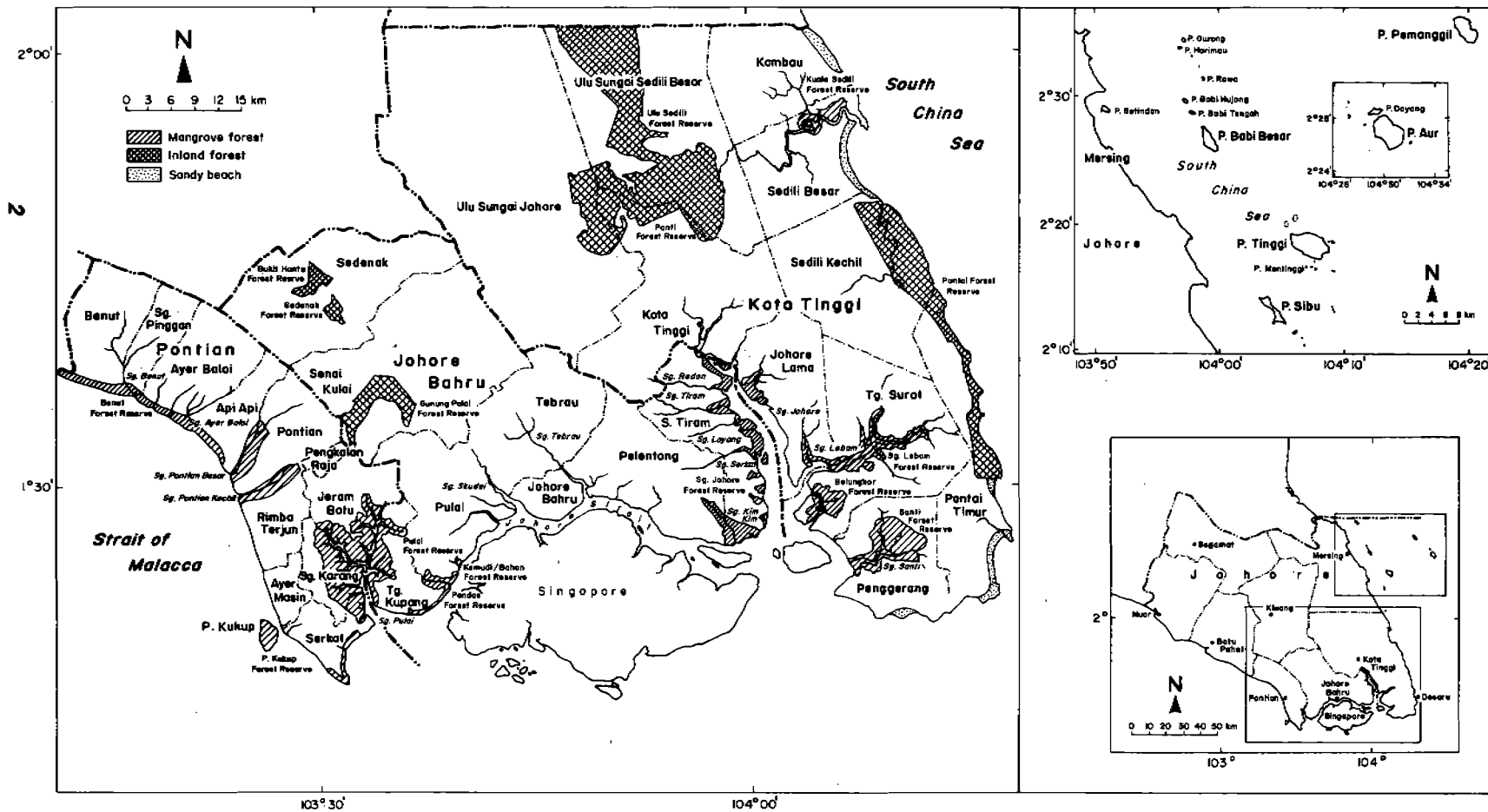


Fig. A.2. South Johore's coastal area and its major ecosystems.

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Development currently being undertaken or planned in South Johore is on a massive scale. There is the proposed 2,400-ha petrochemical industrial estate on the Sungai (which means "river"; "Sg." from here) Johore estuary. Residential, industrial and tourism development on 26,000 ha of land surrounding the Sg. Pulai estuary and fronting the west of Johore Strait is planned in association with the proposed second linkage to Singapore. At Desaru on the east coast, M\$1.6 billion will be invested on a 1,700-ha tourism development project.¹ The concentration of these projects in the coastal area will certainly have significant environmental implications (Fig. A.3).

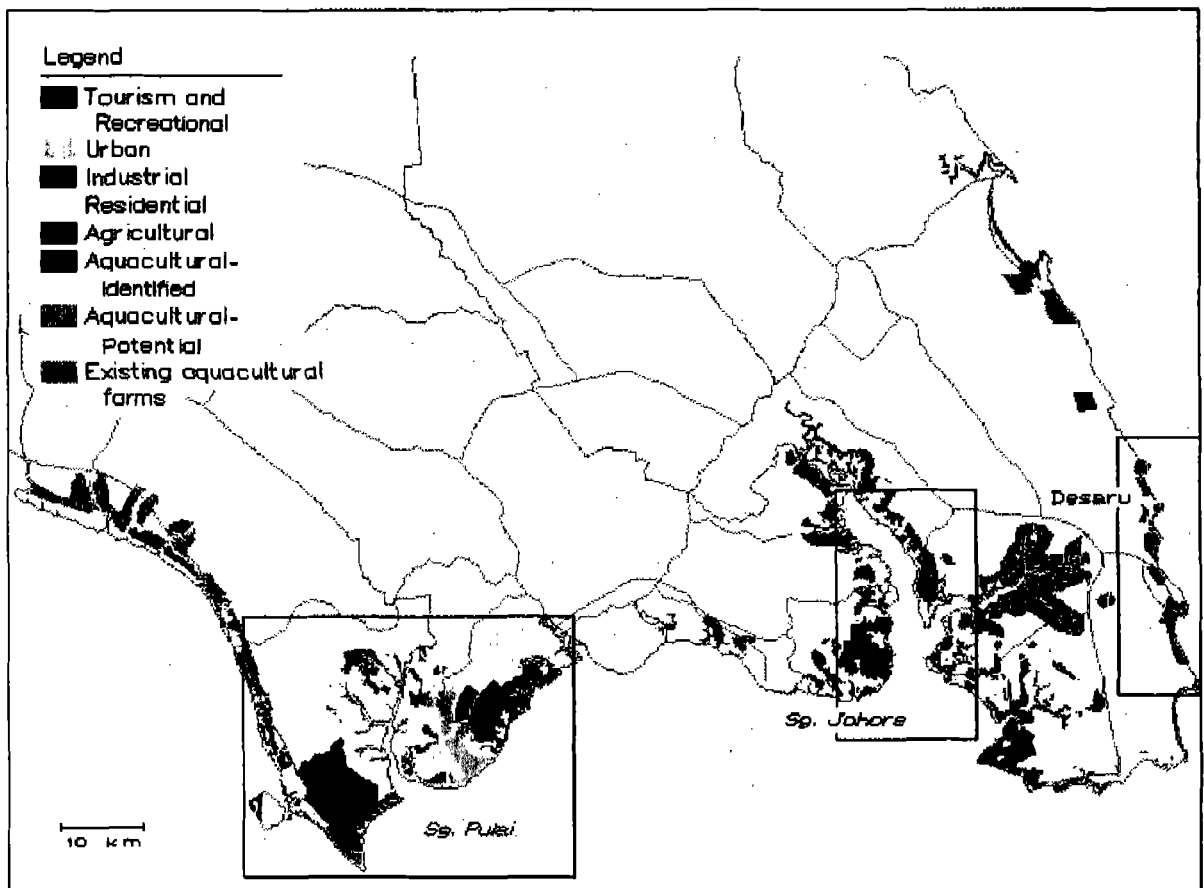


Fig. A.3. Planned land uses and major developments in South Johore.

The economic viability of many existing and proposed activities on and around South Johore's coast depends on the maintenance of the quality of the environment, the functional integrity of the coastal ecosystems and the sustained flow of generated resources. For instance, tourism depends on clean

¹This project was terminated by the Johore state government for nonconformity of the developers with the terms of agreement. Nevertheless, the State Economic Development Corporation (SEDC) has been directed to seek other means of implementing the project.

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waters, pristine beaches, undamaged coral reefs and healthy forests. On the other hand, unpolluted water from rivers is essential in agriculture and in providing nearby communities with potable water. Capture fisheries rely on mangroves, estuaries and coral reefs to maintain stocks.

Sustainable development of the coastal area and its resources is essential, but this largely depends on skillful planning and management.

Thus, sustainable development of the coastal area and its resources is essential, but this largely depends on skillful planning and management. In South Johore, there are several laws pertaining to the coastal zone, but except for the Environmental Quality Act (1974), none incorporates any obvious environmental criteria. Although this Act on the federal level mandates an environmental impact assessment (EIA) for all projects falling within certain standards, the state government does not enforce this in most cases. Even government projects ignore this requirement. Often, the federal government is pressured to approve an EIA because the state government has already done so, and funding or earthworks have been initiated. Appropriate policies should therefore be established, and planning and management arrangements should be strengthened to implement the existing policies to the full. There are also several issues and problems that need to be addressed, such as resource use conflicts, destruction of renewable resources and degradation of the quality of environment.

In view of all these, South Johore was chosen as the Malaysian pilot site for CRMP in the ASEAN region. The project, whose overall goal is the development of coastal areas on a sustainable basis, is funded by USAID with technical assistance and coordination by ICLARM. The Ministry of Science, Technology and the Environment (MOSTE) of Malaysia is the national coordinating agency with the Department of Fisheries (DOF) as the implementing arm.

Recommendations to achieve the goal of the ASEAN/US CRMP and to address the several issues and problems in South Johore are presented in this volume. The recommendations are based on a series of comprehensive technical studies made by the Malaysian project staff from government institutions and universities.

The technical studies and bases for the recommendations are presented in the companion volume of this plan.

CRM ISSUES AND PROBLEMS IN SOUTH JOHORE

There are three basic issues in CRM in South Johore. First is the gross undervaluation of the economic and environmental importance of natural resources. The total value of the goods and services generated by the coastal ecosystems has not been properly assessed. The treatment of mangroves as "worthless" unless converted into "higher and better" uses is an example of this undervaluation. The roles mangroves play in marine fisheries, erosion control and agricultural crop protection from coastal

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There are three basic CRM issues in South Johore: the gross undervaluation of the importance of natural resources; the poor incorporation of sound economic and environmental management concepts into the development planning process; and the lack of integration of sectoral plans and insufficient coordination of investment by individual agencies.

storms, although substantial, are often overlooked. In addition, the total value to the economy derived from these areas through fisheries, salt production, timber, shrimp and crab culture and others is far greater than usually assumed.

The second issue is the poor incorporation of sound economic and environmental management concepts into the development planning process. This is, in part, a consequence of resource undervaluation. Another culprit is the shortage of interdisciplinary planning and management skills for CRM.

The third issue is the lack of integration of sectoral development plans and insufficient coordination of investment by individual agencies. This results because existing development policies focus on maximizing the production from specific activities rather than optimizing the use of all natural resources. There is no clear, overall policy that unites development objectives promoted by different agencies, so that a course of action prompted by one sector is not necessarily binding on other sectors. As a result, planning and management are done by private entrepreneurs or individual sectoral agencies that maximize specific uses of coastal areas or resources but ignore resulting conflicts. Existing planning and management methodologies, therefore, should be modified and strengthened to address this issue.

In the absence of comprehensive policies and guidelines for a multisectoral and integrated CRM, the screening of projects or activities will depend almost entirely on EIAs. However, an EIA generally does not take into account the combined impacts of multiple projects. A measure of control can also be achieved through the zonation of areas for compatible activities and the use of buffer zones to separate noncompatible activities. However, unless the environmental linkages among coastal ecosystems, the carrying capacity of different areas and the sustainable limits to resource exploitation are properly evaluated, zonation might not result in the optimal mix of activities, and buffer zones might not effectively prevent environmental degradation.

Following are the planning and management problems that are seen as limiting the sustainable development of South Johore's coastal zone:

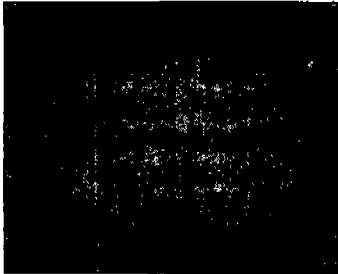
1. Current coastal resources planning and management approaches are reactive and issue-driven. They do not sufficiently emphasize forward planning, which efficiently uses land and water resources, capital and labor. The principles upon which coastal resources planning and management must be based are the:
 - a. inclusion of economic and environmental planning and management concepts and procedures for the establishment of an integrated CRM plan;

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- b. early introduction of an overall EIA as a planning and management tool in the formulation of policies and development of programs and projects; and
 - c. sound management of environmental systems that generate the renewable resources required to sustain a diverse and expanding economy.
2. The current system of coastal resources planning and management is fragmented. There is little coordination of management strategies or development initiatives among federal, state or local bodies. An integrated resources management plan should be established and all projects, public or private, should conform with it. A body or committee on the state level should see to the implementation and review of this plan, and the approval of project proposals, so that all activities of the various government agencies and the private sector are coordinated.
 3. Existing policies, laws and regulations on CRM are not effectively enforced. This is caused, in part, by the overemphasis on short-term financial gain rather than on sustainable development.
 4. The misallocation of resources and environmental degradation lead to:
 - a. decline in the availability and quality of renewable resources required to support economic development and human welfare;
 - b. pollution resulting from inadequate treatment and improper disposal of sewage and industrial and solid wastes;
 - c. contamination of groundwater and soils with toxic materials;
 - d. increased incidence and severity of natural hazards;
 - e. loss of development opportunities; and
 - f. unnecessary imposition of costs on economic activities.
 5. There are mounting conflicts over the use of available land and water resources due to the lack of clear policies and guidelines or the failure to fully implement existing ones.
 6. There is a dearth in trained and skilled manpower that could ensure the sustainable use of available coastal resources in meeting national, state and local development goals. This is due to the absence of funds for training.
 7. There is a general lack of public involvement in the establishment of policies and plans affecting the people's lives and economic welfare.

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GENERAL RECOMMENDATIONS



The recommendations designed by the Malaysian Coastal Resources Study Team (MCRST) of the ASEAN/US CRMP are divided into two complementary groups. The first group, made up of five general recommendations, is designed to improve the integration of coastal resources planning and management initiatives.

1. Strengthen the integration of economic and environmental information, planning, concepts and management principles in the assessment of coastal resources.
 - a. There should be a comprehensive economic and environmental appraisal of coastal ecosystems in terms of the functions they perform and the flow of goods and services they generate.
 - b. Activities that are or could be sustained by this flow of renewable resources should also be assessed.
 - c. The environmental process essential to the maintenance of the health and productivity of coastal ecosystems and the sustained generation of their resources should be determined. For example, the productivity of most coastal resources systems depends on the maintenance of the hydrologic regime of major watersheds and the flow of nutrients and materials from upland areas. The critical importance of the linkage between upland and coastal areas and activities should be disseminated to all parties involved in their planning and management.
 - d. The multiple-use potential of coastal ecosystems should be evaluated to determine the appropriate forms and intensities of development.
2. Reinforce the coastal resources planning and management process.
 - a. An integrated regional planning approach specifically adapted to the sustainable use of coastal resources should be implemented.
 - b. The information base concerning the carrying capacity of the different coastal areas and ecosystems should be improved. Based on this, the types and levels of coastal activities can then be determined.
 - c. Environmental management principles and guidelines should be applied to coastal resources planning and management.
 - d. Use of the geographic information system (GIS) as an information management tool should be optimized.
 - e. Planning procedures should be developed to promote the multiple-use management of coastal resources.

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- f. Environmental monitoring should be efficiently carried out to provide information on the effects of development on coastal areas and resources, and to adapt the plans to correct adverse economic, social and/or environmental impacts.
- g. Critical issues should be anticipated by assessing sustainable development opportunities and potential problems, and by preparing CRM plans that will guide public and private initiatives and will help avoid conflicts and adverse impacts.
- h. The EIA should be used more effectively as a planning and management tool. The EIA, as currently applied, has three serious flaws:
 - 1) Its emphases are on the identification of potential pollution problems and reduction of pollution to acceptable standards. A major weakness of this approach is that there is no attempt to assess other critical ecological processes or functions that maintain the health of major ecosystems.
 - 2) The assessment is project-driven, that is, it is required only once a development project has already been proposed, and permission to proceed is requested. At this point, an EIA would already be late in the project development cycle when critical decisions about the design and location of projects have already been made. Once these are done, developers resist reconsideration of their plans because it will cause them delay and additional expenses. This provides little opportunity for an EIA to have a positive influence on the design or location of the project.
 - 3) The cumulative or synergic impact of different development initiatives (e.g., in the major port and industrial complexes) are also not assessed.

The environmental impact assessment (EIA) should be used more effectively as a planning and management tool.

One flaw of the EIA is that while it emphasizes the identification of potential pollution problems and reduction of pollution to acceptable standards, it does not assess other critical ecological processes that maintain the health of major ecosystems.

The following improvements could be made in the application of EIAs in South Johore:

- 1) The assessment should be applied early in the formulation of CRM policies, programs and plans so that the positive and negative impacts of developments could be assessed before details are drafted.
- 2) The extended cost-benefit analysis should be incorporated into the EIA process.
- 3) An EIA methodology relevant to coastal areas and their various economic, social and environmental linkages should be developed.
- 4) A comprehensive EIA should be applied to local or regional development programs rather than to individual projects.

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Public participation in the formulation of CRM policies, plans and strategies is not an integral part of the planning process.

i. Public participation in the formulation of CRM policies, plans and strategies should be encouraged. At present, this exercise is not an integral part of the planning process, which is essentially top-down in nature. Opportunities for bottom-up planning are limited, although local groups would occasionally present proposals for modifying existing land uses or for introducing new forms of development. But such initiatives play only a small part in the overall system of development. Besides, the general level of environmental awareness on the part of the public and the government officials is low, and funds for environmental education and dissemination are limited. This situation should be improved.

3. Strengthen the integration of national and state policies, investment strategies and sectoral development plans for the allocation and utilization of coastal areas and resources.

To effect this, three courses of action are proposed:

a. Reinforce existing institutional arrangements.

There are no formal institutional structures or procedures for coordinating the different sectoral policies, strategies and plans. Under the present arrangement, emphasis is placed on permit procedures. Neither is there an effective regional CRM plan or strategy. Decisions are made on a case-to-case basis with no reference to existing or planned activities. Thus, the authorities react to development proposals rather than provide sound guidance to the public and private sectors submitting the proposals.

The State Industrial Development Committee (SIDC), made up of representatives from the State Executive Council (SEC), is responsible for approving major development projects. The State Department of Land and Mines (SDLM) operates as the coordinator for some projects and seeks advice from agencies such as DOF, Department of Forestry (DOFor), Department of Drainage and Irrigation (DDI) or Department of Waterworks (DOWW). However, these agencies are given very little time to comment on and discuss the projects among themselves. They are not informed of the decisions concerning the proposed projects, the conditions attached to any approval or whether these have been met by the developer. Without any knowledge of the attached requirements, it is impossible for an agency to enforce these. Furthermore, there is a lack of trained manpower to assess any violation of the conditions as a first step to effective enforcement.

To strengthen the institutional arrangements, an interagency Coastal Resources Committee (CRC) should be established to promote environmental protection and to integrate coastal resources planning and management initiatives. The CRC will be responsible for overseeing the implementation of the CRM plan in the region.

The interagency Coastal Resources Committee (CRC) should be established to promote environmental protection and to integrate coastal resources planning and management initiatives.

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This committee will be chaired by the Minister of the Environment and will include senior personnel from all federal and state departments that are concerned with CRM. The CRC will have the authority to form interagency working groups that will complement the interdisciplinary nature of the proposed projects and activities. The participation of senior personnel in the implementation phase will help ensure the effective transfer of technologies and the adoption of the resulting recommendations. The CRC should then be in a strong position to arbitrate among conflicting demands for the allocation and use of resources. Following the completion of the project, CRC and its member-agencies are expected to maintain their cooperation and coordination, which are essential to effective CRM.

The main terms of reference (TOR) for the CRC will include the following:

- 1) Ensure that federal, state and local agencies fully understand the policies and management principles embodied in the CRM plan and work toward their successful implementation.
- 2) Evaluate public and private development proposals and management plans in terms of their environmental, economic and social impacts on the coastal resource base and existing activities, and ensure the compatibility of the proposals and plans with the objectives of the CRM plan.
- 3) Integrate the views of all departments regarding any development proposal and present a balanced recommendation to SEC for approval.
- 4) Inform the different departments concerned about the conditions attached to the approval of any development proposal or management plan.
- 5) Oversee the monitoring of development activities.
- 6) Assess the effectiveness of the CRM plan with respect to the protection of the environment and the sustainable use of resources.
- 7) Update and make the necessary changes in the CRM plan, to see to it that sustainable development is achieved.

Where appropriate, CRC should be empowered to establish working parties staffed by qualified personnel to provide technical advice on proposed projects and management plans. This will guarantee that

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environmental considerations are fully addressed. The recommendations to strengthen GIS will provide CRC and its working parties with the basic information required to evaluate new proposals and to continuously update and monitor the development of the coastal area and its resources.

The CRC will be supported by a strong secretariat that will perform the following functions:

- 1) Liaise among participating government agencies, the private sector and other interested parties.
 - 2) Coordinate with other ASEAN member-countries and the international donor community in mobilizing external support for conservation activities in Johore.
 - 3) Cooperate in maintaining a GIS to record and update information on the environment, resource use and development proposals.
 - 4) Ensure that policies, plans and management measures formulated by CRC are implemented and that their effectiveness is accurately monitored.
 - 5) Support the work of the CRC working parties that will be set up to design and implement multisectoral, integrated conservation projects and/or feasibility studies of regional development proposals and plans.
- b. Strengthen CRM policies, laws, regulations and guidelines.
- 1) Greater emphasis should be given to the sustainable development of renewable resources to protect existing and planned coastal activities.
 - 2) A state policy for the sustainable development of the coastal zone in South Johore should be established.
 - 3) Sectoral development policies and plans that optimize the use of available biophysical, social and economic resources should be formulated to achieve the development objectives of the state policy.
 - 4) Sectoral plans should be integrated into regional and state development plans.
 - 5) Development initiatives should be coordinated on the state, district and local levels.

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It is necessary to modify existing laws and regulations to facilitate the sustainable development of coastal areas and resources.

- 6) Discreet adjustments in development policies and objectives should be introduced to economic and environmental guidelines for planners and managers.
- c. Modify existing laws and regulations to facilitate the sustainable development of coastal areas and resources. There are a number of existing legal instruments that may be used: National Land Code (1965); Environmental Quality Act (1974); Pesticide Act (1974); Town and Country Planning Act (1976); Sewage and Industrial Effluent Regulations (1979); National Forestry Act (1984); Fisheries Act (1985); and National Parks-Johor Corporation (NPJC) Enactment (1989).

Some acts could be amended to include the coastal area, e.g., the Land Conservation Act (1960, revised 1989), which pertains primarily to hill and inland areas. This will increase control over soil erosion, siltation and surface runoff into rivers. Specific amendments to other acts will reduce existing environmental problems and sectoral use conflicts. Thus, there will be not much need to enact new laws. In addition, laws with respect to Development Authorities would need to be revised to include environmental criteria.

4. Formulate an integrated CRM plan. The plan should include the following:
 - a. a policy that promotes the integration of sectoral development policies, plans and management strategies;
 - b. an integrated master plan linking all the sectoral plans;
 - c. a general CRM plan for each sector and issue, i.e., coastal forests, mangrove forests, aquaculture, sand mining, coastal erosion, water quality, tourism, fisheries, river basins, offshore islands and marine protected areas;
 - d. guidelines and policies for managing coastal ecosystems and resources;
 - e. management plans for marine and estuarine areas; and
 - f. area-specific plans that use zonation to designate areas where compatible activities can be integrated and noncompatible ones can be segregated.

The integrated CRM plan should include area-specific plans that use zonation to designate areas where compatible activities can be integrated and noncompatible ones can be segregated.

Furthermore, current land use plans should be revised to incorporate environmental management considerations. These will include the:

- a. demarcation of the different coastal ecosystems;

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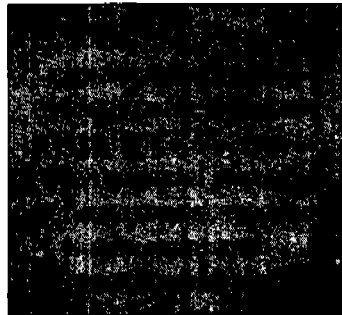
- b. definition of management boundaries for controlling development activities that influence the health and productivity of the ecosystems; and
- c. zonation to define areas where multiple-use development could be encouraged in ecosystems whose flow of resources can sustain various activities, where nonresource-dependent activities could operate efficiently without causing adverse impacts and where there are major environmental constraints to development.

The entire coastal area of South Johore could be divided into different management zones: totally protected; restricted access; those with special building codes; those needing restrictions on whatever kind of harvesting operation that is used (e.g., only shellfish, only seaweeds, only large-mesh gill nets); aquaculture (including rafts, floating cages, bottom cages, landward sides of mangrove swamps subject to soil suitability); mass tourism; low-density tourism; etc.

Using the zonation and resource-specific management schemes, action plans could be developed for particular areas with resource use conflicts.

- 5. Develop manpower for CRM. There is a general shortage of personnel trained in the different aspects of CRM, such as environmental planning and assessment, resource economics and integrated management. Also, only a few people have been trained to function in interdisciplinary teams since they are often assigned tasks that they perform in isolation. The results are then simply compiled together to form a report. This situation, as admitted by government officials, poses a major hindrance to effective management.

Thus, the establishment of training courses in all levels and covering a wide range of techniques is recommended. Three kinds of training are suggested for administrators, managers and/or planners: a. in-service training; b. short-term (1-3 months) training; and c. professional and degree programs at higher educational establishments in Malaysia or other countries. However, it must be kept in mind that the development of manpower alone will not provide all the answers to current weaknesses in the system. Coastal resources planning itself needs to be improved so that skilled manpower can be used to the maximum.



SECTOR- AND PROBLEM-SPECIFIC RECOMMENDATIONS

The following is the second group of recommendations of MCRST, which are based on an analysis of the resources and activities within coastal areas extending 5 km inland from the coast and 10 nautical miles out to the sea. These are in the southern districts of Johore-Pontian, Johore Bahru and Kota Tinggi (Fig. A.4).

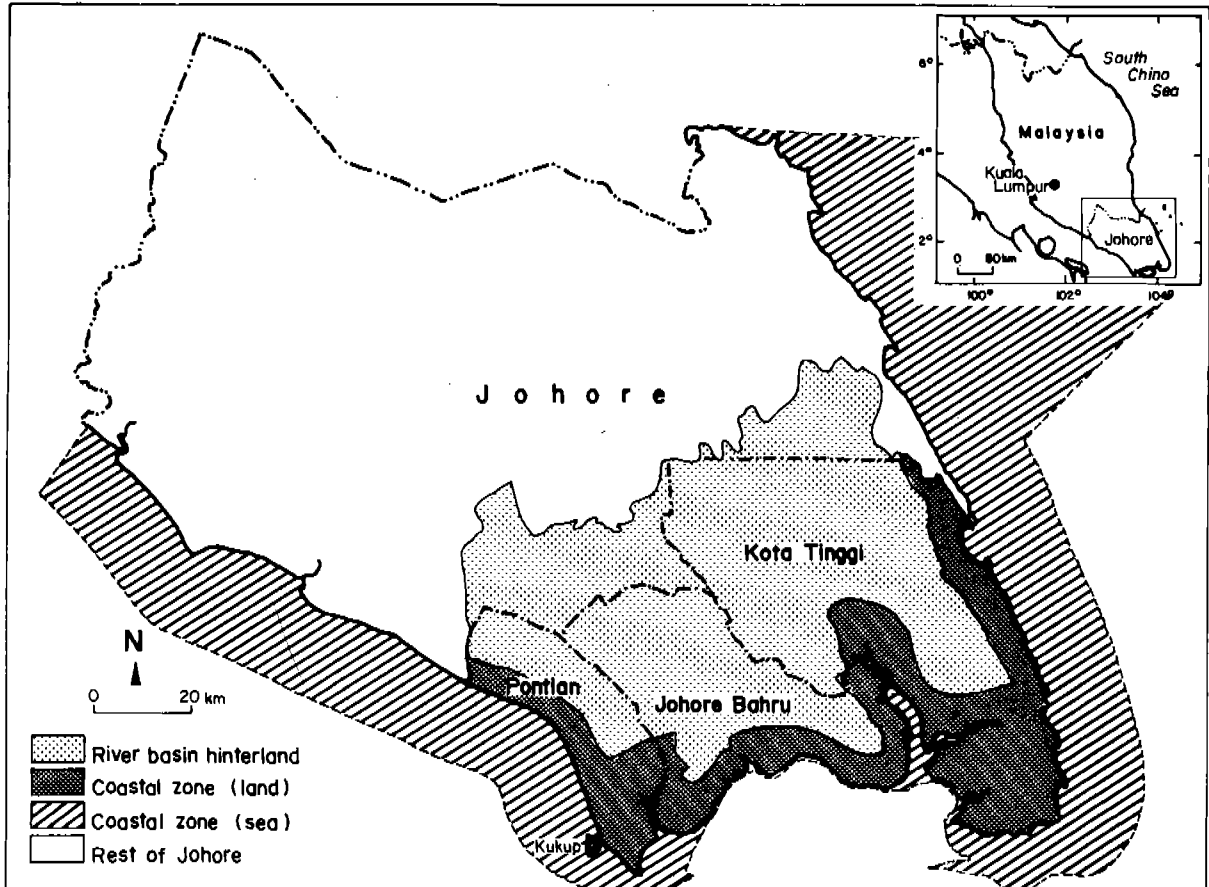


Fig. A.4. Demarcation of the CRMP pilot site.

Water Resources

The most critical environmental issue influencing sustainable development is the need for improved measures in water resource conservation to ensure constant supply. Proper management of watersheds is important in minimizing the disruption of water flow and the reduction in water quality, which cause the degradation of uplands, lowlands, and coastal and marine ecosystems. These problems are often brought about by developments of different types that are allowed in these areas, since permanent forest reserves are not really "permanent" in the Land Code. The cost of mitigation or rehabilitation could be prohibitive, thus placing a burden on the public authorities.

The basins of the nine major rivers flowing into South Johore's coastal area cover a total area of 733,612 ha. These are all subject to major changes in land use and vegetation cover. In 1974, land use pattern showed that much of the western portion was used for agriculture, while the forest areas (35% of South Johore) were confined to the eastern portion and to the upper parts of the basins of Sg. Johore and Sg. Sedili Besar (Fig. A.5). However, from 1974 to 1986, 57% of the forested area was cleared for agriculture under the land development schemes.

The most critical environmental issue influencing sustainable development is the need for improved measures in water resource conservation to ensure constant supply.

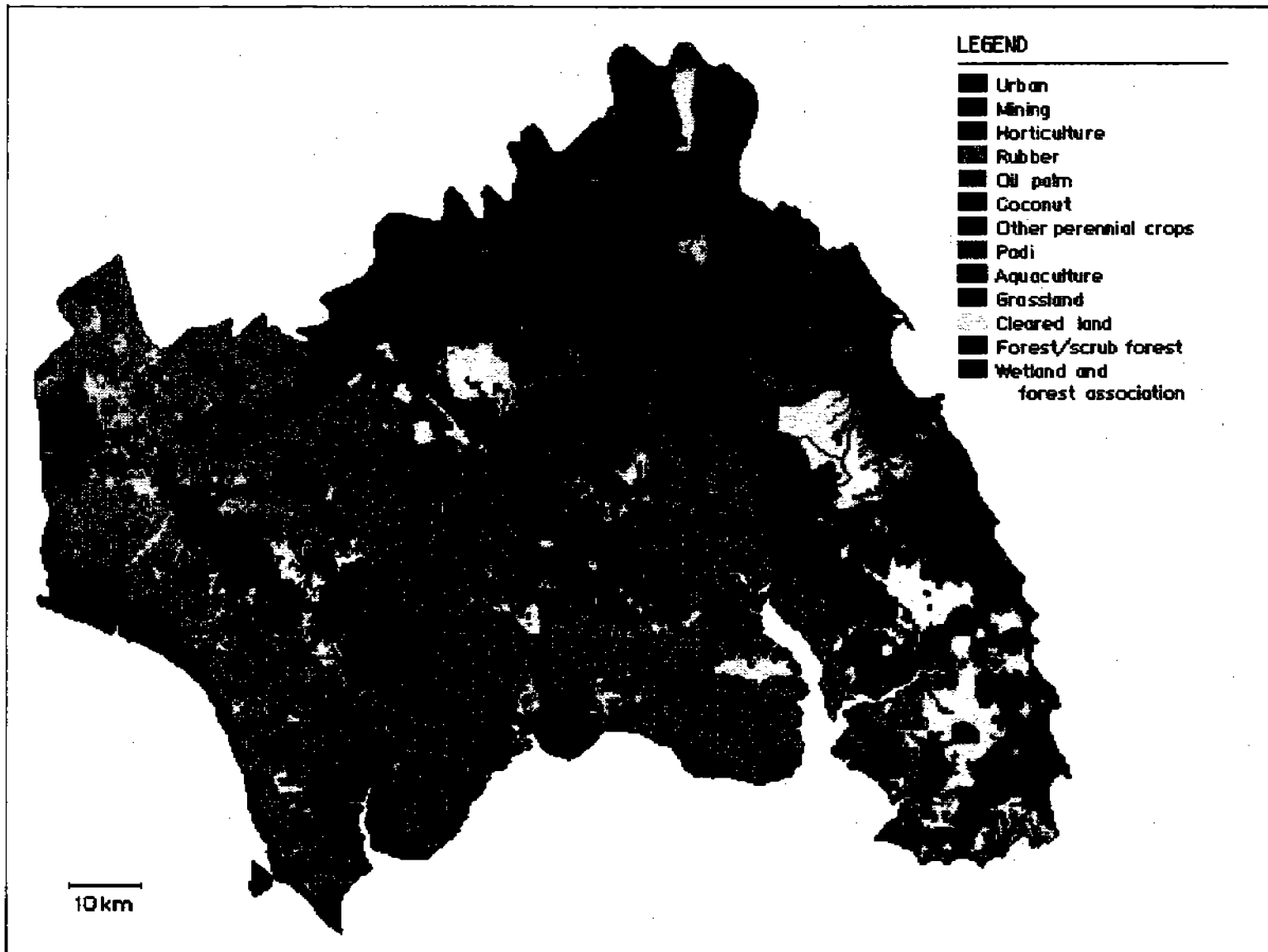


Fig. A.5. 1974 land use pattern in South Johore.

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The changes in land use in South Johore during the past 15 years have been rapid and extensive. At present, land use is characterized by the following:

1. Small-scale agriculture in the western part. There is little forest land remaining for extended farming operations.
2. Expanding large-scale plantations, mainly of oil palm, in the eastern part. The opening of land for agriculture has been progressing from the interior toward the coast and has caused a reduction in the strip of coastal forest, particularly in the Sg. Sedili Kechil basin.
3. Rapid urbanization in the southern part radiating northward and eastward from Johore Bahru. This process includes residential and industrial expansion at the expense of agricultural land.
4. Increased development of recreational areas along the coast close to Johore Bahru, and more extensively in the Desaru area along the east coast.

Associated with the rapid development in major watersheds is the increase in rates of surface water runoff, soil erosion, sediment loads in rivers and pollution from organic and inorganic materials.

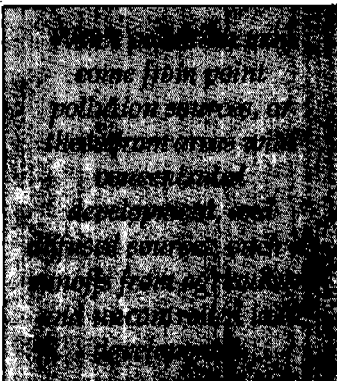
There are two types of sources of water pollution: (1) the point sources or those from areas with concentrated development, e.g., organic wastes; and (2) the diffused sources, e.g., runoffs from agriculture, uncontrolled land development and urban areas. Both types contribute to the increase in the levels of sediment and trace metals in the rivers and coastal waters.

The main sources of pollution are: domestic waste, land development, waste from palm oil mills, rubber and pineapple factories, industrial waste and animal wastes from intensive stock farms.

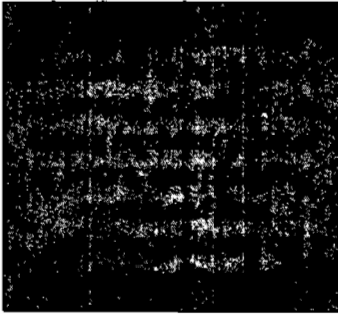
Domestic sewage, produced by the growing population in the coastal area, is the biggest contributor to the water quality problem in South Johore. This consists of human waste and wastes from household and commercial products such as cleaning materials, insecticides and detergents. This increasing pollution load is compounded by inadequate sewage treatment systems.

Improper land development, coupled with the absence of erosion prevention measures, increases sediment loads in rivers, resulting in enhanced turbidity and siltation.

Agricultural activities may cause soil erosion and runoff, giving way to the occurrence of suspended sediments in rivers. The use of pesticides results in toxic residues being washed into inland and coastal waters.



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Pig farming is considered the most important activity in the animal husbandry sector in Johore. However, untreated pig waste contributes to organic and fecal coliform (FC) pollution in receiving watercourses where it is discharged. According to the Department of Environment (DOE 1988), pig waste ranks second in terms of contribution to the total biological oxygen demand (BOD) load discharged into rivers. Implementing a waste management scheme is difficult as the farms are small and scattered. Setting up a centralized waste facility is impractical while providing individual facilities is economically nonviable. Moreover, pig farmers are not receptive to new ideas or alternative farming technologies.

To top it all, the general public and many government agencies consider the practice of dumping waste in rivers and coastal waters acceptable. Thus, no industry, farming enterprise or municipality is penalized for doing so.

In view of these, the following specific recommendations are made:

1. River classification - All rivers in South Johore should be classified based on the interim National Water Quality Standards. This categorization may be used to determine areas requiring immediate action, the carrying capacities of the river systems and their ability to sustain proposed developments, and the remedial measures needed.
2. Watershed protection and management
 - a. To preserve all existing forests in water catchment areas, these resources should be gazetted as Permanent Protective Forests (Fig. A.6).
 - b. A master plan for watershed protection and management should consider any development's impacts within and outside a watershed area. The plan should therefore encompass the entire water catchment area in South Johore, including forested and nonforested areas.
 - c. The Land Code should be modified such that watershed areas are protected in perpetuity, and no development is allowed here.
3. Prevention of soil erosion caused by land development
 - a. Conditions regarding the incorporation of adequate erosion prevention measures should be attached to approvals submitted for land development, and these should be rigorously monitored and enforced. This is provided for in the National Land Code (1965) and the Land Conservation Act (1960, revised 1989). Examples of such measures are the provision of sediment traps and the practice of cover cropping any exposed ground. The conditions may be based on the silt control guidelines of DOE and the soil erosion control

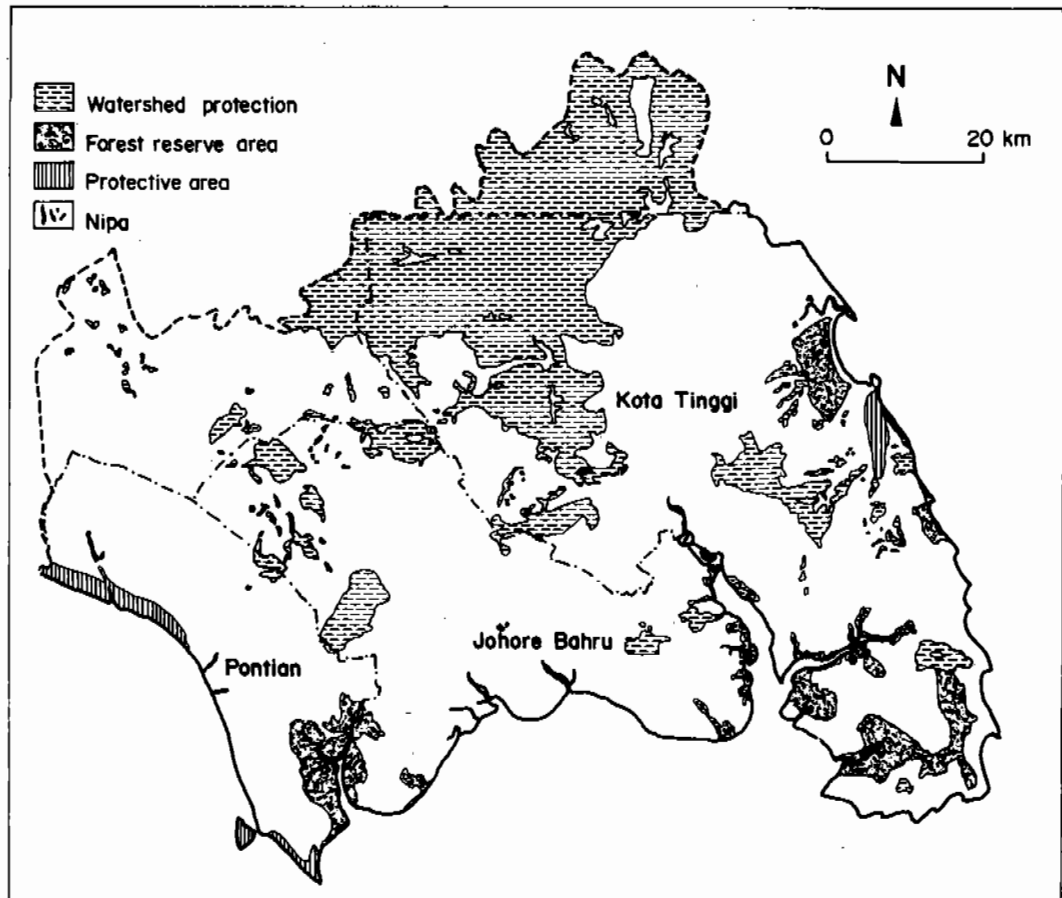


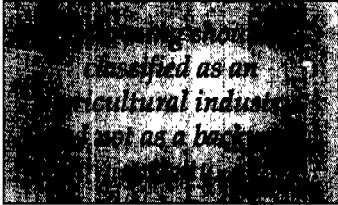
Fig. A.6. The proposed protected areas for South Johore.

guidelines of the Department of Agriculture (DOA) and DDI. In this respect, the agencies concerned should employ adequate competent staff to carry out enforcement and monitoring.

The Land Conservation Act should be adopted by the state government and hill land gazetted under the Act for protection.

- b. A phased development approach based on the type of terrain, especially along rivers, must be used in land development projects. The approach is expected to reduce and control sediment loading due to land clearing. Again, the Land Conservation Act must be applied.
4. Improvement of legal and institutional arrangements for agriculture
 - a. The Pesticide Act (1974) should be strictly enforced especially in the use and smuggling of illegal pesticides.
 - b. The Ministry of Agriculture (MOA) should continue its programs that encourage farmers to use the less persistent types of pesticides rather than the more persistent ones.

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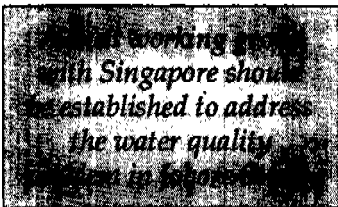


- c. The MOA should continue its education of the public regarding the safe use of pesticides, including the household variety, which are also pollutive.
- d. Pig farming should be classified as an agricultural industry and not as a backyard activity. The Sewage and Industrial Effluent Regulations (1979) should be amended to include animal waste. When reclassification and amendments are made, DOE will have specific jurisdiction to monitor the effluent quality and to enforce standards.

5. Improvement of legal and institutional arrangements for aquaculture

- a. The water quality criteria for aquaculture and the harvesting of seafood for human consumption should be established and enforced.
- b. The DOE should establish standards for effluents from aquaculture farms and ensure that these are met.

6. Proper management of domestic sewage - It is strongly recommended that the proposal for Johore Bahru's sewerage and drainage project made by the Asian Development Bank (ADB) in its study, "Development of selected urban centers in Peninsular Malaysia" (BKH 1989), be implemented as soon as possible.



7. Cooperation with Singapore - A joint working group should be established to address the problem of water quality in the strait. Priority will be set by the highest national authorities in each country. The group's terms of reference will include planning to reduce the pollutant load of the strait, improving the current flow under the causeway and establishing a program to zone the uses and to monitor water quality.

8. Evaluation of industrial development

- a. The recommendations of the study on Sg. Segget (Envilab 1985) should be updated and implemented.
- b. The pollution load of a proposed project must first be evaluated regarding its cumulative effect on the total pollution load of the area. Only then can the next proposal in line undergo assessment.
- c. Heavy and pollutive industries should be grouped in particular areas rather than spread along the coast. A 1,000-m buffer zone from the high water mark of the shoreline should be part of the site plan for industrial development, except where water access requires piers and roads.

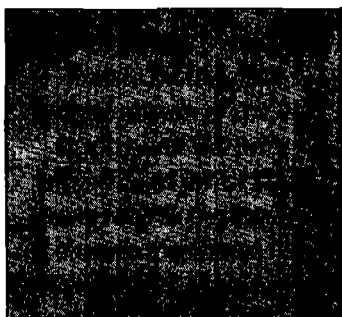
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9. Controls on sand mining

- a. The SDLM should formulate a policy for inland sand mining similar to that for ore mining. Compliance with the conditions attached to any mining approval should be monitored and strictly enforced for the duration of the project.
- b. Soil stabilization measures, such as planting and the use of silt curtains, should be imposed as conditions for any permit to extract sand. The cost of the measures should be shouldered by the developer.
- c. When a mining activity is finished, the land should be rehabilitated so that it can still be used for other purposes. The costs of rehabilitation should be borne by those undertaking the mining activity.

Forests

Coastal nonmangrove forests



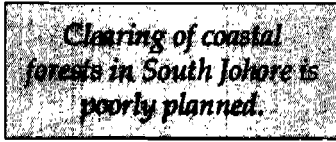
In South Johore, the coastal forests are confined in the east, primarily from Tanjung (which means "cape"; "Tg." from here) Punggai to Teluk Mahkota and the Sg. Sedili Kechil basin. This area includes the largest stands of coastal *kapur* and the only transitional forest from mangrove to freshwater swamp forest in Peninsular Malaysia.

The coastal forest area in southeast Johore was reduced by 46% between 1974 and 1986 (Kam 1989). Most of it was converted for agricultural use, primarily for oil palm. In the Sg. Sedili Kechil area, including the coast south to Tg. Kelesa, about 7,400 ha (40% of the basin) have been logged. The Lembaga Kemajuan Johor Tenggara (KEJORA), or the Southeast Johore Regional Development Authority, the agency responsible for development on most of the land in the area, recently leased out several large tracts of the forest (totalling about 1,700 ha) for logging, including those upstream. This has significantly reduced the forest's capability to absorb floodwaters and to maintain high water quality for uses downstream such as aquaculture. In Desaru, there are plans for a massive resort development costing a total of M\$1.6 billion in the remaining areas of coastal woodland.

Clearing or converting coastal forests results in environmental problems such as flooding and sedimentation. The forest's importance for scientific research, as a wildlife habitat and to tourism is also lessened.

Moreover, clearing of coastal forests is poorly planned. For example, the Sg. Sedili Kechil basin is being developed by KEJORA, which has alienated a large tract of land to the Federal Land Consolidation and Rehabilitation Authority (FELDA) for agricultural development. FELDA, however, is not

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planning to use the southern part of the land for agriculture, since it is considered only marginally suitable for that purpose due to its swampy nature. This means that coastal forests are being cleared although there are no plans for their agricultural use.

Another instance that shows poor planning is the development of a tourist resort in Desaru. The developers tried to harmonize nature with development with the idea of leaving clusters of trees within the resort's golf facilities. However, the remaining forest area was too small to sustain the trees, and the diversion of streams reduced their groundwater supply. Thus, in some areas, only about 3 km of coastal forest strip remains.

To address the above problems, the following are recommended:

1. Water catchment areas should be established as permanent forest reserves where no development or excision will be allowed in perpetuity. The National Land Code should be revised to provide for the nonconversion of these reserves into other uses.
2. The Sg. Sedili Kechil forest should be gazetted as a state park. The area should include the transitional, hill and coastal *kapur* forests, including the one along the coast south to Tg. Siang. A survey should be made to determine the area's extent and location, type of forest, water quality, and wildlife and human activities. The results could be used in preparing the comprehensive management plan by NPJC.
3. A survey such as the above should also be conducted in the Desaru coastal forest. The results could be used to zone the area into three:
 - a. core zone - for complete protection; no development or logging will be allowed;
 - b. buffer zone - to be used as a nature reserve; with restricted access and a limited number of visitors; and
 - c. multiple-use zone - development of tourist resorts is permitted, provided regulations are complied with.

Mangrove forests

Mangrove forests in South Johore are located along the sheltered west coast, which borders the Strait of Malacca; at the estuaries of Sg. Pulai and Sg. Johore; along the sheltered south coast bordering Johore Strait; and at the estuaries of Sg. Sedili Kechil and Sg. Sedili Besar on the east coast.

The annual value of forestry products from mangroves in South Johore is over M\$41.7 million. The annual value of fisheries output from the Pulai forest reserve alone is estimated at M\$3-4 million.

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South Johore's mangroves are classified either as forest reserves or stateland forests. Forest reserves are federal reserves (under the state DOFor) that are protected for the time being, but can be converted into other uses that are more beneficial economically. Stateland forests, which are under state jurisdiction (SDLM), are deemed to be state property and can be converted into any use.

From 1960 to 1986, the forest reserve area was reduced by over 20% (from 22,901 ha to 18,003 ha) and the stateland forest area, by over 11% (from 8,752 ha to 7,789 ha). The reduction was primarily due to conversion into other uses, such as agriculture and aquaculture (Chan 1989a). These increasing conversional operations have become a major management issue. Mangrove areas are considered wasteland; there will be higher financial returns if they are transformed for other uses. This perception fails to recognize the essential functions of these resources in maintaining the coastal ecosystem. The economic cost of combatting the adverse environmental effects of conversion is not likewise considered. This is only a reflection of the lack of a comprehensive policy for the management or use of mangroves. Meanwhile, the following are recommended:

All existing permanent forest reserves should be conserved in perpetuity to maintain their ecological value and to protect the activities dependent on their functions.

1. All existing permanent forest reserves should be conserved in perpetuity to maintain their ecological value and to protect the activities dependent on their functions. Conversion into other uses should be prohibited.
2. Mangrove forests fronting coastal bunds should be legally protected in perpetuity.
3. Conversion of any part of the protective forest reserve area should be prohibited, in compliance with the Malaysian National Mangrove Committee (NATMANCOM) guidelines.
4. The following should be gazetted as protected forest reserves in perpetuity: the Benut Stateland Forest; all nipa forests that are now stateland mangroves; and the forests at Kuala Sedili Kechil and along the Johore Bahru waterfront.
5. Minimum buffer zones between mangrove and development areas:

industrial development	-	1,000 m
housing estates	-	500 m
tourism development	-	100 m
aquaculture development	-	100 m
6. Strict pollution control should be enforced for developments adjacent to mangrove areas to prevent the discharge or dumping of wastes into these.

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7. The National Forestry Act should be amended to include legal instruments that provide the directives for the conservation of mangroves and their ecological functions. This amendment will also ensure that the proper management of mangroves can be legally enforced.
8. Existing water channels running parallel to the coastline and those from the hinterland to the coasts should be preserved.

Aquaculture

Aquaculture is a growing industry in South Johore with activities such as pond and cage culture of shrimp and finfish, and raft culture of shellfish. The total gross revenue from aquaculture in 1987 was estimated at M\$16 million, with more than 50% of the total contributed by shrimp farming (DOF 1987). Aquaculture also provides additional food source and supplementary or alternative employment.

Good water quality is essential to aquaculture. However, in South Johore, aquaculture farms are already being affected by water pollution caused by upstream logging and siting of incompatible development projects adjacent to the farm.

The following recommendations are made:

1. Current laws and regulations for pollution control should be strictly enforced. Effluents from aquaculture farms should be strictly monitored to prevent the spread of disease to other farms or ponds.
2. Based on the NATMANCOM guidelines, the following forms of land are recommended for aquaculture development:
 - a. Nonmangrove land, for large- and small-scale aquaculture.
 - b. Former mangrove lands that were already reclaimed for agriculture and located behind the DDI bunds, especially those areas that are currently unused or abandoned due to poor soil conditions. Caution should be taken when choosing these areas whose acid sulfate conditions make them unsuitable for agriculture and aquaculture.
3. Based on the physical and biological requirements, the areas shown in Fig. A.7 are recommended for aquaculture.
4. Only nonconversional forms of aquaculture, such as raft, cage and pen culture, are deemed suitable for use in permanent mangrove forests.

No conversion into large-scale aquaculture is recommended for stateland mangrove forests. Only development of less than 3 ha should be allowed, but still, upper limits on the cumulative numbers of such developments should be established.

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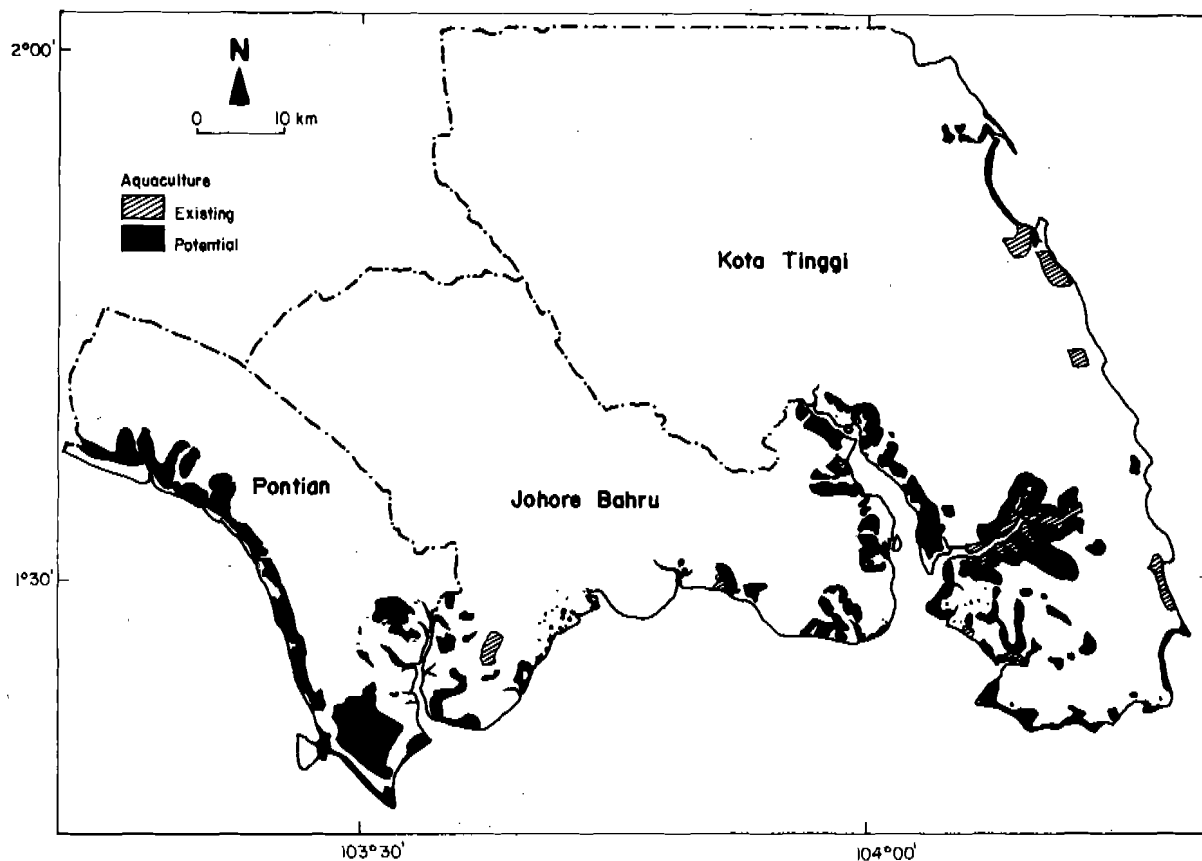


Fig. A.7. Areas suitable for aquaculture, South Johore.

Capture Fisheries

Coastal fisheries, which are multispecies and multigear, provide food, income and employment in South Johore. The bulk of the landings come from the east coast.

Stock overexploitation is the most critical issue in capture fisheries.

Stock overexploitation is the most critical issue in capture fisheries. This is compounded by: the loss of mangroves, which serve as feeding, spawning and nursery areas; pollution; and the use of destructive fishing methods.

To address overexploitation, ecosystems must be rehabilitated and protected, and fishing effort must be reduced. Current fisheries management is based on the Fisheries Comprehensive Licensing Policy (FCLP) of 1981, which gives clear guidelines for the control of fishing effort using a license limitation scheme (LLS). The FCLP outlines a phased program that removes excesses in the fishing manpower and boats. However, the program has not been fully implemented due to local political pressures.

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The following are the major recommendations:

1. Fisheries management should be strengthened. This can be done by fully implementing the FCLP program and maintaining the freeze on the number of licenses despite political pressures. This should be coupled with the prevention of illegal entry into the inshore fishing industry. In addition to these, an effective surveillance program should be established to monitor fishing activities and to assist in the enforcement of regulations.
2. Habitat protection should be made an integral part of fisheries management.
 - a. All breeding and nursery grounds such as mangroves, estuaries and coral reefs should be protected.
 - b. An EIA should be required of projects within and adjacent to all breeding and nursery grounds, and of those that affect environmental processes influencing the health and productivity of the areas.
 - c. Pollution control should be strictly enforced on all coastal developments.

Tourism

In recent years, the tourism industry has become one of the priority areas for development of both federal and state governments.

Tourism is a relatively new industry in Malaysia. In recent years, it has become one of the priority areas for development of both the federal and state governments, resulting in its rapid growth. In 1987, about 1.8 million tourists visited South Johore, and this number is expected to increase each year. This growing market is an incentive for the development of more tourist facilities and projects.

Several potential areas for development as tourist resorts have been identified. However, the state government must assess the proposals' suitability by assessing their cumulative impacts on the environment and the carrying capacity of the different coastal ecosystems. Also, adequate planning for the provision of infrastructure, such as sewage and waste treatment facilities, and the protection of the environment must also be done (Maragos et al. 1983; Clark 1985). It must also be ensured that the local people are not alienated in the planning of incoming developments.

Degraded water quality is often associated with tourism-related activities. This problem is caused by contamination due to the lack of sewerage and solid waste facilities. The lowering of the water table, especially on the islands, has also resulted in poor water quality caused by saltwater intrusions. This happens when groundwater pumping for drinking and other uses such as irrigation of golf courses and agricultural crops is increased.

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Coastal erosion has occurred where tourist facilities were built too close to the shore. It is also seen in sites where large stands of forest were cleared for development without any remedial measures done.

The following are the major recommendations for tourism management:

1. Management zones should be established.
 - a. Based on the existing demand for and supply of resources, six tourism zones were identified by Kechik et al. (1991): southern gateway, mangrove estuarine, historical estuarine, beaches, coastal/nearshore waters and offshore islands.
 - b. Within each tourism resource zone, areas were ranked according to different scales of development that they are suited for. This zoning is based on the environmental situation and the available facilities.
 - c. Coastal and mangrove forest areas proposed as protective forests could be used for tourist activities compatible with the sustainable management of these areas.
2. An EIA should be required of large-scale coastal tourism developments, as stipulated in the 1987 Environmental Quality (Prescribed Activities) (EIA) Order. The scale of development should be reviewed to ensure that it is within the carrying capacity of the area. The EIA should also be reviewed by relevant agencies to identify mitigating measures that must be undertaken by the developer at his cost. A certificate of fitness should be issued only upon full compliance with requirements.
3. The local population should be involved, as a direct or indirect labor force, in all local tourism projects.
4. Operators of any tourist development should be prohibited from discharging their wastes into the rivers or sea.

Sand Mining

Sand mining is a thriving industry in South Johore. The projected economic recovery and the expanding construction industry mean an increase in the demand for sand aggregates. Reclamation operations in neighboring Singapore are also in huge need of sand as fill materials. To meet this demand, there is an expressed interest to dredge in most of the nearshore areas of East Johore from Tg. Siang southward down to and including the Sg. Johore estuary.

Sand reserves are estimated to be about 100 million m³, and the present rate of extraction is 800,000 m³/year. At this rate, it means that mining for sand can continue only for about the next 20 years. The adverse effects of sand

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At the present rate of extraction in sand reserves, mining for sand can continue only for about 20 years.

Offshore mining normally incurs the risk of altering the beach dynamics, wave and swell patterns, and coastal current circulation.

mining are due mainly to its dredging activities, which cause the suspension of sediments that release absorbed pollutants affecting the local fauna and water quality. Dredging also results in the disturbance of sediments, causing changes in the shoreline and also affecting aquatic resources. Offshore dredging, on the other hand, causes massive displacement of the substrate and destruction of nonmotile benthic communities. Some effects may not be easily recognized, though, such as the:

1. reduction of primary productivity (photosynthesis) due to increased turbidity of the water column;
2. reappearance of toxic substances uncovered by mining activities; and
3. destruction of adjacent habitats.

Offshore mining normally incurs a risk of altering the beach dynamics, wave and swell patterns, and coastal current circulation. This alteration causes increased sedimentation or erosion of the coastline.

Both federal and state authorities have control over sand mining, depending on the area of operation. All land, including foreshore and seabed, up to 3 nautical miles from the shore is under state jurisdiction. The seabed and waters beyond this limit up to the continental shelf waters boundary is under federal control. This problem of dual jurisdiction is compounded by the lack of coordination and consultation in the issuance of permits for sand mining, the impact of which is seldom considered. The procedure itself for issuing permits is inadequate. There is no established framework whereby the state authority is required to submit to DOE all applications for sand mining although legal conditions exist. No attempt is made to ensure that the applicants comply with EIA requirements. Moreover, the agencies consulted are not given enough time to assess applications nor are they informed of the final decision on these.

Also, dredging is not well monitored due to staff shortage and lack of competent personnel. Thus, it is frequently left to the dredging operator to provide information on the quantity of sand excavated but nothing on the environmental impacts of the operation.

The following recommendations are made:

1. Sand mining should be prohibited:
 - a. within the area from the mean low water line to 1.5 km from the shore, or the 10-m depth contour measured from the lowest astronomical tide, whichever is farther from the shore;
 - b. in rivers where there are fisheries, aquaculture operations or drinking water intake points; and

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- c. near sensitive resource areas, e.g., coral reefs, seagrass beds, productive fishing grounds, aquaculture areas or beach/tourism areas.
2. River sand mining, when allowed, should be restricted to the middle one-third section of the river to avoid erosion of the banks.
3. The environmental effects of all sand mining operations should be monitored by competent independent firms and paid for by the operator.

Offshore Islands

The islands off the east coast of Johore are scenically attractive. Marine life in the surrounding waters is abundant, and the tropical forest and coral ecosystems are unique. However, major issues beset the management of these islands.

The most critical problem is the lack of local authority and the resulting absence of a clear legal jurisdiction over development and of an institutional framework for the administration of laws. Since there are no statutory controls or guidelines, development occurs haphazardly, without any safeguard for the environment or for the long-term viability of the islands' economy. There is also no solid waste disposal system because no agency is authorized to establish one.

Development has encroached onto the beaches in several areas because there are no beach setback zones. This causes erosion, reduced public access and poor sanitation.

The decrease in water catchment areas due to logging has caused the problem of limited drinking water supply. The extraction of groundwater resources beyond replenishment rate will eventually lead to saltwater intrusion into the aquifer.

The overall level of development that the islands can sustain is not known. The adverse impacts of overdevelopment will eventually result in the failure of the tourism industry.

The following are recommended:

1. The adjacent local authority should be extended, and an appropriate, effective legal and institutional framework should be established for the administration of the islands.
2. Trained personnel should be made available to enforce the legal requirements.
3. The carrying capacity and optimal mix of activities for each island should be determined, and areas for development should be zoned accordingly.

On the offshore islands, development has encroached onto the beaches in several areas because there are no setback zones.

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4. The Johore State Government has agreed, in principle, to allocate the unalienated lands on the islands for the establishment of land parks under the NPJC Enactment (1989). However, NPJC, which will be responsible for the administration of this enactment, has not yet been established. This should be done as soon as possible.
5. There should be an integrated resources management plan for the off-shore islands, including the surrounding seas.
6. All developments on the islands should have zero discharge of waste-waters, sewage and domestic waste into the rivers or sea.

Major Development Proposals In South Johore

There are three major development proposals for South Johore: the developments associated with the second linkage with Singapore; the petrochemical industrial estate at Tg. Langsat; and the international resort at Desaru.

There are three major development proposals for South Johore (Fig. A.3), namely:

1. the developments associated with the second linkage with Singapore;
2. the petrochemical industrial estate at Tg. Langsat; and
3. the international resort at Desaru.

The scale of these developments is massive. Unless they are skillfully planned and managed, their long-term success could be jeopardized.

There are plans to develop industrial complexes, housing, government offices, a new town center and related infrastructure in association with the proposed second linkage with Singapore. There is also a proposal for a second port in the area. More developments are proposed north of the second linkage in anticipation of tourism expansion. Several critical issues concerning these plans were identified:

1. Some of the developments are being sited adjacent to mangroves, which will result in the runoff of pollutants and the diversion of water.
2. The increased pollution load will reduce water quality and the suitability of the area for aquaculture, adversely affecting the fish stocks, which are already overexploited.
3. Coastal erosion will result from construction activities directly adjacent to the coastal bunds.
4. The building and operation of a second port will require continuous and extensive dredging, resulting in the high turbidity of the coastal waters. This will have a negative impact on fisheries and aquaculture.

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5. With all these developments, there will be a concomitant increase in population and disenfranchisement of the local inhabitants from the resources on which they depend. This will result in a dramatic change in the existing agrarian and fishing lifestyle.

The petrochemical industrial estate at Tg. Langsat, covering 2,400 ha of land, is being proposed specifically for heavy industries such as petrochemical factories and steel mills. The establishment of an oil sludge disposal system on Sg. Santi and an oil sludge/oil slop reprocessing facility on Sg. Lebam is also planned. Despite these proposed developments, the nearby industrial estate at Pasir Gudang continues to expand and more petrochemical factories are being planned here.

There are also plans to increase activities in the tourism, fisheries and aquaculture sectors in these areas and in the entire Sg. Johore estuary. In view of all these, the following issues were identified:

1. The proposed developments are not compatible, and insufficient attention is given to management measures in reducing the negative effects of one activity on another and on the environment. There is a need to separate these incompatible activities from one another.
2. The scale of development may be greater than what the area can sustain without causing severe environmental damage.
3. The estuary and downstream sections of Sg. Johore already have existing problems in water quality that are almost certain to worsen with the proposed developments.

KEJORA has received several development proposals for Desaru. The main one is for a large-scale resort development covering an area of 1,700 ha. The project, which has been approved by the Johore State Government, includes: 14 hotels, 4,000 holiday homes, 5 golf courses and a marina with 350 berths.

The following are the major recommendations on the management of the above forthcoming developments:

1. The total existing and proposed developments within each area should be assessed, and the capacity of the resources to sustain further developments should be quantified.
2. The infrastructure (e.g., sewage disposal, water supply and roads) should be planned as an integral part of the development proposals.
3. The environmental and socioeconomic costs of these developments should be fully assessed.

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4. The zoning of developments is not sufficient to guarantee sustainable development nor to prevent adverse effects. The sectoral plans and management strategies for development in each zone should be integrated.
5. Particular attention should be given to developments that could affect water catchment areas.
6. Forests to be preserved should maintain a minimum area to ensure sustainability.

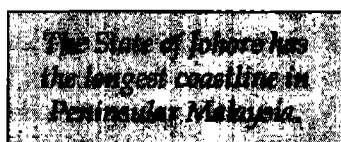
CONCLUSION

As discussed, planning and management should be strengthened using an integrated approach to realize the full potential of South Johore's coastal resources. This is one of the main purposes of this CRM plan.

CHAPTER 1

INTRODUCTION

SOUTH JOHORE: CRM PILOT SITE



The State of Johore is located at the southern end of Peninsular Malaysia. Having the longest coastline in the country, Johore largely depends on its coastal resources for livelihood and economic development. The surrounding waters and rivers are used for drinking, fishing, aquaculture, recreation and transportation. Coastal forests generate various products, while mangroves are important as a wildlife habitat and as breeding, nursing and feeding grounds for fisheries. The forests also help maintain the quality of nearby waters and act as buffers to prevent flooding and erosion.

At the southernmost part of Johore are the three districts of Pontian, Johore Bahru and Kota Tinggi, collectively known as South Johore (Fig. A.1). On the east of this region are found diverse, productive ecosystems such as coral reefs, seagrass beds and forests, and offshore islands; muddy shorelines, mangroves and river basins are seen on the west (Fig. A.2). Tradeoffs among various activities undertaken in the area result in use conflicts. For example, logging of coastal forests reduces these resources' ability to control floodwaters and supply adequate drinking water. Conversion of mangroves for aquaculture purposes decreases the resource base for fisheries and forestry. Untreated or partially treated wastes from upstream industrial activities or municipalities may affect water quality, causing conflict with downstream aquaculture, fishing and recreational activities.

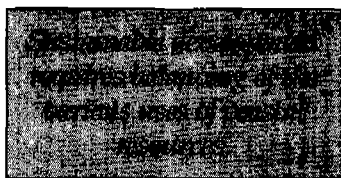
South Johore is currently undergoing massive development with the establishment of large industrial estates, and expansive residential and tourist complexes (Fig. A.3). In association with the proposed second linkage with Singapore, about 8,500 ha of land will be utilized for development: 4,100 ha for a housing project that will service over 250,000 people; 3,000 ha for industrial development; 500 ha for government institutions; 300 ha for the new town center (Bandar Baru Piai); and 560 ha for the town park. Development will also include the construction of a high-level bridge 2,300 m long with viaducts connecting both shores, and a 26-km road connecting the bridge to the North-South Highway.

Further east, a 2,400-ha industrial estate at Tg. Langsat is proposed, particularly for heavy-industry facilities such as petrochemical and steel mills. It will have its own port, including facilities for cargo handling, oil sludge disposal and oil sludge/oil slop reprocessing.

In the East Kota Tinggi District, plans are underway for the expansion of tourist facilities in Desaru, the main resort center. The largest project has an investment of M\$1.6 billion, and will include hotels with over 4,000 rooms, 4,000 holiday homes, 5 golf courses, a 350-slip marina, large man-made lakes and waterways, an amusement park and a wilderness reserve.

In the face of its environmental conditions and intense development pressures, South Johore was chosen as the Malaysian pilot site for the ASEAN/US CRMP.

THE GOAL: SUSTAINABLE DEVELOPMENT



The goal of CRMP in Malaysia is to achieve balanced, sustainable development of the coastal resources, which will ensure the productivity of the resource base for present and future generations. Sustainable development requires balancing of various uses of coastal resources to minimize adverse impacts on the environment. It can only be achieved by integrated resource management and land use planning, taking into consideration the interrelationship between land, sea and human activities.

The three objectives of the CRM plan for South Johore are:

1. to provide the Johore State Government with a database of information on coastal resources;
2. to develop guidelines for sustainable development of the coastal resources; and
3. to provide tools to evaluate coastal zone development options.

Sectoral Planning and Management

The studies undertaken in the preparation of this plan revealed several critical issues regarding the existing sectoral approach to planning and management of South Johore's coastal zone (Table 1.1):

1. The current system of planning and managing coastal resources is fragmented, and there is little coordination of policies, management strategies or development initiatives among federal, state, local and statutory bodies.
2. Although mechanisms and procedures exist for resolving conflicts over the allocation and use of coastal resources, these are not used to their full effect.
3. Most laws and regulations are obsolete and lacking in environmental criteria.

Chapter 1. Introduction

Table 1.1. CRM problems and issues in South Johore.

Environmental degradation	Water pollution	Inadequate treatment of sewage and pig wastes High level of use and overapplication of pesticides/biocides Increased sedimentation due to clearing of coastal forests and poorly planned development
	Aquaculture Environmental quality and tourism	Deterioration of the quality of water for aquaculture Inadequate domestic waste and sewage treatment/collection Coastal erosion caused by construction of tourist facilities too close to shore
	Environmental quality and sand mining	Deterioration of water quality due to suspension of sediments and release of contaminants/pollutants from sand mining
Resource exploitation	Coastal forest conversion	Conversion of coastal forests (mangrove and nonmangrove) into other land uses (e.g., aquaculture and agriculture)
	Habitat destruction	Loss of spawning, nursery and feeding grounds due to mangrove forest conversion Use of fishing methods that destroy habitat
	Overfishing	Overexploitation of available stocks
	Overdevelopment of offshore islands	Overdevelopment because of lack of information on the ecological carrying capacity of the islands Extraction of groundwater resources beyond the replenishment rate, resulting in saltwater intrusion into aquifers
	Undervaluation of resources	Undervaluation of the economic and environmental values of natural ecosystems and the resources they generate
	Resource use conflicts	Conflicts due to the lack of clear policies and guidelines or failure to implement existing ones
Legal/institutional framework	Insufficient monitoring	Insufficient monitoring of development activities due to lack of staff/personnel
	Insufficient arrangements	No statutory control or guidelines on the development of offshore islands Lack of local authority to administer solid waste disposal systems, particularly in offshore islands
	Inadequate integration	Inadequate integration of sound environmental and economic information, and management concepts into the development planning process Inadequate integration of sectoral development plans and insufficient coordination of investment by individual agencies
	Ineffective law enforcement	Ineffective enforcement of existing policies, laws and regulations on CRM
	Obsolete laws	Existing laws contain no specific environmental criteria

4. There is a lack of effective enforcement of existing policies, laws and regulations due to overemphasis on short-term financial gains versus long-term sustainable use of renewable resources. Where the need for improved enforcement is recognized, the lack of trained personnel hinders it.
5. Most planners, decisionmakers and resource managers (especially of land) on both state and federal levels lack environmental awareness.
6. There is a general lack of public involvement in the establishment of policies and plans affecting their lives and economic welfare.
7. Current planning and management approaches are reactive and issue-driven, and put insufficient emphasis on forward planning, which makes efficient use of land and water resources, capital and labor.
8. The EIAs are site-specific and do not take into account the ecosystem as a whole.

**Integrated Planning
and Management**

A comprehensive planning and management system needs to be developed for South Johore. This system should combine:

- the establishment of an overall policy for the sustainable development of the coastal zone;
- the formulation of sectoral development policies and plans that are compatible with the objectives of the overall policy;
- the integration of sectoral plans into regional and statewide development plans; and
- coordination of development initiatives on the state, district and local levels.

Fundamental to all these actions is the establishment within the state of an integrated resource planning, which would take into account the need for the conservation of the natural ecosystems that generate the resources required to sustain different economic and social activities. Planning, implementation and review of plans should be coordinated by one body or committee to ensure the integration of policies, plans and individual development initiatives. All private and public development projects, from their proposal to implementation, should be vetted by this body so that these conform with the established integrated CRM plan.

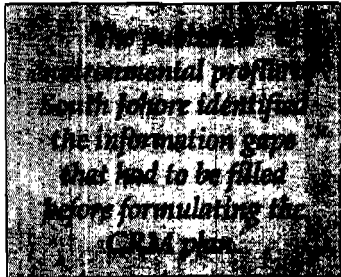
A key principle that should also be adopted is the optimization of long-term productivity of resources. This requires greater cooperation among different sectors and levels of government, adjustment to legislation and improvement of basic management skills.

A popular management action employed as part of integrated planning and management is zonation. A zonation scheme aggregates activities that are congruous to one another and segregates those that are incompatible. Likewise, it ensures that areas that are able to sustain multipurpose development are identified and those for protection are covered by legislation. Therefore, areas for coastal erosion and flood control, water catchment and habitat protection, and marine resources management, including fisheries, can be identified and mapped. Suitable areas for aquaculture, recreation, tourism, industrial use and sand mining can also be identified. Zonation is thus a useful tool in development planning.

Using a zonation strategy and resource-specific management plans, action plans are developed for specific sites that are currently experiencing critical resource use conflicts, or have proposed resource developments that may result in such conflicts.

THE MANAGEMENT PLAN

The Planning Process



This CRM plan was a collaborative effort of scientists (Annex A), resource managers, administrators and decisionmakers from various federal and state government agencies and universities (Annex B). This collaboration is facilitated by the existence of two committees on the federal and state levels, respectively: the National Steering Committee and the Johore State Consultative Committee (Annex C and Fig. 1.1).

The first step in the planning process was to come up with an environmental profile of South Johore, which was subsequently published. This profile identified the information gaps that had to be filled before formulating the

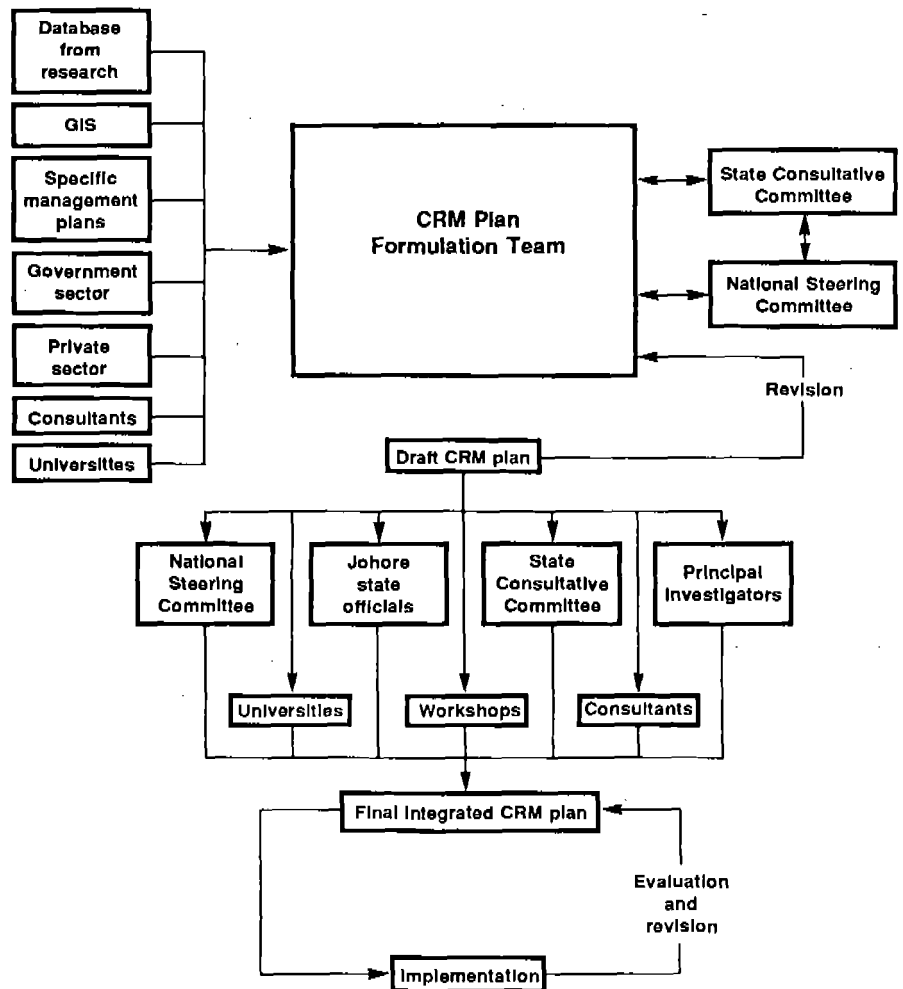


Fig. 1.1. The CRM plan formulation team and the planning process.

plan. The next stage was the research proper, which was undertaken by several universities and agencies. The active participation of these individuals involved in the planning process in four large in-country meetings, eight small technical working group meetings and the review course of the various research reports and administrative schemes is a significant factor in the consensus development of the management plan. The provision of this forum for open discussion, analyses of research data and formulation of recommendations for management ensured that recommendations are practical and represent a consensus of all those involved in decisionmaking since the project's initial phase.

CRM education was also intensified during the planning process. Several project technical staff were given short-term, medium-term and/or on-the-job training. Some of them also participated in regional conferences and workshops attended by policymakers, decisionmakers, scientists and others.

Another important feature of the plan development process is the use of GIS in the spatial analysis of the data. This system enabled the group to evaluate the overlapping impacts of development on the environment and the sustainability of the development currently being undertaken. Use of GIS greatly enhanced the planning capabilities of the government, which was able to assimilate and integrate various types of data, e.g., maps, figures, tables and databases. As the plan is expected to evolve constantly due to dynamic developmental conditions in the state, GIS is indeed an important tool.

Elements of the Plan

The integrated CRM plan contains the strategies, action plans and projects, and recommendations that will attempt to solve problems and issues (Tables 1.2-1.3). Also central to the plan is a zonation scheme for development and conservation purposes.

To implement the management guidelines recommended in the plan, federal and state legislation is needed. In general, the zonation plans need to be incorporated into the structural and local plans through the Town and Country Planning Act. The proposed protective and productive forests need to be gazetted through the National Forestry Act. The proposed national parks in Johore need to be gazetted through the National Parks-Johor Enactment.

The Town and Country Planning Act, with its regulations and by-laws, has to be reviewed and updated to incorporate environmental criteria. Amendments to the National Forestry Act, Environmental Quality Act, Continental Shelf Act, Local Government Act, Sewage and Industrial Effluent Regulations and Uniform Building By-laws, among others, are also required. In the case of islands, existing by-laws (such as those for the Mersing District) need to be extended to ensure compliance to building plans and regulations here.

Chapter 1. Introduction

Table 1.2. Summary of strategies, action plans and projects featured in the integrated CRM plan for South Johore.

-
- A. Water quality
 - 1. River classification
 - 2. Watershed protection and management
 - 3. Prevention of soil erosion from land development
 - 4. Control on use of pesticides and implementation of effluent regulations for pig farming
 - 5. Establishment of water quality criteria for aquaculture and harvesting of seafood
 - 6. Johore Bahru sewerage and drainage project
 - 7. Zoning of uses and water quality monitoring for Johore Strait
 - 8. Industrial development zoning and evaluation of pollution loads and their cumulative effects
 - 9. Policy formulation for inland sand mining activities
 - B. Coastal forest
 - 1. Establishment of forest reserves in water catchment areas
 - 2. Sg. Sedili Kechil forest project
 - 3. Desaru coastal forest project
 - C. Mangrove forest
 - 1. Mangrove forest reserve conservation
 - 2. Establishment of protective forest reserves
 - 3. Enforcement of minimum buffer zones
 - 4. Enforcement of pollution controls
 - 5. Review and revision of the National Forestry Act
 - D. Aquaculture
 - 1. Pollution control
 - 2. Zonation for aquaculture development
 - 3. Prohibition of aquaculture in marine park waters (unless cultured filter feeders are fed artificially)
 - E. Capture fisheries
 - 1. FCLP
 - 2. Habitat protection
 - 3. Prohibition of kelong or fishing stakes in marine waters
 - F. Tourism
 - 1. Establishment of management zones for tourism
 - 2. Planning, implementation and monitoring
 - G. Sand mining
 - 1. Establishment of sand mining areas
 - 2. Monitoring programs to assess the environmental effects of sand mining operations
 - H. Offshore islands
 - 1. Improvements on legal and institutional arrangements
 - 2. Determination of carrying capacity and optimal mix of activities
 - 3. Prohibition of any waste discharges into marine waters
 - 4. Establishment of a buffer zone
 - I. Sg. Johore estuary development
 - 1. Integrated planning and management for developments associated with the second linkage with Singapore
 - 2. Integrated planning and management for the industrial estate at Tg. Langsat
 - 3. Integrated planning and management for the Desaru tourism area
-

The main institutional recommendation in the plan is the establishment of an interagency planning committee within the Johore State Government. This committee shall review and evaluate development proposals in terms of their environmental impacts within the context of the South Johore Structural Plan, which will incorporate the integrated CRM plan. The committee shall also integrate the views of the various institutions regarding the proposed projects in the plan. The integrated views shall be presented as recommendations to policymakers and to the State Industrial Development Committee (SIDC) or CRC.

The plan also recommends that all major planning and regional development agencies establish environmental units within them. These units shall handle environmental concerns in the agencies' activities. It also recommends that adequate trained manpower be provided to implement the plan.

Chapter 1. Introduction

Table 1.3. Summary of recommendations featured in the integrated CRM plan for South Johore.

-
- A. Management zones for:
 - 1. Potential areas for forestry, aquaculture, tourism, sand mining and industrial development
 - 2. Former mangrove land for compatible development
 - 3. Water catchment areas
 - 4. Critical/sensitive areas for protection
 - 5. National Parks-Johor and marine parks
 - 6. Multipurpose, compatible-use areas
 - 7. Tourism development limitation zones
 - 8. Prohibition areas for fisheries, aquaculture, sand mining and industrial development
 - B. Construction setbacks for mangroves:
 - 1. 100 m for tourist development
 - 2. 400 m for coastal bunds
 - 3. 500 m for residential development
 - 4. 1,000 m for industrial development
 - C. Construction setback from mean high tide line for beaches:
 - 1. 60-m beach reserve or entire beach, whichever is greater
 - 2. Preservation of all sand dunes
 - D. Buffer zones:
 - 1. Around the core zone in marine park areas
 - 2. Around coastal forest areas
 - 3. Around mangroves, aquaculture, industries and coastal forests
 - E. Identification of alternate, compatible and nonconventional economic activities
 - F. Operational guidelines for potentially harmful development activities, e.g., sand mining and industrial development
 - G. Maintenance of water quality and pollution control of effluents/discharges (specific guidelines for domestic sewage, animal wastes, land erosion, industrial development, sand mining, agriculture, shipping, toxic chemicals and petroleum)
 - H. Development and planning controls (for resorts, tourist accommodations, community tourism, historical sites, offshore islands, and mangrove and estuarine areas)
 - I. Siting, design and construction of facilities (e.g., jetties, marinas, resorts, industrial areas)
 - J. Sewage and solid waste disposal requirements
 - K. Groundwater supply management
 - L. Carrying capacity management, especially in sensitive areas (e.g., islands)
 - M. Guidelines for evaluation of development proposals
 - N. Maintenance of hydrological regime in bund areas
 - O. Monitoring requirements
 - P. EIAs
 - Q. Shore/escarpment protection measures
 - R. Site-specific action plans for critical/sensitive areas
 - S. Legal and institutional recommendations
 - T. Local community participation and education
 - U. Funding and manpower recommendations
-

Funding proposal for plan implementation has been submitted to the Johore State Government by the concerned agencies, as regards their respective areas of responsibility under the Sixth Malaysian Plan (for the period 1991-1996).

The plan also realizes that CRM is important not only for South Johore. Other states in Malaysia are faced with similar conflicts in coastal resource use and management. Hence, the following recommendations are made to the federal and Johore state governments regarding CRM in Malaysia (Fig. 1.2).

1. Integrated CRM should be established to promote sustainable and compatible development.

Coastal resources management is important not only for Johore but also for the other states of Malaysia.

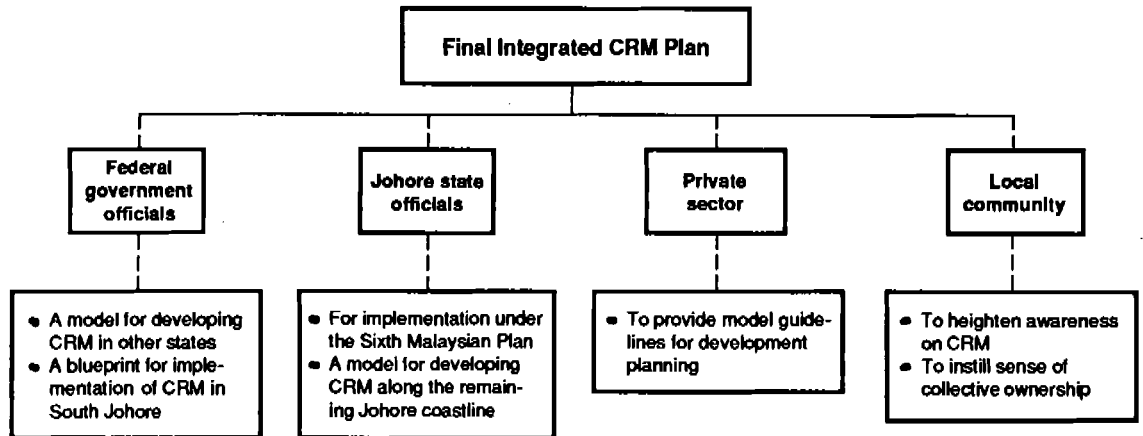


Fig. 1.2. Recommended uses of the CRM plan by various sectors.

2. Interagency collaboration in a decentralized manner should be promoted. Based on the general management guidelines, site-specific studies should be used to develop site-specific management plans. The plans, in turn, should prescribe zonation schemes for the different types and levels of resource use, operational guidelines (including permits, licenses, open/closed seasons), and manpower and legislative requirements.
3. The concepts, methodologies and policies in the integrated CRM plan for South Johore should be extended to other coastal areas in the country.

CHAPTER 2

MANAGEMENT PLAN FOR COASTAL FORESTS

INTRODUCTION

Coastal forests are important economically as well as ecologically, as they serve as water catchment areas, providing freshwater supply and flood control (Fig. 2.1). These forests help to moderate stormflows by reducing runoff and increasing infiltration to underground aquifers. As a result, erosion and sedimentation in coastal waters are reduced, too.

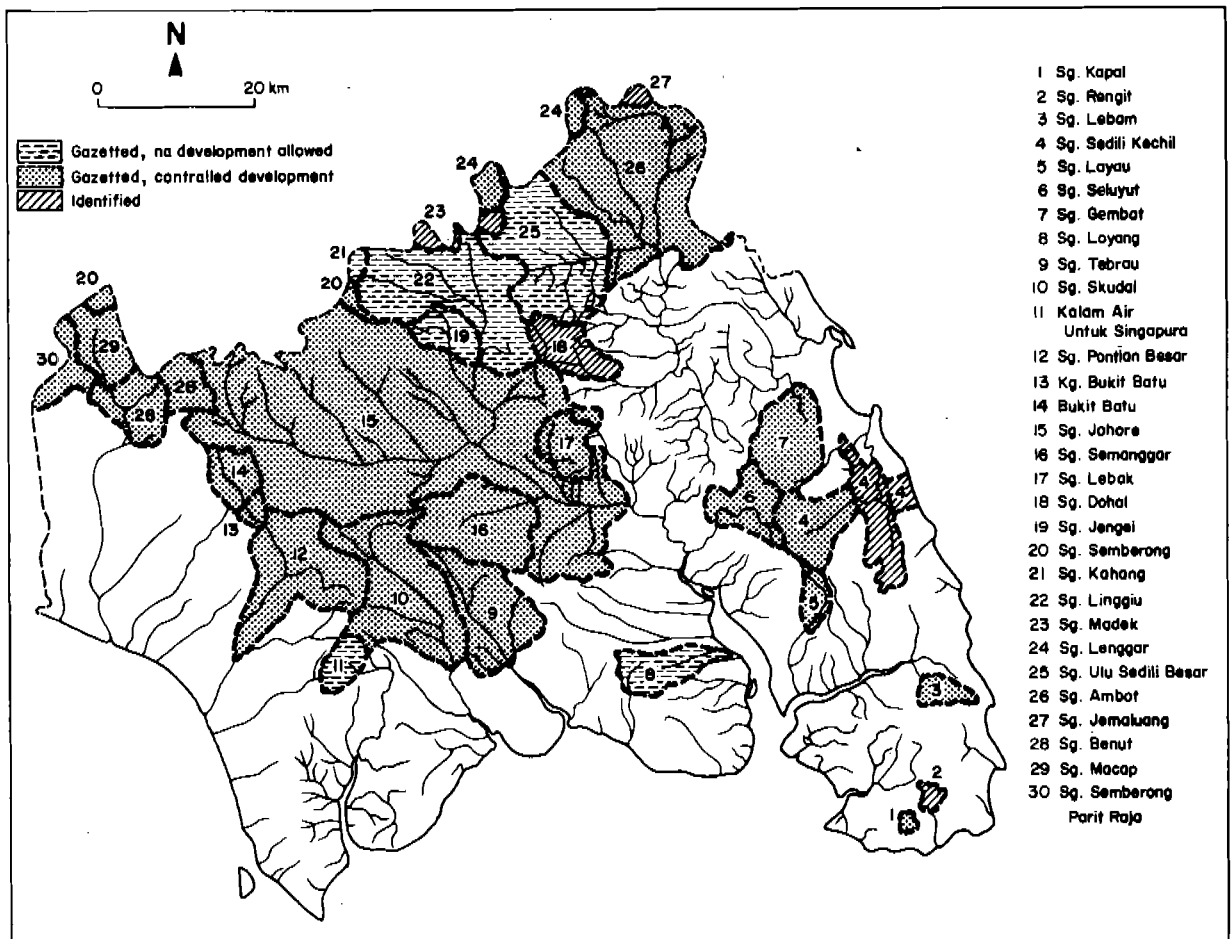
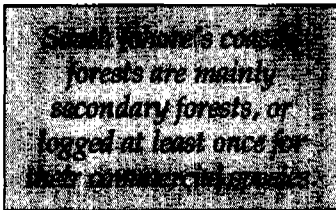


Fig. 2.1. Water catchment areas in South Johore.

Coastal forests are also a potential resource for nature tourism, which includes activities such as boat tours and wildlife watching. These are also valuable as scientific research and cultural sites.

Destruction of coastal woodlands could result in reduced freshwater supplies, degraded water quality, and increased sedimentation and vulnerability of neighboring areas to floods. These could have adverse impacts on economic activities such as agriculture, aquaculture and tourism along the coastal and offshore island areas as well as on coral reefs and fisheries.

CURRENT STATUS



The coastal forests of South Johore are mainly secondary forests, which have been logged at least once for their commercial species. Coastal forests range from wetland, such as mangroves and other swamp forests, to dryland forests. All these resources are covered in this plan, but mangroves will be addressed separately in Chapter 3.

The following is based on the research by Chan (1989b), Kam (1989) and Prentice et al. (1989).

As of 1986, there were about 36,840 ha of coastal forest in South Johore. These are confined to the east, 78% (about 28,710 ha) of which is concentrated within the 5-km coastal corridor southeast of the region.

The different coastal forest types include the Mengkuang and the Kempas-Nyatah swamp forests, the *kapur* and Resam-Tiup-Tiup forests, and the Seraya hill forest. There are also logged or disturbed areas as well as scrubland.

In 1974, about 45% of the river basins in South Johore were under forest cover, mostly in Sg. Johore, Sg. Sedili Besar and Sg. Sedili Kechil. A comparison of the 1974 land use maps with 1986 aerial photographs shows a significant reduction of coastal woodland area in the southeast from 81,730 ha to 35,173 ha (Fig. 2.2). Only about 43% of forest remained (Table 2.1), with approximately 30% cleared for oil palm and another 7% for rubber.

Much of the agricultural expansion since the 1970s has been due to the various land development schemes. Of the total land area developed under these schemes, about 53% is located in the east, mainly in the Kota Tinggi District. These projects included those undertaken by the following government agencies: FELDA, which had 58,690 ha under its jurisdiction; Federal Land Consolidation and Rehabilitation Authority (FELCRA), 1,425 ha; Group Settlement Areas, 4,084 ha; and KEJORA, 9,390 ha. Approximately 14,176 ha of land was developed under private estates and companies and 2,626 ha under other schemes.

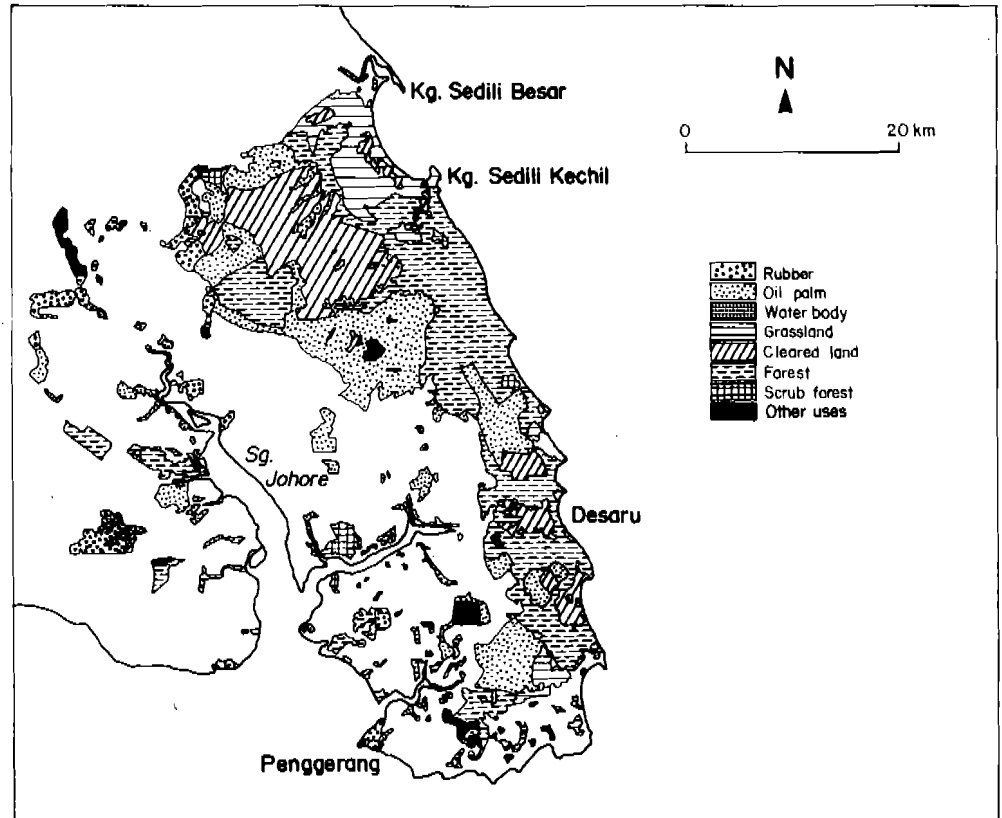


Fig. 2.2. 1986 land use within forest areas (as of 1974), Southeast Johore.

Table 2.1. Land use (as of 1986) within forest areas (as of 1974) in the eastern part of South Johore.

Land use	Area (ha)	(%)
Rubber	5,874	7.19
Oil palm	24,846	30.40
Coconut	39	0.05
Water body	408	0.50
Grassland	7,061	8.64
Cleared land	5,292	6.47
Forest	32,783	40.11
Scrub forest	1,518	1.86
Wetland forest	872	1.07
Other uses	3,037	3.72
Total	81,750	100.0

In the Sg. Sedili Kechil basin, aquaculture development by various private companies, namely, East Asian Marine Farms (EAMF), Bungawang Sdn. Bhd. and Unilever, is being threatened by floods as a result of the logging and clearing of upstream forests. Over M\$8 million has been invested in this development.

The Japan International Cooperation Agency (JICA 1985) has recognized the high potential of the Sg. Sedili Kechil basin and Desaru for tourism development. In fact, there is currently over M\$70 million in tourism investment in Desaru. In addition to this, M\$1.6 billion will be put in for a massive resort development project (see Chapter 8).

MANAGEMENT ISSUES AND PROBLEMS

Sg. Sedili Kechil Basin's Coastal Forest

Logging and subsequent clearing of a forest are precursory activities in its conversion to agricultural land. The Sg. Sedili Kechil basin is being developed by KEJORA, which has already identified several logging tracts (Fig. 2.3). As of 1 September 1989, approximately 1,700 ha of the Sg. Sedili Kechil basin was contracted out by the agency for logging. It also has alienated a large tract to FELDA for agricultural development. However, FELDA might not develop the southern section of the alienated land since it considers the area only marginally suitable due to its swampy conditions.

The issue at hand is that coastal forests are still being logged over even though there are no plans for their agricultural use. There is evidence of a significant flood risk for aquaculture operations due to logging and agricultural development in the watershed. After conversion has been completed, the agricultural use of fertilizers and pesticides would also reduce water quality.

Logging operations also caused the increased erosion resulting in sedimentation of the coastal areas and the coral reef system on the islands off Mersing. Erosion has reduced the areas' value as scientific and cultural spots, and as habitats for wildlife as well. (For instance, elephants were forced to rampage into oil palm estates with the destruction of their habitat.) Sustainability of the local tourism industry, in effect, may be threatened. Riverine and estuarine fisheries have also been adversely affected.

Desaru Tourism Development Area

Resort developers in Desaru had tried to harmonize nature with development by retaining islands of forest within the resort's golf facilities. Unfortunately, the survival of any coastal forest depends on maintaining an area large enough for the necessary breeding population and for retaining

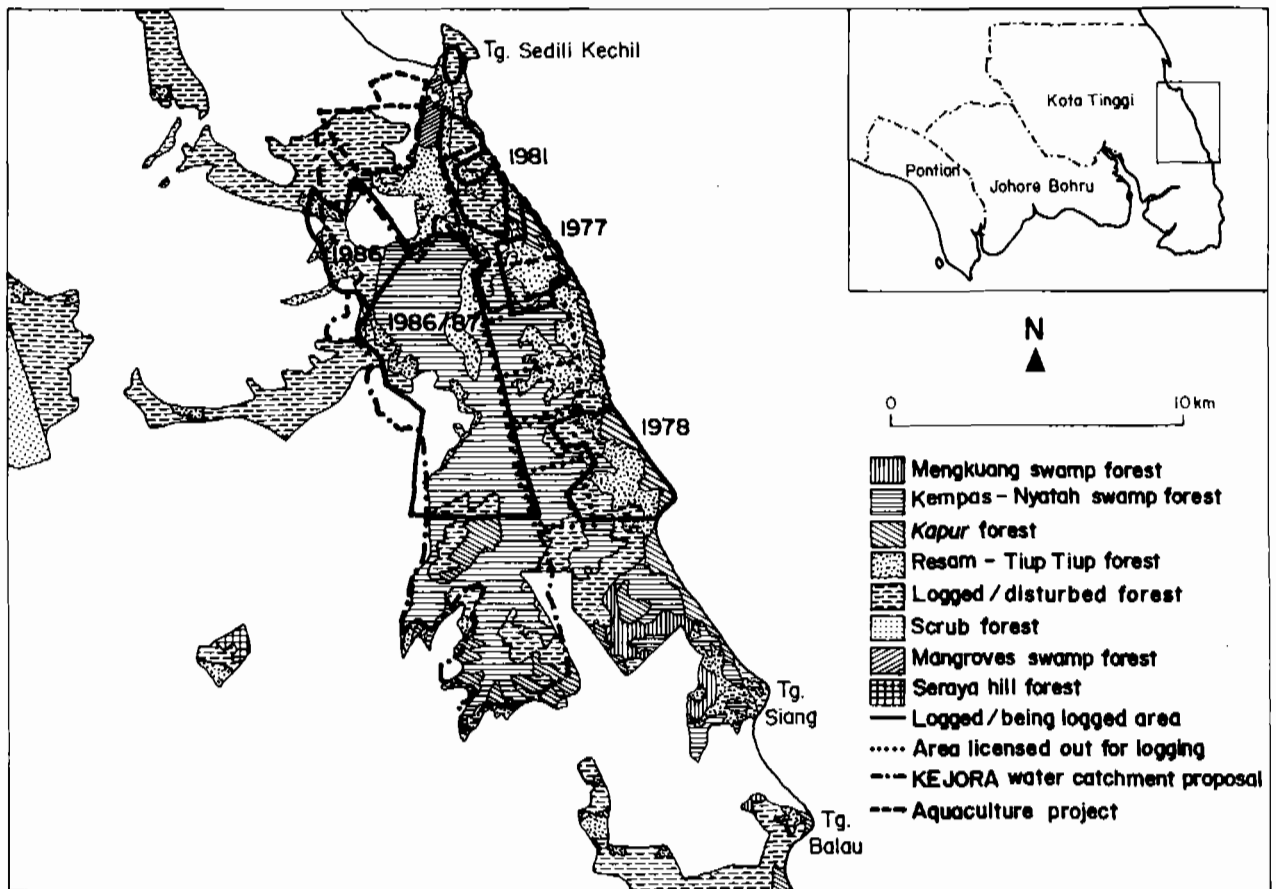


Fig. 2.3. Development pressures within the Sedili Kechil river basin's forest area, South Johore.

sufficient moisture to sustain the trees. These small clusters of trees within the resort have started to dry out and die because of the winds. This phenomenon is called the "edge effect." Furthermore, stream diversion has reduced the trees' groundwater supply. Thus, in some parts, only about 3 km of coastal forest strip have remained. From this experience, KEJORA has realized the ineffectiveness of the design concept and is now planning to have islands of development within the forest area, rather than the reverse.

LEGAL AND INSTITUTIONAL ISSUES

Legal Aspect

Currently, forests may be gazetted as water catchment areas by the state authority under either of two laws: the 1965 National Land Code (Section 62:1), which declares them as water catchment areas under the jurisdiction of either DOWW or the Department of Public Works (DPW); and the 1984 National Forestry Act (Section 10:1), which declares these forests as Permanent Forest Reserves (as water catchment forests) under the jurisdiction of DOFor.

Chapter 2. Management Plan for Coastal Forests

The National Forestry Act (1984) was promulgated with the objective of promoting the uniformity of laws of various states pertaining to the management of forests, including mangroves (See Chapter 3). The Act was adopted by the Johore State Government via the Johore Enactment No. 12/85 w.e.f. (14 March 1986).

In the National Forestry Act (1984), permanent forest reserves are not really protected in perpetuity.

The main issue is that the Permanent Forest Reserves as designated by the Act are not really "permanent", which, in its true sense, means "protection in perpetuity." An area is not assured perpetual protection even if it were constituted as a "Permanent Forest Reserve" for any of the following uses: (a) timber production under sustained yield; (b) soil protection; (c) soil reclamation; (d) flood control; (e) water catchment; (f) forest sanctuary for wildlife; (g) virgin jungle; (h) amenity; (i) education; (j) research; and (k) federal purposes.

In Section 11 of the National Forestry Act (1984), the state authority is given the prerogative to decide whether the purposes for which these forest reserves are given protection no longer exist and the areas can thus be reverted to other uses. Moreover, in the reclassification of such forest reserves, the state authority is directed to act in favor of the option that would have a higher "economic value." Unless "economic value" includes all the potential uses of the forests and their role in the ecosystem, then the forests will lose out to commercial projects that promise high financial returns. In addition, the political exigencies of the state often favor projects whose potential value in the short run can be accurately assessed.

Section 4 of the National Forestry Act (1984) seems to imply that management plans for forests could only be established to effect sustained yield. This only enhances the temporary status of protective forests established as forest reserves under the Act, no matter how noble the objectives may be.

The main substance of the National Forestry Act (1984) is not consistent with the objective of conservation, as outlined in its preamble.

The main substance of this Act, therefore, is not consistent with the objective of conservation as outlined in its preamble. Provisions that would work for the permanency of forest reserves established for various conservation reasons are needed. The Act should also set the framework and guidelines for the management of forests, such as the requirements for buffer zones between development and forest areas or reserves, and the emphasis placed on the economic value of forests in terms of their ecological role in the maintenance of fisheries, in erosion and flood control, and as a national heritage, among others.

Stateland forests are viewed as low-value, noncommercial resources dispensable for any development purposes.

Another legal problem is the administration of the Johore State Government over stateland forests. These forests are managed without any consideration for their conservation, thus, they are viewed as low-value, noncommercial resources dispensable for any development purposes.

Chapter 2. Management Plan for Coastal Forests

One of the beneficial roles of swamp forests and mangroves is that they act as feeding, nursery and breeding grounds for fish and shrimp. The Fisheries Act (1985) provides for the protection of animal and plant resources in marine and estuarine waters in the mangrove areas as well as in freshwater forest swamps. Jurisdiction over the mangroves lies with the Federal DOF, while the freshwater swamps are under the state government. The main problem is that the marine, estuarine and freshwater plant and animal resources are all found in areas that have been traditionally under the purview of the State DOFor, whose management policies do not even include that for fisheries. Therefore, there is an overlap of jurisdiction.

Institutional Aspect

The State DOFor in Johore is responsible for the administration, management, development and conservation of areas established as forest reserves. This department, however, does not have sufficient manpower to implement the proposed management plans for permanent forest reserves. On the other hand, stateland forests, forests on unalienated land deemed to be state property, fall under the jurisdiction of SDLM, which also lacks trained management personnel who can analyze any proposed development in these areas.

The federal Forest Research Institute of Malaysia (FRIM) is responsible for forest research and training. Since land is a state matter, any recommendations by FRIM can only be considered on an advisory basis.

MANAGEMENT GOAL

The goal of the coastal forest management plan is to guide management in preserving and sustaining the remaining blocks of coastal forests to enable these resources to:

- act as an effective water catchment area;
- moderate stormflows and thus reduce the risk of flooding of Sg. Sedili Kechil for the protection of aquaculture operations downstream;
- act as a filter for sediments so that water quality is maintained for aquaculture farms and capture fisheries downstream;
- provide for a sustainable tourism industry;
- protect the wildlife habitats, thus maintaining their scientific, cultural and economic values; and
- preserve the unique freshwater swamp forest as a national heritage.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

1. Sites identified as water catchment areas should be established as Permanent Forest Reserves where no excision or development is allowed in perpetuity.
2. All remaining blocks of coastal forest in the Sg. Sedili Kechil basin should be gazetted as a State Park. This area includes the unique transition of woodland from mangrove to freshwater swamp to inland forest, as well as the coastal *kapur* and other forests along the coast south up to Tg. Siang (Figs. 2.1 and 2.3).
3. The coastal *kapur* forest in the Sg. Sedili Kechil basin should be gazetted as a Permanent Forest Reserve to serve as a windbreak and to control coastal erosion.
4. The Desaru coastal forest from Tg. Siang to Tg. Punggai should be surveyed and then divided into three zones: core protected area, buffer zone and multiple-use area (Fig. 2.4).

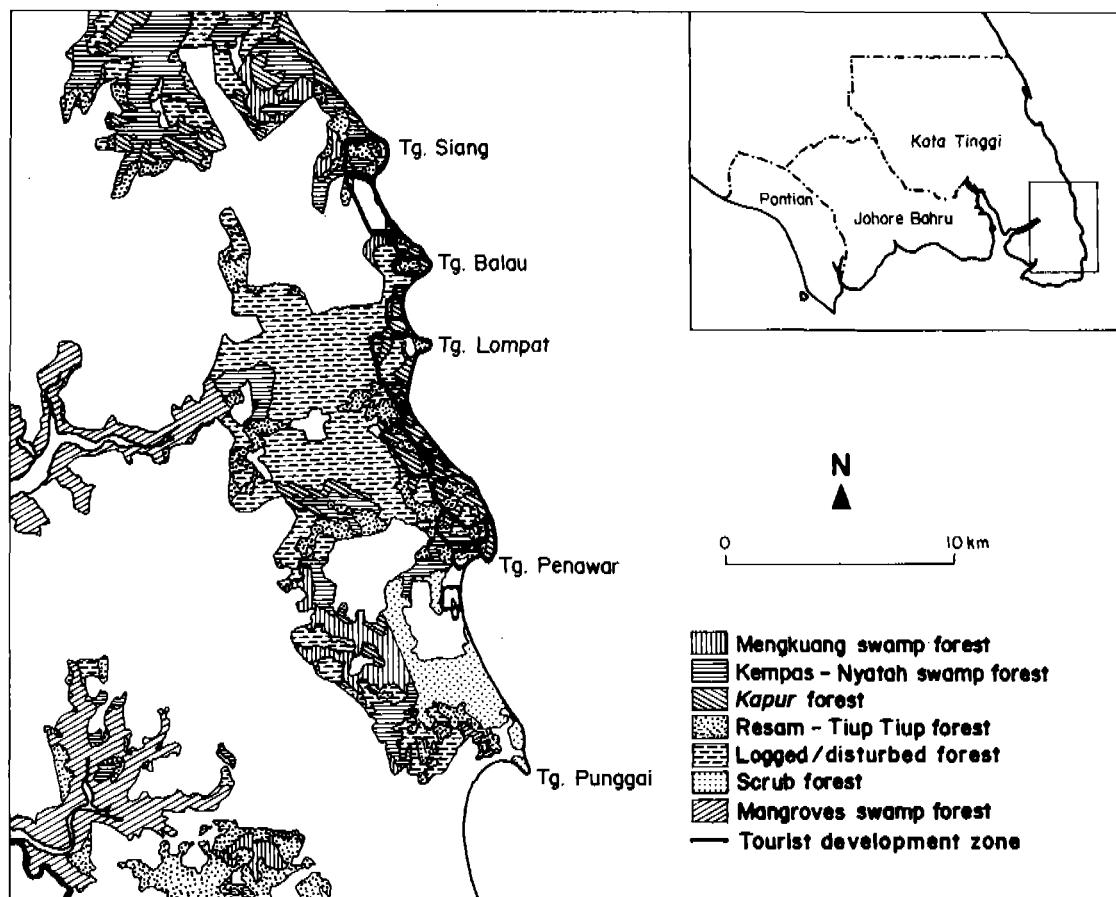


Fig. 2.4. Tourism development pressures within the coastal forest area of Desaru, South Johore.

Chapter 2. Management Plan for Coastal Forests

General Guidelines

The following are the recommended guidelines for coastal forest management:

For water catchment areas gazetted as Permanent Forest Reserves, strict development controls as recommended in Chapter 7 (Water Quality and Land Use Management Plan) should be enforced.

For the Sg. Sedili Kechil basin forest:

1. A detailed survey should be done to determine the extent and location of the forested area, verifying the information on its different forest types, water quality, wildlife resources and human activities.
2. As a State Park, no excision or logging should be permitted.
3. All logged-over areas should be allowed to regenerate naturally and should be monitored to ensure that resource renewal is sufficient. Otherwise, a replanting program should be implemented, using coastal forest species only.
4. Nature tourism activities should be encouraged as an economic opportunity for the local population.
5. Industrial, agricultural and residential developments upstream should be limited and carefully managed to minimize their negative impacts on the river's water quality.
6. Water quality monitoring by DOE should be carried out on a regular basis to prevent further degradation of the water quality from upstream activities.
7. Once the remaining coastal forest is established as a State Park, a park management plan should be developed by NPJC.

In the Sg. Sedili Kechil basin forest, all logged-over areas should be allowed to regenerate naturally.

For the Desaru coastal forest:

1. A detailed survey to determine forest types and extent, waterways, drainage patterns and soil types should be conducted. A report written for KEJORA (Manap et al. 1988) analyzes the forest that lies within the area proposed for the Desaru International Resort. Data from this paper can be used as a starting point for the survey.
2. Based on the collected data, the three zones into which the area has been sectioned should be subject to the following development controls:

Chapter 2. Management Plan for Coastal Forests

- | | |
|--------------------|---|
| Core area | <ul style="list-style-type: none">• All development and logging will be prohibited.• There will be strict and complete protection of all forest areas. |
| Buffer zone | <ul style="list-style-type: none">• Only light nonconsumptive nature tourism activities will be allowed. |
| Multiple-use areas | <ul style="list-style-type: none">• Development of tourist resorts will be permitted following the management guidelines outlined in Chapter 8. |

3. The indigenous species should be left in their natural state and no non-indigenous species should be introduced.

4. A minimum size of forest area should be established as a Permanent Forest Reserve to maintain a healthy forest ecosystem. This may be based on the minimum breeding population size that should be preserved for certain species. Since species diversity is usually quite high in coastal forests, there may be only several individuals per hectare. A minimum size of 100 ha of coastal forest is recommended.

5. In the protected zone, the ratio of area to perimeter should be as high as possible, i.e., the edge should be minimized (a large circle is preferable to a long polygon) to reduce forest damage.

6. Indigenous endangered or threatened species and their location should be identified. Priority for protection should be given to the area with the highest concentration of these species.

7. The corridors of woodland that connect forests in the hinterland with those along the coast should be maintained as Permanent Forest Reserves to facilitate the movement of animals from one area to the other.

8. Any alteration in direction and amount of flow as well as in the water quality of streams flowing into the Permanent Forest Reserves should be prohibited.

9. Soil erosion and water pollution control recommendations should be strictly enforced.

A minimum size of 100 ha of coastal forest in Desaru should be established as a permanent forest reserve.

**RECOMMENDATIONS FOR
LEGAL AND INSTITUTIONAL
ARRANGEMENTS**

The National Forestry Act (1984) should be reviewed to provide the framework for the conservation of forests as Permanent Forest Reserves in perpetuity. The Act should provide guidelines for any development adjacent to such reserves, including the establishment of buffer zones. It should also give recognition to the forest's ecological worth, and require that it be assigned a corresponding economic value.

The National Fisheries Policy needs to be reassessed to provide for the protection of the waters in swamp forests as breeding, feeding and nursery grounds for fish and other aquatic fauna.

For water catchment areas:

1. All areas identified as water catchment areas by authorities such as KEJORA, DOWW and DPW should be gazetted as Permanent Forest Reserves (for water catchment purposes) under Section 10(1) of the National Forestry Act (1984).
2. All recommendations for the management of water catchment areas (see Chapter 7) should be included in the forest management plan to be developed by DOFor (1989 National Forestry Act, Section 24).

For the Sg. Sedili Kechil basin forest:

1. The Sg. Sedili Kechil coastal forest should be gazetted as a State Park under the NPJC Enactment.
2. The recommendations for management as outlined in the management plan to be developed should be made into regulations under the NPJC Enactment (1989).
3. The NPJC should work with DOFor and FRIM to prepare the management plan for the area.
4. The NPJC should recruit experienced personnel to manage the State Parks.
5. The proposal to establish the forested area as a State Park should then be reviewed by the proposed Subcommittee on Coastal and Mangrove Forests. The recommendations of this subcommittee will be given to the proposed CRC, which will then submit a consensus recommendation to SEC for consideration.
6. All development proposals in areas adjacent to the State Park should be reviewed also in the above manner to minimize these developments' adverse impacts on the park.
7. All recommendations by the technical subcommittee and CRC should be forwarded to SEC.

Chapter 2. Management Plan for Coastal Forests

For the Desaru coastal forest area:

1. The core area should be gazetted as a Permanent Forest Reserve (to act as a sanctuary for wildlife) under Section 10(1) of the National Forestry Act (1984).
2. The buffer area should be gazetted as a Permanent Forest Reserve (to act as an amenity forest) under Section 10(1) of the National Forestry Act (1984).
3. The coastal *kapur* forest should be gazetted as a Permanent Forest Reserve (for soil protection) to serve as a windbreak and to control coastal erosion.
4. The recommended guidelines contained here should be incorporated into the forest management plan by DOFor under Section 24 of the National Forestry Act (1984).
5. The committee's review and recommendation process, as detailed here, should be followed in evaluating the forest management plans and development proposals within the Desaru and adjacent areas.
6. The development controls and environmental criteria, as found in the management guidelines here, should be attached as conditions in any alienation or leasing agreement for private development. The imposition of these requirements is legislated under the 1965 National Land Code (Sections 52(1), 115, 116, 117, 121 and 122).
7. A local authority in the Desaru area, namely Bandar Penawar, should be established, with by-laws to impose controls for development on alienated land. Zonation plans and management guidelines should be incorporated into the structural plan for this area.

CHAPTER 3

MANAGEMENT PLAN FOR MANGROVE FORESTS

INTRODUCTION: SOCIAL, ECONOMIC AND ECOLOGICAL BENEFITS

Mangrove forests are an important revenue earner for South Johore. In 1987, the royalties and premiums collected by DOFor for mangrove products in this region amounted to about M\$180,200. This value is expected to increase with the projected annual gross value of mangrove products from the Pulau Forest Reserve, which is about M\$3.6 million, and from the South Johore Forest Reserve, which is approximately M\$.9 million (Chan 1989a).

Forest Products

The mangrove forest is an important ecosystem that plays a unique and vital role in the socioeconomic well-being of the coastal communities that depend on its harvested resources (Chan and Salleh 1987). In South Johore, as elsewhere in Malaysia, it is an important source of wood for charcoal production and for poles used in pilings, scaffoldings and fishing stakes.

The nipa palm (*Nypa fruticans*) forest is found mainly on Sg. Benut. Its leaves are extensively used for mat-making and cigarette wrapper manufacturing, while the inflorescent and infructuous stalks are tapped for sugar (Fong 1984; Chan and Salleh 1987). The making of *attap* shingles out of nipa leaves for roof thatching is an important traditional occupation among the coastal Malay villages (Chan and Salleh 1987).

Nursery, Breeding and Feeding Grounds

Many finfish and shrimp use mangroves as breeding habitat and protective shelter for their larvae and juveniles (Zamora 1981; Chan and Salleh 1987). Numerous studies show their linkage to fishery resources (Heald and Odum 1970; MacNae 1974; Gundermann and Popper 1984; Hamilton and Snedaker 1984; Por 1984 a and b; and Rao 1986). An analysis of the 1981 fish landings in Malaysia suggests that 32% of the total landings may be associated with mangroves (Jothy 1984).

Mangroves along the west coast of South Johore also make significant contributions to nearshore fisheries. A study by Audrey et al. (1989) indicates that the Sg. Pulau mangrove forest area is a nursery ground for several nearshore species of commercial marine shrimp and some fish. Approximately 100

village communities are known to fish along the mangrove areas south of Benut and along the river basins of South Johore. At least seven fishing villages, with a total of 1,424 fishers, are located within or near the Benut mangroves alone.

Coastal Erosion Control

Mangroves also consolidate the coastline by trapping the sediments brought down by the rivers and by enabling accretion to occur. (In South Johore, the total accreted area within mangrove sites is 524 ha.) This process extends the coastline and increases the width of the protective coastal belt, thus reducing erosion damage (MacNae 1974; Chan and Salleh 1987). Indeed, erosion often follows the removal of mangroves (Carter 1959). Hence, maintaining mangroves diminishes the need for expensive shore stabilization structures. For example, the cost incurred in building a 4.8-km coastal bund to contain erosion along the west coast of Johore was M\$2.6 million.¹

Water Quality Control

Surface runoff from the inland areas is filtered by mangroves, which trap sediments and other particulates in the water. This helps keep the nearshore waters clean and prevents siltation of coral reefs and seagrass beds.

Wildlife Habitat

Mangroves are an important habitat for numerous varieties of animals and are valuable stopover points for migratory shorebirds. Migratory and native birds, such as the common redshank (*Tringa totanus*), the terek sandpiper (*Xenus cinereus*), the Mongolian plover (*Charadrius mongolus*), smaller numbers of the marsh sandpiper (*T. stagnatilis*), the greenshank (*T. nebularia*), the Asian golden plover (*Pluvialis fulva*), the white-winged black tern (*Chlidonias leucopterus*), the little tern (*Sterna albifrons*), the common tern (*S. hirundo*) and the common sandpiper (*Actitis hypoleucos*), are found here. Herons and storks are found mainly in the Benut Forest Reserve. The principal heron species, such as the grey heron (*Ardea cinerea*), the little egret (*Egretta garzetta*) and the great white egret (*Egretta alba*), as well as the lesser adjutant stork (*Leptoptilus javanicus*), were sighted here. The second recorded sighting of the single milky stork (*Mycteria cinerea*) in the state took place at this reserve (Hawkins and Howes 1986). In addition, several species of monkeys, monitor lizards and snakes are among the mangrove inhabitants.

Recreational and Scientific Resources

Mangroves serve as unique recreational areas for avid wildlife-watchers and nature-trippers. The abundance of widely varying flora and fauna species, as well as the peaceful forest environment, are its main attractions.

¹July 1992: M\$2.50 = US\$1.00.

The natural ecosystem of the mangrove is of vital importance to the country's scientific researches and studies on forestry, fisheries and coastal erosion. In other countries, mangroves have proven to be a valuable source of pharmaceuticals (Baines 1984), a potential that has yet to be tapped in Malaysia.

CURRENT STATUS

Mangrove Forest Reserves

In South Johore's mangrove forest reserves, a total of 4,884 ha had been lost over a period of 26 years.

There are ten mangrove forest reserves in South Johore, which totalled 18,002.7 ha in 1986 (Fig. 3.1). From 22,901 ha in 1960, a total of 4,884 ha had been lost over a period of 26 years (Table 3.1). Within that time span, the Benut Mangrove Forest Reserve was reduced in size by almost 90%. Conversion to agriculture accounted for a 45% reduction and the shift to stateland status further cut down the reserve's size by around 45% (Table 3.2). During the same period, the Pendas Forest Reserve lost about 33% of its mangroves, and the Sg. Johore and Sg. Pulai reserves lost about 15% and 16%, respectively (Table 3.1). Since 1986, several hundred more hectares of such reserves are estimated to have been used for other purposes. Currently, there are proposals for more extensive conversion.

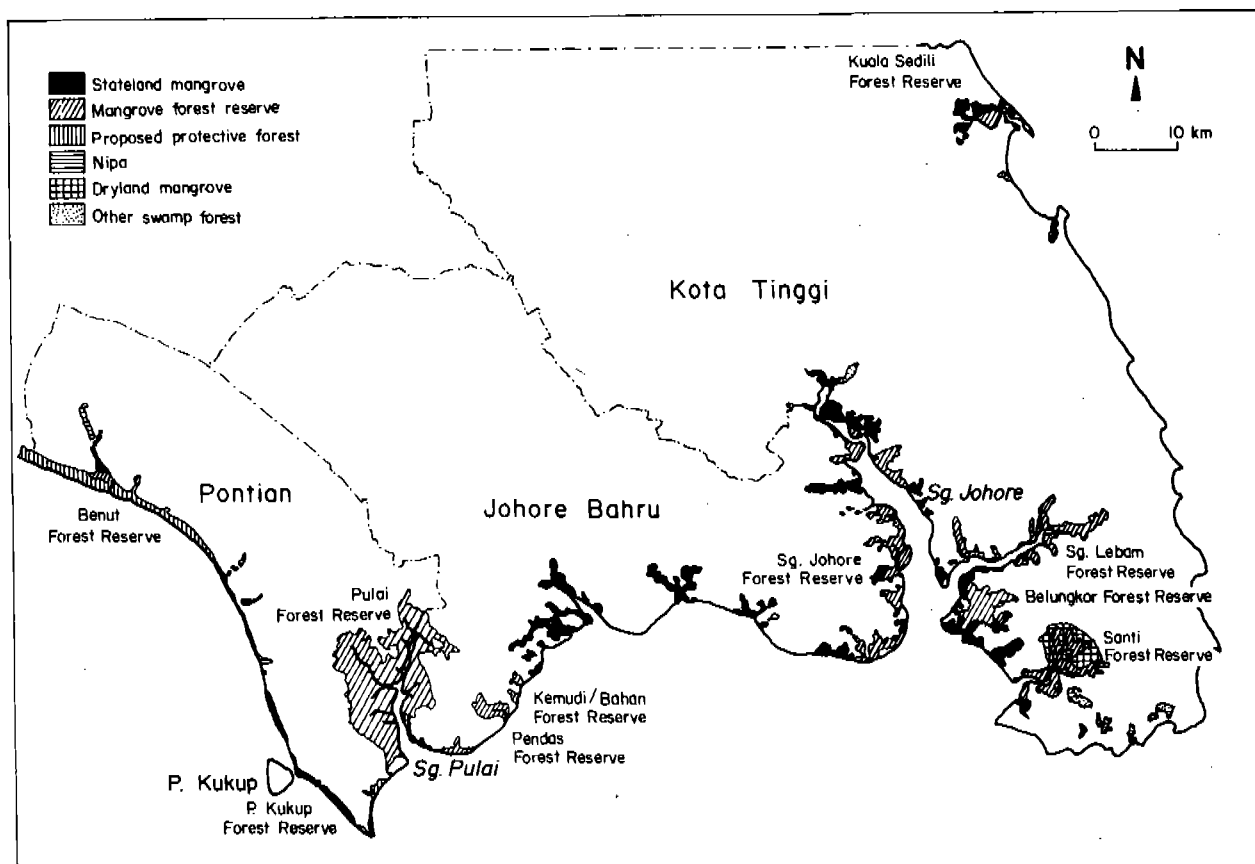


Fig. 3.1. Distribution of mangrove forests in South Johore, 1986.

Chapter 3. Management Plan for Mangrove Forests

Table 3.1. Extent of mangrove forest reserves and area losses in South Johore, 1960-1986.

Reserve	Extent		Area loss	
	1960	1986	(ha)	(%)
Pulai	9,148.6	7,647.4	1,501.2	16.4
Pendas	815.6	545.8	269.8	33.1
Kukup	650.0	650.0	0	0
Sg. Johore	3,800.3	3,215.8	584.5	15.4
Sg. Santi	2,502.1	2,453.5	48.6	2.0
Belungkor	1,261.8	1,261.8	0	0
Lebam	1,473.0	1,354.0	119.0	8.0
Benut	2,661.0	300.0	2,361.0	88.7
Kuala Sedili	433.0	433.0	0	0
Sg. Kemudi/Bahan	155.6	155.6	0	0

Source: ASEAN/US CRMP (1991).

Table 3.2. Extent of area (ha) excised for various uses/purposes in the mangrove forest reserves of South Johore, 1960-1986.

Mangrove Reserve	Sent to other uses	Land for agriculture	Purposes for excision				Total (ha)
			Timber encroachment	Impoundment	Mining	Shift to Sealand	
Pulai	815.5	610.5	75.2	-	-	-	1,501.2
Pendas	-	269.8	-	-	-	-	269.8
Kukup	-	-	-	-	-	-	-
Sg. Johore	318.2	-	214.1	52.2	-	-	584.5
Sg. Santi	-	-	-	-	48.6	-	48.6
Belungkor	-	-	-	-	-	-	-
Lebam	111.3	-	7.7	-	-	-	119.0
Benut	-	1,194.0	-	-	-	1,167.0	2,361.0
Kuala Sedili	-	-	-	-	-	-	-
Kemudi/Bahan	-	-	-	-	-	-	-

With sustainable wood production as its primary goal, the management of mangrove forest reserves has been undertaken through a series of working plans. The 1960-1964 Working Plan, which remains the main guide for current management, requires that the rotation or cutting cycle be fixed at 20 years. The prescribed harvesting is by clear-felling, followed by girdling or felling of noncommercial species. The annual coupe (area allocated for felling) is about 405 ha (Table 3.3).

Table 3.3. Annual coupe in mangrove forest reserves, South Johore.

Pulai	45
Pendas	39
Kukup	65
Sg. Johor	92
Sg. Santi	57
Belungkor	73
Lebam	34

Stateland Mangrove Forests

Stateland Mangrove Forests are mangrove forests on unalienated land that are deemed to be the property of the state. The estimated total extent of these forests in South Johore is about 7,800 ha in 1986, based on aerial photographs (Table 3.4). Fig. 3.1 shows the distribution of stateland mangroves throughout South Johore's coastal area.

Mangrove forests that are of stateland status are not subjected to any management plan and are therefore not managed for sustained timber production by DOFor (Chan and Salleh 1987). The authority over their use lies with the state government, with its DOFor responsible only for processing the applications for harvesting forest resources. From the late 1960s to 1986, approximately 963 ha or about 11% of the total stateland mangrove forests have been alienated by the state government for conversional uses (Table 3.4). Since 1986, a large area of stateland mangrove land has been further alienated and converted.

Nipa Forests

A 1986 aerial survey of South Johore's nipa forests showed that their total extent is about 165 ha (Table 3.5). Their distribution can be seen in Fig. 3.1. The forest fringing the upstream banks of Sg. Benut in Pontian, which covers a total area of 89 ha, is the largest block of nipa in the region.

MANAGEMENT ISSUES AND PROBLEMS

In the past, the main pressures on the mangroves of South Johore were those concerning the conversion of their sites for agricultural and aquaculture purposes (Fig. 3.2 and Table 3.2). Lately, however, there is an increasing demand to use mangrove areas for industrial (Fig. 3.3) and tourism development. These development pressures on the mangrove reserves and stateland forests are the results of the following factors:

1. increased land demand from industries, agriculture and shrimp farming, which are expected to produce higher financial returns;

Chapter 3. Management Plan for Mangrove Forests

Table 3.4. Extent of some stateland mangrove forests in South Johore, 1986.

Mangrove	Extent (ha)	
	Late 1960s	1986
Johore Bahru	1,228	1,214
Kukup	833	801
Penggerang	546	546
Pontian Kechil	1,010	1,010
Kota Tinggi	3,626	2,871
Kuala Sedili	592	570
Tg. Surat	917	777
Total	8,752	7,789

Table 3.5. Extent of nipa forest in South Johore, 1986.

Location	Extent (ha)
Benut	89
Kuala Sedili Besar	28
Pontian Kechil	24
Pontian Besar	24
Total	165

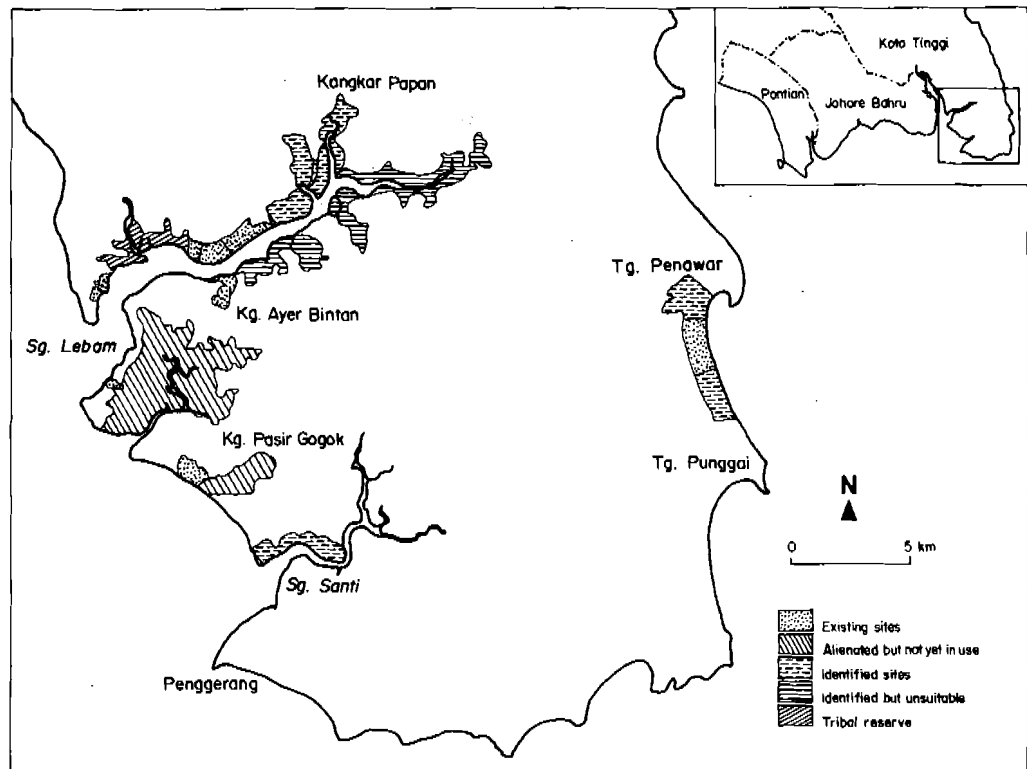


Fig. 3.2. Aquaculture development pressure in Southeast Johore.

2. undervaluation of goods and services derived from mangrove lands, especially nonmarketed products harvested by local communities, and off-site and nonmarketed services such as habitat and shoreline protection;
3. lack of appreciation for the essential ecological roles that mangroves play;

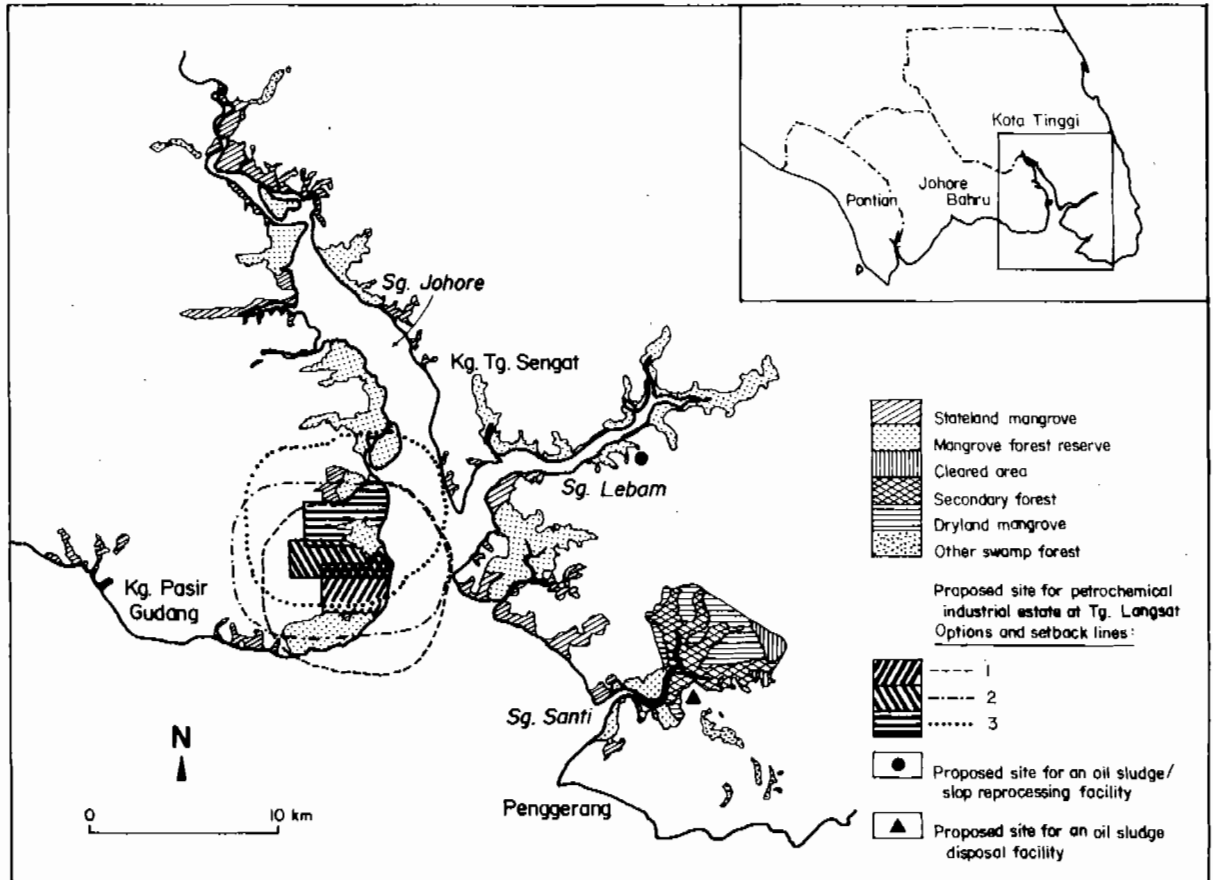


Fig. 3.3. Industrial development pressures in the Sg. Johore estuary, with the proposed setbacks.

4. incorrect perception that mangrove areas are a necessity for shrimp pond culture; and
5. failure to weigh the short-term financial gain versus the long-term cost of losing the mangrove forest.

The following are the problems in mangrove management:

High Relative Economic Cost of Conversion

A major problem caused by the conversion of mangrove areas into agriculture is the formation of acid sulfate soils by exposing soil, previously underwater, to the air. This highly acidic soil is of marginal value for agricultural uses, which is why some of the land reclaimed from mangroves is lying idle (NATMANCOM 1986). In addition, mangrove soils are often too saline for good crop growth. These must first be drained and leached for up to three to five years before crops can thrive here (Law 1984).

Turning mangrove land into aquaculture ponds faces the same problems. Fishfarmers must lime the ponds to neutralize the acidity, which is a costly and wasteful measure. Furthermore, the acid sulfate soils cannot be effectively fertilized. When fertilizers are applied to the pond water, the phosphate is promptly bound up in the soil, making it unavailable for primary production (NATMANCOM 1986).

The economic cost of using mangrove areas for agriculture and aquaculture, therefore, would necessarily be higher, in view of the infrastructure, facilities and production practices that would be prerequisites to effective conversion. For instance, a bund on the seaward edge is needed to prevent further ingress of seawater. Adequate drainage for dissolved salts, a ready supply of freshwater to flush these salts and sulfuric acid out, and a lowering of the water table are needed when planting dryland crops. Moreover, the economic returns on such investments are lower than on those that use other types of soil that are more suitable. Coconut plantations on former mangrove areas are known to produce 1.8 t/ha of copra, while those on nonmangrove areas can produce yields of 3.8 t/ha (Law 1984).

Losses In Mangrove Forest Production

The increasing encroachment of agricultural and aquaculture activities on areas designated by law as Permanent Forest Reserves has diminished the latter's resources for sustained forestry management. More than 20% of mangroves have already been removed for these purposes between 1960 and 1986.

Nonadherence to Logging Requirements of Working Plans

Although the prescribed harvesting system is clear-felling, this is observed only in mangrove forests fringing the rivers, as the gathering and transportation of logs in South Johore are highly dependent on the tides. Thus, in mangrove forests that are further inland and beyond the reach of tides, the areas are selectively logged for commercial species only.

As a result, the mangrove forest reserves in the region have a very mixed species composition and therefore are considered relatively poor in terms of the density of commercial trees and timber production per hectare, as compared with the Matang Mangrove Forest Reserve in Perak. This reserve is often used as a model for mangrove management as logging operations are carefully monitored so that the *Rhizophora* spp. remain the dominant species in the forest composition.

Selective felling is also a problem in the Pendas, Pulau and Sg. Johore reserves.

Absence of Replanting Programs and a Lack of Natural Regeneration

Natural regeneration of commercial species up to two years following logging appears to be adequate in the Sg. Johore reserve. This is because all the forest compartments are fringing the river, so sufficient seedlings and saplings of *Rhizophora* regenerate naturally up to 200 m from the river.

However, the mangroves further inland, e.g., the Sg. Pulai, Sg. Belungkor and Sg. Santi reserves, are inadequately stocked due to infrequent tidal inundation and the presence of numerous mud lobster mounds and dense thickets of *Acrostichum* ferns.

Erosion

A total of 164 ha of seaward mangroves in South Johore has already been eroded. Fig. 3.4 shows the accreting and eroding shorelines in the area. From 1960 to 1986, certain parts of the mangrove coastline had retreated by 250-300 m. The problem is severe along the south coast at Tg. Piai (Pulai Forest Reserve) and the Sg. Piai estuary. The Ternakan Marine Sdn. Bhd. shrimp farm, which is located at the Sg. Pulai estuary, was originally about 300 m from the coast. Now coastal bunds are being more and more exposed to the sea because the eroded protective mangrove belt has been reduced to a mere 50-m strip.

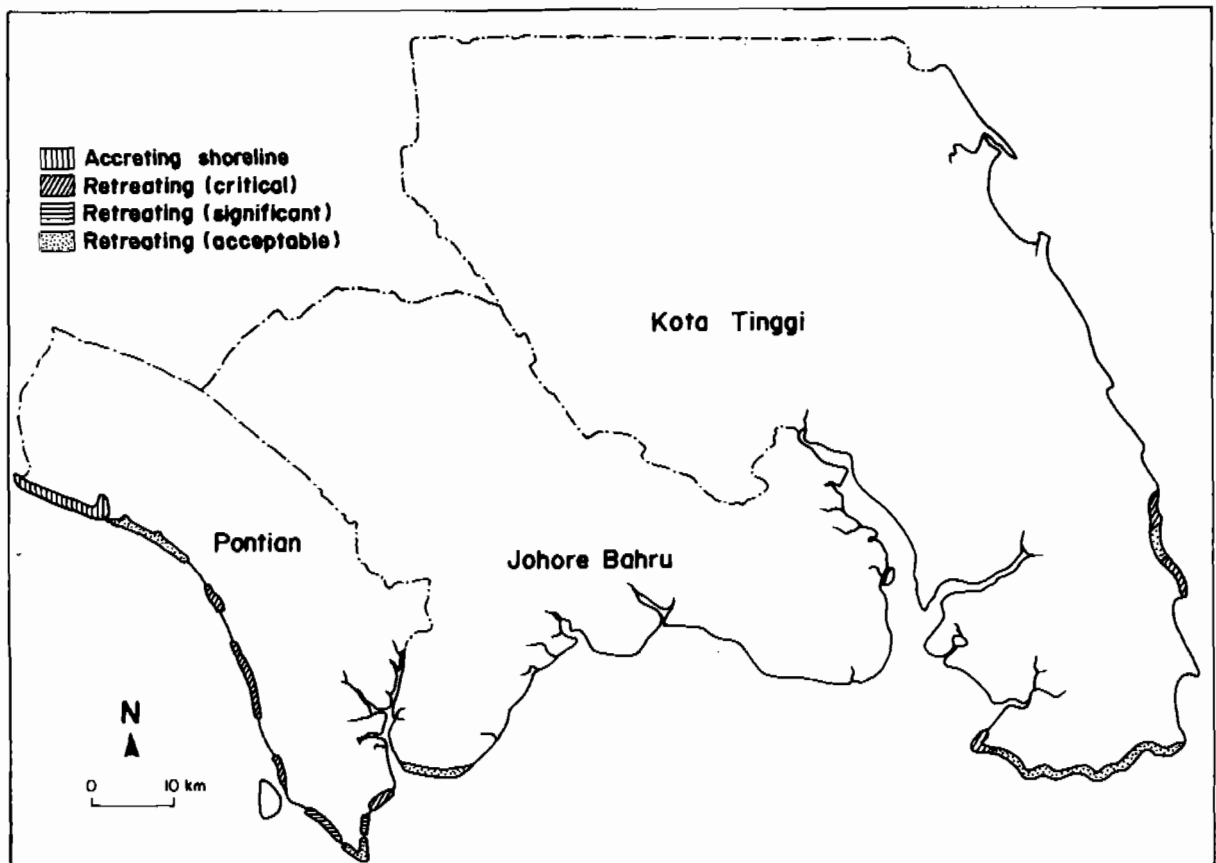


Fig. 3.4. Varying levels of coastal erosion in South Johore.

Coastal erosion may have been caused by: (1) the bunding of mangroves for agricultural purposes, which prevents the inflow of freshwater and sediments from the rivers, thus changing the physical conditions necessary for the survival of the mangroves; and (2) strong wave actions, particularly during the monsoons.

Loss of Fisheries

The loss of mangroves affects the health of marine capture fisheries. To the local communities, this means a reduction in fish, shrimp and shellfish catch.

LEGAL AND INSTITUTIONAL ISSUES

Legal Aspect

There is no single law that specifically addresses the ecological dimension of mangrove management.

There is no single law that specifically addresses the ecological dimension of mangrove management. This is probably because the laws for forest management were established at the time when the environmental functions of mangroves were not yet well defined or even understood. The current administration regards mangroves as part of the forest resources whose management is governed by the National Forestry Act (1984).

The nonpermanent status of mangroves as forest reserves is just one of the problems that beset mangrove management. This makes the mangroves subject to change in use any time, thus hindering their management on a sustainable basis. Another problem is the lack of understanding of the real economic value of these resources in terms of their ecological functions, which is also an issue in coastal forest management. A third management concern is the exclusion of the function of mangroves in the area of fish stock administration in the objectives outlined in Section 10(1) of the National Forestry Act (1984).

Despite its shortcomings, the Act provides some degree of protection in that it sets conditions for the sustainable uses of forest reserves. However, this does not cover forests outside the classification, thus making mangroves in these excluded areas easy prey to excision and total clearing, despite their ecological importance. In these operations, it is obvious that no environmental considerations are being addressed, whether they be on state or private land. The National Land Code (1965), on the other hand, does not address forests (including mangroves) as a special regime that requires a different set of criteria for decisionmaking. The conditions imposed under this Code are set to ensure that land is utilized for the purpose for which it has been approved.

For Permanent Forest Reserves constituted under the National Forestry Act (1984), construction setbacks and buffer zones that separate incompatible activities from mangroves are not required. Similarly, the Environmental Quality Act (1974) and its subsidiary legislation, the 1987 Environmental Quality (Prescribed Activities) (EIA) Order, are not applicable to any development adjacent to mangroves if land being developed is less than 50 ha. The Act, however, imposes an EIA requirement on any development of mangrove land near marine or inland parks. With respect to the conservation of mangroves as ecological niches for fishery resources, the Fisheries Act (1985) and the National Forestry Act (1984) have control over different resources in the same spatial dimensions. This creates a "gray area" in jurisdiction. For instance, DOF has a policy for the preservation of mangrove forests as reserves for the consideration of marine and brackishwater life under the National Forestry Act (1984), but it does not state so in the Fisheries Act (1985).

Institutional Aspect

The Prime Minister's Department (PMD), which establishes national policies that are followed by all government agencies (including the state agencies and quasigovernment bodies), does not have one for the management of mangroves, although NATMANCOM has drawn up some guidelines for this.

The NATMANCOM is only an ad hoc committee set up under the aegis of the United Nations Environment Programme (UNEP) and plays only an advisory role to the Malaysian government. Unless the guidelines are adopted as government policy, they can be used at the discretion of the various agencies concerned. There is, however, a flaw in these guidelines. While these limit the use of mangroves to only 20% of the total area, a baseline for its calculation is not provided.

Within the Department of Fisheries, there is no established policy for the preservation of mangroves for fish stock management...In fact, the department's aquaculture section identifies and zones mangrove land as suitable for aquaculture use.

Commercial use of available mangrove land (x ha), thus, would proceed along the following line: 20% of available mangrove land in 1990, for instance; 20% of $(x - 20\%)$ for 1991, and so on. Mangroves would eventually be used up, and NATMANCOM's objective to preserve 80% of the mangroves in perpetuity is therefore not met.

Even within DOF, there is no established policy for the preservation of mangroves for fish stock management, although marine parks are established to protect coral reefs. The marine capture fisheries section within the department only manages fish stock through the limitation of licenses to fish, fishing area and limitation on the size of boat used. In fact, the policy in the department's aquaculture section identifies and zones mangrove land as suitable for aquaculture conversion.

Decisions on applications for the conversional uses of mangrove forest reserves are made by the State Natural Resources Committee (SNRC), which consults with relevant state departments. These views are, however, not binding on the committee. The overriding factor in decisions made on such applications is the incorrect economic valuation of the proposed use of the mangroves, which does not include values of nonmarketed goods and services derived from mangroves in their natural state. In addition, concerned agencies are given insufficient time and data to make appropriate comments on such applications.

Although by law, any development of mangrove land above 50 ha is subjected to an EIA, this is often not adhered to by the committee. Even when it was, a cursory assessment is often accepted. Moreover, relevant government agencies lack competent personnel to efficiently evaluate the EIAs. There is also not enough manpower trained to monitor and enforce management plans. All these often lead to the illegal removal of mangroves.

MANAGEMENT OBJECTIVES This plan will serve as a guide for mangrove management, whose main objectives are:

- to manage the mangrove forests on a sustainable basis, so that their economic, social and ecological benefits are optimized;
- to minimize nonsustainable and conversional uses of mangroves;
- to lessen the impact of adjacent developments on mangroves;
- to preserve the mangroves seaward of coastal bunds and those bordering rivers;
- to preserve the mangrove ecosystem to sustain marine fishery stocks;
- to provide livelihood means and employment to coastal communities;
- to ensure that the ecological functions of mangroves are not hampered;
- to set aside critical and biologically diverse mangrove habitats as protected areas not only to preserve their ecological functions but also to provide compatible tourism, and educational, medical and research opportunities;
- to restore degraded mangrove forest areas either through natural or artificial regeneration; and
- to heighten the awareness of government decisionmakers and the public on the ecological importance and real economic value of mangroves, and their vulnerability to human interference.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

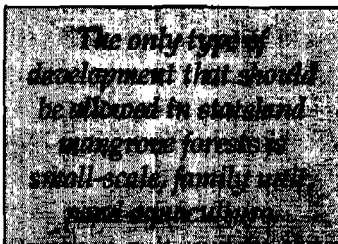
1. All existing Permanent Forest Reserves should be conserved in perpetuity for their various ecological roles, without further excision or conversion to other uses. These include the Mangrove Forest Reserves in Benut, Pulau, Pendas, Demudi/Bahan, Johore, Lebam, Belungkor, Santi and Kuala Sedili.
2. The following mangrove areas should be gazetted by laws in perpetuity -

As protective forests:

- a. the mangrove forests fronting coastal bunds, including the Benut Stateland Mangrove Forest (for the protection of the coast and river-banks, and for erosion control);
- b. Stateland Mangrove Forests that do not meet the recommended requirements for small-scale aquaculture development, e.g., a minimum width of 400 m;
- c. all nipa forests that are now Stateland Mangroves, including those on Sg. Benut, Sg. Pontian Besar, Sg. Pontian Kechil and Kuala Sedili Besar (as amenity forests); and
- d. the mangrove forests at Kuala Sedili Kechil and along the Johore Bahru waterfront west of Lido Beach, from Sg. Skudai over to Sg. Melayu (as amenity forests).

As National Parks-Johor: Pulau (which means "island"; "P." from here) Kukup and the mainland mangrove forest fronting the coastal bund going south to Tg. Piai.

General Guidelines



1. A management plan for each protective forest should be developed and enforced.
2. The only type of development that should be allowed in stateland mangrove forests is small-scale, family unit, pond aquaculture. The minimum area size of forest and the maximum area size of conversion are specified in Chapter 4. (See specific guidelines for small-scale aquaculture.)

Chapter 3. Management Plan for Mangrove Forests

3. The recommended construction setbacks from mangroves for different types of development are as follows:

Industrial development	1,000 m
Housing estates	500 m
Tourism development	100 m
Aquaculture development	100 m

4. Strict pollution controls should be established to prevent any discharge or dumping of wastes into the mangroves.
5. Runoff and leaching of wastes from disposal sites should be minimized.
6. Reclamation projects should not be allowed in or adjacent to mangrove areas as they would create problems such as mangrove destruction and, eventually, erosion.
7. Effective dikes should be constructed around reclaimed areas to prevent discharges of effluents into mangroves. An EIA should be required of any reclamation project proposed adjacent to mangroves.
8. Cage and raft culture should be encouraged in the waterways of mangrove forest reserves, where the bathymetry, current and water quality conditions are favorable. (See "Management Zones" under "Recommendations" in Chapter 4.)
9. Innovative culture techniques, such as the pen culture of shrimp in the waterways, should be researched on, developed and encouraged. This example is a nonconversional and compatible use of mangrove areas that is also congruous with timber production. It could be done in coordination with the harvesting cycle of mangrove forest reserves during their regeneration period.
10. The DOF personnel who handle the licensing of fishing operations in mangrove areas should be responsible for limiting the size and number of cage and raft units used, depending on the area size.
11. Management of productive forests should work for a sustainable timber production, with the prohibition of any excision and/or conversion for other uses.
12. Updated working plans on management for each productive forest should be developed and strictly enforced. (Table 3.6 shows the general format for a working plan.)
13. The working plan should require a harvesting system involving clear-felling.

Chapter 3. Management Plan for Mangrove Forests

Table 3.6. General format for a working plan in the management of a productive forest.

<p>Introduction</p> <ul style="list-style-type: none">A. Constitution of forest reserveB. General description of forest reserveC. Environmental factors <p>Statement of the area</p> <ul style="list-style-type: none">A. Total areaB. Productive areaC. Unproductive areaD. Changes in area <p>Regulation of yield</p> <ul style="list-style-type: none">A. RotationB. Age of forest cropC. Yield estimation <p>Felling areas</p> <ul style="list-style-type: none">A. Management layoutB. Allocation of areas	<p>Felling schedule</p> <ul style="list-style-type: none">A. Intermediate felling (thinning)B. Final felling <p>Silvicultural operations</p> <ul style="list-style-type: none">A. Natural regenerationB. Artificial regenerationC. Thinning <p>Administration</p> <ul style="list-style-type: none">A. Office and field recordsB. Control mapsC. ExpenditureD. Staff requirementsE. Housing and transportation
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A forest inventory should be conducted to determine the location and extent of poorly stocked or degraded mangrove areas (by compartment) in each reserve, so that an enrichment planning program can be initiated.

14. All noncommercial trees such as *Xylocarpus*, *Avicennia*, *Scyphiphora* and *Lumnitzera* should be harvested by loggers through felling or girdling.
15. Only trees with a 5-cm dbh (diameter at breast height) and above should be felled.
16. A 5-km belt of vegetation should be retained as a protective strip along rivers navigable during low tide.
17. A forest inventory should be conducted to determine the location and extent of poorly stocked or degraded mangrove areas (by compartments) in each mangrove forest reserve, so that an enrichment planning program can be initiated.
18. Regular flushing should be required through the coastal bunds, i.e., open the freshwater gates, to ensure the inflow of freshwater and sediments into the mangrove areas. This is for the survival of protective forests of seaward mangroves fronting the coastal bunds.
19. The retreating scarp should be protected and the mangrove vegetation restored, if necessary, in areas of critical erosion.
20. Coastal bund-building activities should avoid the barraging of rivers to allow the inflow of freshwater and sediments into the mangrove areas.

**RECOMMENDATIONS FOR
LEGAL AND INSTITUTIONAL
ARRANGEMENTS**

Legal Aspect

1. The National Forestry Act should be reviewed to incorporate the legal instruments that will provide the directives for the conservation of mangroves and to ensure that the aforesaid recommendations for their proper management can be enforced legally.
2. Section 10 of the Act should be amended to ensure that mangrove forests gazetted as Permanent Forest Reserves will remain so in perpetuity.
3. If, in the review, there is the utmost need to retain Section 11 of the Act (see "Legal and Institutional Issues" in Chapter 2) because of political exigencies, then, the calculation of the economic values of the present and proposed uses of mangroves should be quantified in terms of their social and ecological costs and benefits.
4. The provision for the establishment of Permanent Forest Reserves as fishery nursery and for coastal and riverbank erosion control should be included in Section 10(1) of the Act.
5. A clause should be incorporated in the National Land Code (1965) that provides for the conservation of mangroves as a valuable resource in the applications of the National Forestry Act (1985) (amended as proposed here), regarding allocation of mangrove land for any purpose.
6. To protect mangroves from the adverse impacts of development in their vicinity, the following activities should be incorporated as "prescribed activities" under the 1987 Environmental Quality (Prescribed Activities) (EIA) Order, which requires EIAs and mitigating measures to be carried out in any of the development proposals in such sites:
 - recreational or aquaculture development within a radius of 100 m from mangroves;
 - housing development within a radius of 500 m from mangroves; and
 - industrial development within a radius of 1,000 m from mangroves.

Institutional Aspect

There is a need for PMD to incorporate in the national development policy the conservation of natural resources, including mangroves. This revised policy should then be adopted at both state and federal levels, particularly by DOF (MOA) and DOFor. The policies for the conservation and management of mangroves should be based on the ecological and economic functions of these resources, including their role in fishery stock maintenance and as

An Environment Unit in the Prime Minister's Department to be responsible for the environmental component in the national development policies and for coordination of attendant activities on a nationwide basis should be established.

nursery grounds. It is also necessary to establish an Environment Unit (EU) in PMD to be responsible for the environmental component in the national development policies and for the coordination of attendant activities on a nationwide basis.

The NATMANCOM should be institutionalized as a committee under the auspices of PMD. The NATMANCOM guidelines for mangroves need to be reviewed to eliminate inconsistencies and loopholes, e.g., the lack of a baseline for the calculation of the 20% of mangrove areas allowable for excision. In fact, these should recommend the total prohibition of cutting for any purpose, with some exceptions (see "General Guidelines for Management" in this chapter).

At the state level, formal coordination, with respect to mangrove conservation and management, is urgent and should be undertaken by the proposed CRC, serviced by the proposed subcommittee for coastal and mangrove forest management. All recommendations by the main committee will be submitted to SNRC and SEC for decisionmaking. The state government should also establish an official channel for DOE to submit an EIA for each project proposal where the project activity is classified as a "prescribed activity" in Section 34B of the Environmental Quality Act (1974) and its subsidiary legislation, the 1987 Environmental Quality (Prescribed Activities) (EIA) Order.

The EU for the State Government of Johore will service the above committee.

There is a need to ensure adequate and competently trained manpower for the implementation of the management and conservation plans for mangroves. The implementation will consist most importantly of the monitoring and enforcement of requirements, such as EIAs.

All laws mentioned in the above section on legal arrangements should also be strictly enforced at both state and federal levels.

ACTION PLANS FOR MANAGEMENT

Proposed Protective Forests Benut Mangrove Forest

The Benut Mangrove Forest is located in the Pontian district, stretching from Pontian Kechil in the south to Rengit in the north. It covers 1,557 ha and has a coastline of about 40 km, which borders the Strait of Malacca. It consists of the Benut Forest Reserve (300 ha) and the Benut Stateland Mangrove Forest (1,257 ha), which is made up mainly of accreting coastal fringing mangroves, varying from 0.25 to 1.0 km in width, with extensive intertidal flats (Figs. 3.1 and 3.4-3.6).

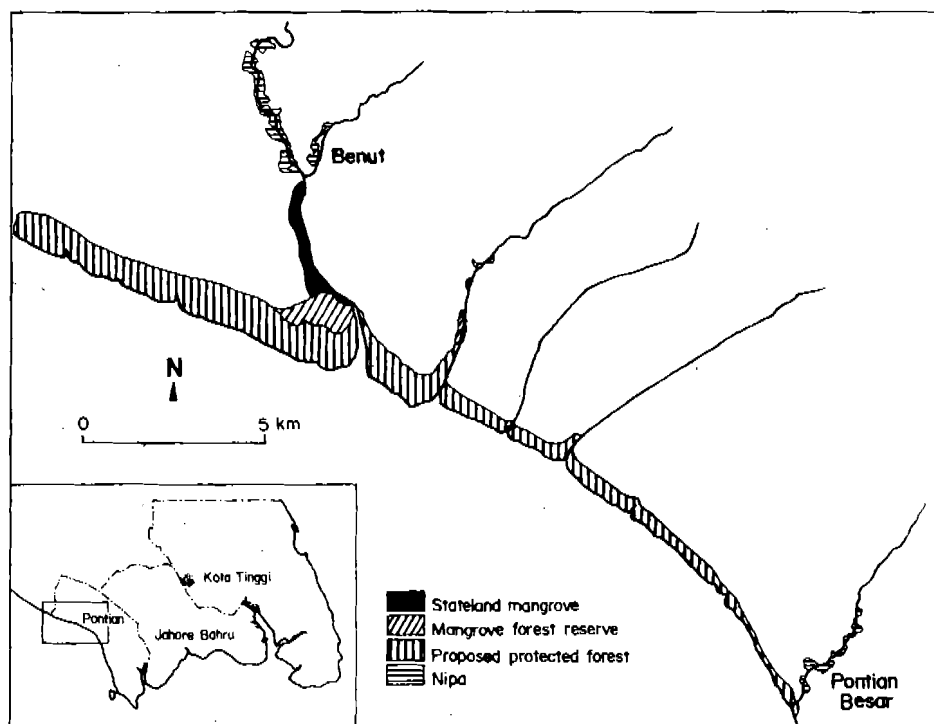


Fig. 3.5. Changes in mangrove and nipa areas in Benut, 1968-1986.

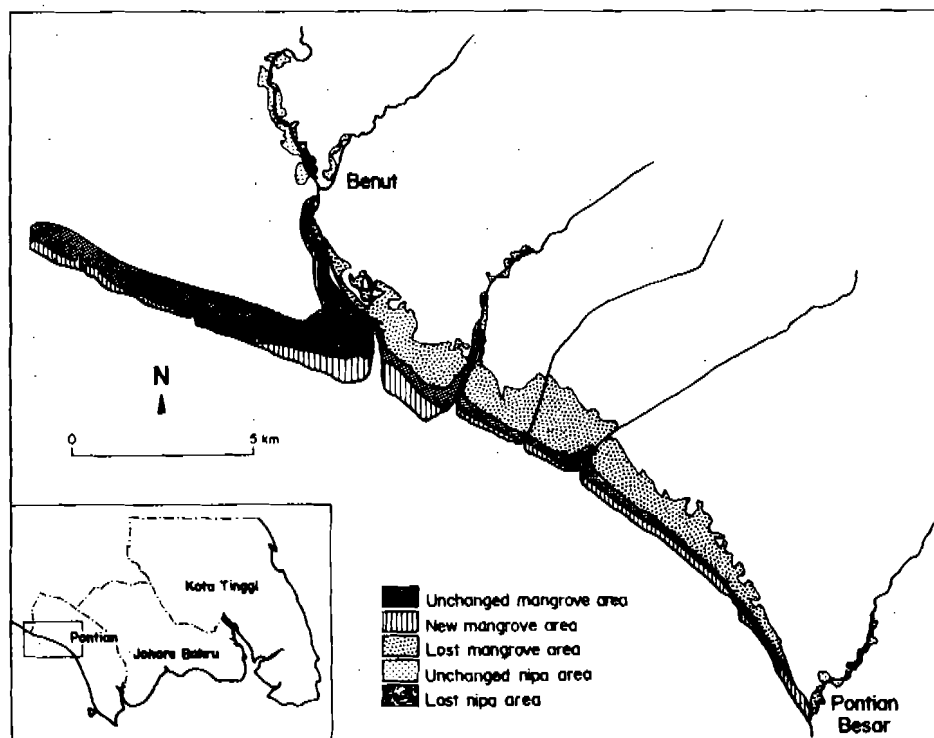


Fig. 3.6. The mangrove forest in Benut (1986) and the proposed protected areas of mangrove.

The whole Benut State Land Mangrove Forest should be designated as a Permanent Forest Reserve (as a protective forest in perpetuity) (Fig. 3.6) for the following reasons:

1. The entire Benut mangrove area has been banded. Retention of existing forests as a protective belt against coastal erosion would protect the coastal bunds, which would, in turn, safeguard the crops grown under the West Johore Agriculture Development Project. This is a long-term project that is being implemented over a 40-year period (1975 to 2015). It covers an area of about 344,000 ha and has incurred M\$270 million in expenses so far (Tan 1988). Removal of the mangroves may lead to bund rupture, seawater ingress into agriculture fields and subsequently, irreparable crop damage. Reinforcement of bunds using quarry rocks has been reported to cost from M\$900 to M\$1,450/m run.
2. The Benut mangrove forest is an important wildlife habitat. It serves as a foraging and breeding ground, and also as a valuable stopover point for migratory sea- and shorebirds.

The upstream nipa forest in the Benut area is now a rapidly dwindling resource.

The upstream nipa forest (90 ha) should be gazetted as a Permanent Forest Reserve (for productive purposes in perpetuity) (Figs. 3.5 and 3.6) for the following reasons:

1. It is a rapidly dwindling resource, and designating it as a Productive Mangrove Forest is important for the sustainable harvest of products that support valuable cottage industries.
2. It supports a substantial inshore fishing industry.

Commercial harvesting of timber based on an updated working plan may be permitted within the Benut Forest Reserve.

P. Kukup and Tg. Piai Mangrove Forest Area

The area consists of 1,248 ha of mangrove forest—648 ha for the P. Kukup Mangrove Forest Reserve and 600 ha for the Tg. Piai mangrove forest area (Fig. 3.7).

P. Kukup has a unique geography in that it has very little elevation and consists primarily of mangrove forest adjacent to intertidal mud flats. The island has been harvested on a 20-year schedule managed by the State DOfor. Part of it has been designated as a Virgin Forest Reserve.

The island provides habitat for numerous species of shorebirds such as the common redshank and the terek sandpiper. Lesser adjutant storks have been sighted here too, as the mature vegetation is suitable for nesting. The honey buzzard (*Pernis apivorous*), a migratory bird, stops over here.

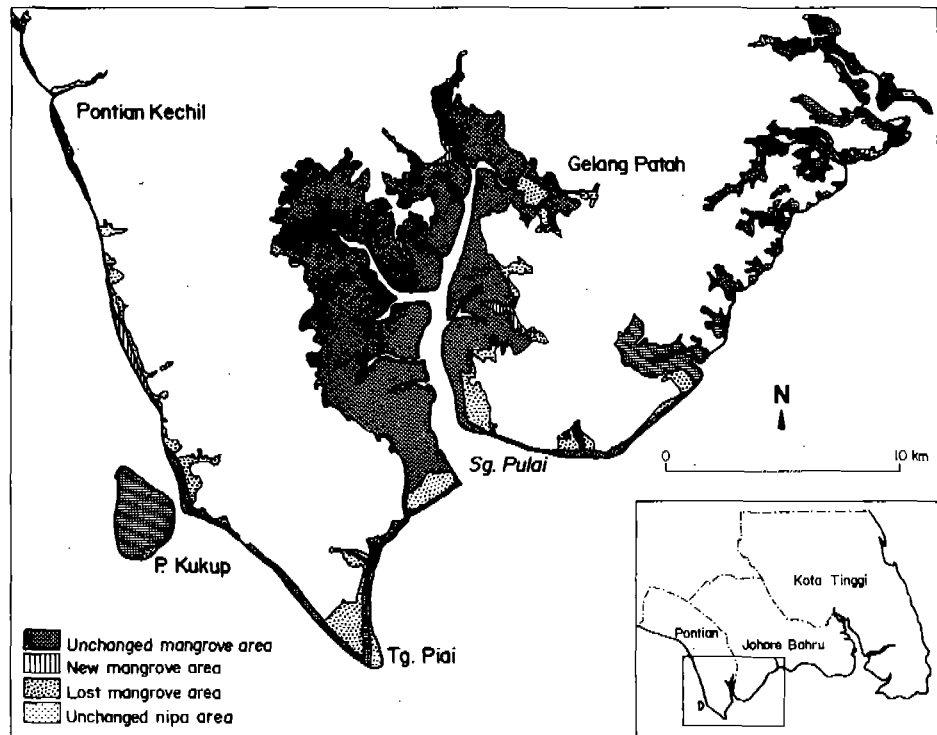


Fig. 3.7. Changes in mangrove and nipa areas in Tg. Piai and P. Kukup, 1968-1986.

The natural endowments of P. Kukup may yet be marred by the development of a large resort hotel with a marina on the reclaimed area west of the island.

The natural endowments of P. Kukup may yet be marred by the development of a large resort hotel with a marina on the reclaimed area west of the island. This project is incompatible with the objectives to preserve the island's mangroves. In addition, the large shorebirds, especially the lesser adjutant storks and the egrets, would be discouraged from nesting here because they are being hunted for sport and food. Even the mere presence of the development would likely scare them away (Hawkins and Howes 1986).

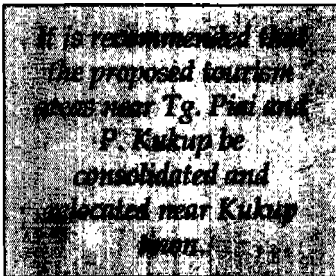
P. Kukup is plagued with problems of untreated sewage discharge and solid waste disposal. Untreated sewage from Ayer Masin and Kukup town is suspected to have affected aquaculture operations in the channel between the town and the island. This has resulted in significant fish kills due to disease. Dumping of solid waste, on the other hand, may become a more serious problem with development pressures around the town, including a recent proposal for extensive residential development in connection with the proposed second linkage.

Moving from Kukup town to Tg. Piai in the south, there is a narrow strip of mangrove seaward of the coastal bunds that is eroding in some places and accreting in others (Fig. 3.4). The lack of freshwater flow through these bunds is stressing mangroves.

Currently, the major pressure on the mainland is mangrove area conversion into aquaculture in Tg. Piai, which is located at the southernmost tip of the peninsula. Plans are also underway to promote this area for tourism and for the construction of some access roads, accommodation facilities, a visitor center and others. Moreover, there are plans for two large tourism projects (again, under the second linkage proposal) directly adjacent to the Tg. Piai mangroves.

It is recommended that:

1. the mangroves at P. Kukup and Tg. Piai areas be designated as a National Park-Johor to serve as a sanctuary for wildlife (Fig. 3.7);
2. no development be allowed on or adjacent to the island;
3. the proposed tourism areas near Tg. Piai and P. Kukup be consolidated and relocated near Kukup town;
4. tourism accommodations to be constructed near Tg. Piai be restricted to small chalets;
5. a management plan be developed that would include zonation of core protected areas, interpretive trails, visitor programs, boat tours and wildlife administration;
6. removal or collection of forest products, plants and animals be prohibited;
7. inflow of freshwater and sediments through coastal bunds be maintained to ensure the survival of the mangroves fronting the bunds; and
8. a cooperative working relationship among DOFor, FRIM, DDI and NPJC be established for the management of the P. Kukup and Tg. Piai mangrove forest.



Mangrove Forests on the Johore Bahru Waterfront West of Lido Beach

Mangrove forests can be seen on the intertidal zone along the waterfront of Johore Bahru west of Lido Beach (Fig. 3.1). Moving farther west from the beach, the mangrove is sparse and a concrete seawall backs the mud flat. Beyond this, beside the Majlis Perbandaran Johor Bahru (MPJB) tennis courts, the forest becomes more extensive. At low tide, mud and sand flats are exposed. The mangrove extends up to Sg. Skudai (including islands on the river) and westward to Sg. Danga and Sg. Melayu.

Chapter 3. Management Plan for Mangrove Forests

The area is used as a roosting site at night for some shorebirds such as the Asian golden plover, *Calidris ferruginea*, common sandpiper and some members of the *Sterna* species, including *S. bengalensis*. Other birds, such as the migrating dauriam starling (*Sturnus sturnensis*) and the white-vented myna (*Acridotheres javanicus*) use the casuarina trees for roosting (Hawkins and Howes 1986).

Currently, the area is used for recreation, fisheries (using hand nets) and mussel digging. A proposal was made to build a sports complex and other facilities west of Lido Beach, including a youth camp that will be located within the mangrove site. It is doubtful that this project will be approved, but since the land is very close to the urban area, another development proposal may be approved in the future.

The discharge of polluted waters from drain pipes leading into the tidal area and improper disposal of solid waste are waste management issues that have yet to be addressed.

It is recommended that:

1. MPJB, otherwise known as the Johore Bahru Municipal Council, designates the area as a recreational and educational park. The mangrove provides a unique natural environment close to the city of Johore Bahru so that day visitors will not have to travel as far as the larger mangrove reserves and protected areas. A trip to these mangroves would provide the urban youths and schoolchildren with an important educational experience as they would be exposed to a natural habitat and learn about its ecology and the animals it shelters.
2. MPJB undertakes the management of the area. It should work together with FRIM, DOFor and the new Parks and Recreation Division of the Department of Town and Country Planning (DTCP) to undertake an initial survey to determine the extent of the protected area. A management plan for the area should include a zonation scheme, the construction of boardwalks, resting benches, interpretive trails and signs, and the establishment of visitor programs.

By designating this site as a city park, the natural shoreline of Johore Bahru, along with its protected forest, birds and intertidal ecological community, could be maintained.

Kuala Sedili Kechil Mangrove Forest

This mangrove area covers approximately 433 ha at the mouth of Sg. Sedili Kechil at the southern end of Teluk Mahkota (Jason's Bay) on the east coast of South Johore. Certain parts are gazetted as Forest, Stateland or Malay

The Johore Bahru Municipal Council, otherwise known as MPJB, should designate the mangrove forests on the Johore Bahru waterfront west of Lido Beach as a recreational and educational park.

The Kuala Sedili Kechil Mangrove Forest, which extends up to the tidal reaches of the river, makes a transition into the lowland freshwater swamp forest. This transition is the only one of its kind in Peninsular Malaysia.

Reserves. This riverine mangrove area extends up to the tidal reaches of the river and makes a transition into the lowland freshwater swamp forest. This transition from mangrove to swampland, the only one of its kind in Peninsular Malaysia, is still intact (Fig. 3.1).

The Malaysian plover (*Charadrius peronii*) breeds in Teluk Mahkota and is found in Kuala Sedili Kechil, and so are other shorebirds, such as the greater sand plover (*C. leschenaultii*), kentish plover (*C. alexandrinus*), Mongolian plover, terek sandpiper, common sandpiper, red-necked stint (*Calidris ruficollis*) and sanderling (*C. alba*). Other birds seen within or near the mangroves include the black baza (*Avideda leuphotes*), cinnamon-headed pigeon (*Treron fulvicollis*), collared kingfisher (*Halcyon chloris*) and the greater racket-tailed drongo (*Dicrurus paradiseus*) (Howes et al. 1986).

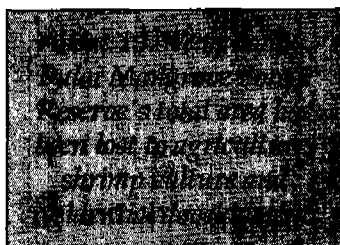
The coastal area supports recreational and economic activities such as shellfish collection, fishing, hunting and local forestry. Tourism, which will probably expand operations in the future, is already present on the sandy beaches adjacent to Teluk Mahkota. Several aquaculture projects, including a 404-ha shrimp farm by EAMF (a joint venture with Johore SEDC), an 8-ha shrimp farm of Bungawang Sdn. Bhd. and another 404-ha development of Unilever Company are in progress around the mouth of Sg. Sedili Kechil. These three operations have a combined investment of about M\$8 million.

There has been some limited conversion of mangrove sites into agriculture. Such developments upstream in the freshwater swamp forest, which also include logging, have reduced the mangroves' capacity to act as a sponge for the major influxes of freshwater, particularly during a heavy rain. As a result, the river's salinity can drop dramatically after a downpour, when flood levels rise.

It is recommended that the mangrove area, which is under KEJORA, be designated as a National Park-Johor, along with the rest of the coastal forest in the Sg. Sedili Kechil basin.

Productive Mangrove Forests Sg. Pulai Mangrove Forest Reserve

This reserve comprises almost the entire Sg. Pulai basin, which covers an area of about 300 km² (Figs. 3.1 and 3.7). Located at the districts of Pontian and Johore Bahru, with Sg. Pulai as the district boundary, it stretches from Jeram Batu in the north to Tg. Piai in the southwest and Tg. Pelepas in the southeast. Sg. Pulai, which drains into Johore Strait, has quite a deep channel, resulting in very little intertidal mud flats being exposed during low tide. Its main tributaries are Sg. Redan, Sg. Karang and Sg. Jeram Choh.



An assessment of the resource, based on the interpretation of 1986 aerial photographs, showed that about 1,426 ha, which involved 96 compartments, have been excised for agriculture and shrimp culture (Table 3.7). Another 75.2 ha within two compartments have been lost as a result of the encroachment of human settlements. The loss amounted to 19.6% of the entire reserve or 21.6% of the total number of compartments. The total extent of the reserve has been estimated to be about 7,650 ha having 454 compartments.

From 1970 to 1986, approximately 100 ha of the mangroves in Tg. Piai and Serkat (including the whole of Compartment 495) have been eroded away (Table 3.8). At the estuary of Sg. Pulai, the protective mangrove vegetation at the seafront was reduced to a width of 50 m from an original 300-m strip.

Table 3.7. Size of area and number of compartments excised from the Sg. Pulai Forest Reserve for various conversion activities, 1960-1986.

Shrimp culture	815.5	38
Agriculture	610.5	58
Human encroachment	75.2	2

Table 3.8. Compartments in the Sg. Pulai Forest Reserve and size of area lost to erosion, 1970-1986.

115	16
116	14
117	12
482	2
488	4
489	6
491	8
494	10
495	16
496	12

As in all other mangrove forest reserves in South Johore, the primary objective of forest management is to sustain the maximum production of mangroves. All silvicultural activities are geared toward ensuring a high proportion of *Rhizophora apiculata* and *R. mucronata*, which are considered to be the most valuable species.

The harvesting system practiced is clear-felling of 1/20th of the total productive forest area per year (annual coupe), on a rotation fixed at 20 years. For Sg. Pulai, the annual coupe is about 415 ha. Axes are used to fell trees, which are later bucked into billets and transported out of the forest by means of small, shallow-draft row boats (locally known as *pok chai*). These boats can only reach felling sites inside the forest that are inundated during high tides. The above factors have somewhat restricted forest harvesting to areas fringing rivers and creeks, a logging pattern evident in a transect laid in a felled area (Table 3.9). This form of forest harvesting appears to be inefficient and explains why some permit holders require several years to work a given area.

Table 3.9. Felling intensity at varying distances from the river in the Sg. Pulai Forest Reserve.

0-10	40	6
10-20	64	3
20-30	33	10
30-40	48	7
40-50	42	3
50-60	55	14
60-70	37	20
70-80	15	55
80-90	9	66
90-100	0	78
100-110	0	65

There are currently no replanting operations in logged-over areas in Sg. Pulai. Stocking for the next cut is solely dependent on the natural regeneration by waterborne propagules. Only the following silvicultural regulations are prescribed:

1. A 5-m buffer belt of vegetation along rivers navigable during low tides should be retained.
2. All noncommercial trees such as *Xylocarpus*, *Avicennia*, *Scyphiphora* and *Lumnitzera* should be felled or girdled.
3. Only trees having a 5-cm dbh and above can be felled.

Recommendations

As productive forests:

1. The remaining bulk of the Sg. Pulai Forest Reserve should be managed as a Permanent Forest Estate (for sustainable timber production). Under this proposal, the total productive reserve will cover an area of about 7,395 ha with 454 compartments.
2. Existing regulations requiring all noncommercial trees, such as *Xylocarpus*, *Avicennia*, *Scyphiphora* and *Lumnitzera* to either be felled or girdled by loggers, should be enforced.
3. A forest inventory should be conducted by compartments to determine the location and extent of poorly stocked or degraded mangrove areas, so that an enrichment planting program can be initiated.

The forest reserve in Sg. Pulai is the major source of forest produce in South Johore.

The forest reserve in Sg. Pulai is the most important reserve in terms of productivity, being the major source of forest produce in South Johore. Two of its more valuable resources are *nibong* (*Oncosperma tigillarum*) for pole making and nipa for *attap* making. Even at the present annual coupe size of only 415 ha (5.4% of the total reserve), the expected annual gross revenue from forest output in the form of poles and charcoal has been estimated to be about US\$1.36 million (Table 3.10). Moreover, the charcoal industry in the area provides employment to 83 workers, who are involved in tree felling, transportation of logs or charcoal manufacturing.

Table 3.10. Estimated value of produce (in US\$) from the Sg. Johore and Sg. Pulai Mangrove Forest Reserves, South Johore.

Reserve	Produce		Total
	Poles	Charcoal	
Sg. Pulai			
Annual coupe (415 ha)			
Average expected yield	850 pcs/ha	15 t/ha	
Current market value	\$1.20/pc	\$150.00/t	
Current value (per hectare)	\$1,020.00	\$2,250.00	
Expected annual value	\$423,300.00	\$933,750.00	\$1,357,050.00
Sg. Johore			
Annual coupe (92 ha)	-		
Average expected yield	-	25 t/ha	
Current market value	-	\$150.00/t	
Current value (per hectare)	-	\$3,750.00	
Expected annual value	-	\$345,000.00	\$345,000.00

Managing the Sg. Pulai mangroves as a Permanent Forest Reserve (for productive purposes) would also sustain the present inshore fishing industry. There are at least 19 fishing villages (with a total of 927 fishers) located within or close to the Sg. Pulai mangroves.

As protective forests:

All compartments fronting agriculture or aquaculture bunds in Sg. Pulai should be set aside as a Permanent Forest Reserve (for protective purposes in perpetuity), including those that have been partially excised. Under this proposal, a total area of 253 ha composed of 46 compartments will be protected.

Retention of these compartments (which have already been excised out of the reserve but not completely alienated to private owners) would provide a buffer belt to protect farming land in Tg. Piai and Tg. Pelepas, and shrimp farms in Serkat (Ternakan Marine Sdn. Bhd., Daiman Marine Products Sdn. Bhd. and Kukup Marine Sdn. Bhd.) from coastal erosion.

Chapter 3. Management Plan for Mangrove Forests

Excised compartments that would be retained in Jelutong near Gelang Patah would serve as a peripheral buffer belt for the existing shrimp farms (Pusat Penyelidikan Ayer Payau and Malayan Commercial Enterprise Sdn. Bhd.) and at the same time ensure the sustenance of water quality vital to shrimp farming.

The bunded mangroves at Tg. Piai are an important habitat for shorebirds. About 450 shorebirds of five species were recorded during counts made in March 1986 (Hawkins and Howes 1986). The common redshank and the terek sandpiper were the most frequently sighted. All shorebirds were observed roosting on dead *Avicennia alba* and *Sonneratia alba* trees during high tide. Local fishermen indicated the presence of the estuarine crocodile in Sg. Perepot Pasir and Sg. Chokoh Besar east of Tg. Piai.

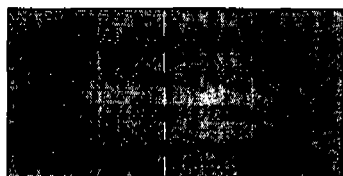
CHAPTER 4

MANAGEMENT PLAN FOR AQUACULTURE

INTRODUCTION

Aquaculture is an expanding industry in South Johore, providing food and employment for the growing population. In recent years, there has been a rapid conversion of mangrove land to aquaculture ponds. From 1960 to 1986, a total of 1,169 ha was lost to such a conversion and several hundred more hectares have been alienated since 1986 for the same purpose.

Thus, there is a conflict of use between aquaculture development and the management of mangroves for timber production, erosion control, as an essential nursery habitat for larval and juvenile fish and shrimp, and as a source of nutrients for nearshore fisheries.



Current environmental problems affecting aquaculture primarily concern water quality. Rapid industrial, residential, agricultural and tourism development activities all contribute to the degradation of rivers and coastal waters by generating pollutants such as increased sediment loads, nutrients, heavy metals and pesticides.

To ensure the long-term economic and environmental sustainability of the aquaculture industry, it is important to weigh all conflicting uses of the coastal zone, paying particular attention to their impact on aquaculture as well as to the world market's supply and demand. These analyses can serve as a basis for the zonation and protection of areas for aquaculture development.

CURRENT STATUS

Aquaculture is rapidly developing in the districts of Pontian, Johore Bahru and Kota Tinggi. Five main types of marine aquaculture activities are practiced here: (1) pond culture of tiger prawn (*Penaeus monodon*) and banana prawn (*P. merguensis*); (2) cage culture of sea bass (*Lates calcarifer*), grouper (*Epinephelus* sp.) and red snapper (*Lutjanus* sp.); (3) raft culture of mussels (*Perna viridis*); (4) cockle (*Anadara granosa*) culture; and (5) hatcheries for tiger or banana prawns (see Table 4.1).

Chapter 4. Management Plan for Aquaculture

Table 4.1. Types of aquaculture practices and main species of shrimp and finfish currently cultured in Johore.

Aquaculture practice	Local name	Species cultured	Scientific name
Pond culture	<i>Udang harimau</i>	Tiger prawn	<i>Penaeus monodon</i>
	<i>Udang putih</i>	Banana prawn	<i>Penaeus merguensis</i>
Cage culture	<i>Siakap</i>	Sea bass	<i>Lates calcarifer</i>
	<i>Kerapu</i>	Grouper	<i>Epinephelus</i> spp.
	<i>Jenahak</i>	Red snapper	<i>Lutjanus</i> spp.
Raft culture	<i>Kupang</i>	Mussel	<i>Perna viridis</i>
Cockle culture	<i>Kerang</i>	Cockle	<i>Anadara granosa</i>
Hatchery	<i>Udang harimau</i>	Tiger prawn	<i>P. monodon</i>
	<i>Udang putih</i>	Banana prawn	<i>P. merguensis</i>

Source: ASEAN/US CRMP (1991).

There are activities that are predominant only in specific areas. Cage culture of finfish, for instance, is concentrated in Pontian. Raft culture of mussels predominates in Johore Bahru, while pond culture of penaeid shrimp is practiced most widely in Kota Tinggi (Table 4.2). This development trend is mainly due to the availability of areas for the various aquaculture operations that are both suitable and low-cost in their respective districts.

In 1987, there were about 600 ha of land used for pond culture of shrimp, 3,570 units of floating cages for finfish culture and 283 rafts for mussel culture in all three districts (Table 4.2).

Table 4.2. Aquaculture developments in the districts of Pontian, Johore Bahru and Kota Tinggi, South Johore, 1987.

District	Aquaculture practice								
	Pond		Cage		Raft		Cockle		Hatchery
	No. of ponds	Area (ha)	No. of cages	No. of farmers	No. of rafts	No. of farmers	Area (ha)	No. of farmers	No. of hatcheries
Pontian	62	137	2,725	69	-	-	No culture		4
Johore Bahru	108	101	464	38	283	39	No culture		2
Kota Tinggi	103	360	381	32	-	-	No culture		5
Total	273	598	3,570	139	283	39	-		11

Economic Benefits

Production from Johore's coastal aquaculture in 1987 was estimated at 685 t. Total gross revenue from the various coastal aquaculture activities in the state was estimated at M\$16 million in the same year, more than 50% of which came from shrimp farming (DOF 1987).¹

Coastal aquaculture is an important source of foreign exchange earnings through exportation of shrimp and other high-value commercial fish. It also generates jobs for some 220 culturists/operators, and provides supplementary or alternative employment opportunities for the fishing communities. In addition, its produce is an important food source, supplying particularly the protein needs of the population.

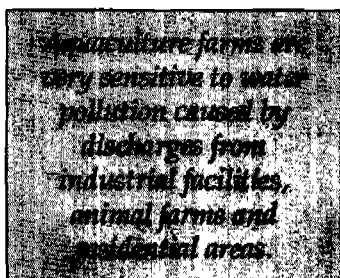
MANAGEMENT ISSUES AND PROBLEMS

Environmental Issues

Aquaculture operations rely heavily on good water quality, which is why farms are very sensitive to pollution caused by discharges from industrial facilities, animal farms and residential areas.

The major pollutants and their land- or sea-based sources include:

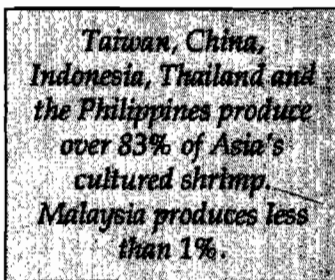
- alluvial sediments in the water mainly due to erosion resulting from deforestation, urbanization and mining activities;
- raw sewage and agricultural wastes discharged into rivers, estuaries and nearshore coastal waters, especially in areas with a high concentration of human settlements and agro-based industries;
- high nutrient loading caused by agricultural runoff, felt most in estuaries and nearshore coastal waters;
- effluents from sewage treatment plants;
- phosphates from detergents;
- pesticides from areas of large-scale agricultural development;
- marine pollution caused by petroleum transport, particularly in areas near shipping lanes; and
- other pollutants from developments adjacent to but incompatible with aquaculture areas.



¹1987: M\$2.65 = US\$1.00.

The proposed second linkage with Singapore and its associated development could affect the suitability of the areas in West Johore Bahru and Pontian for aquaculture. The industrial estate that is being planned at Tg. Langsat could also render the Sg. Johore estuary and its tributaries unsuitable. The logging in the Sg. Sedili Kechil basin, on the other hand, could cause flooding and water quality problems for aquaculture at the river mouth. Yet, aquaculture development is still being planned adjacent to these operations by various agencies such as KEJORA and the State Economic Planning Unit (SEPU).

Economic Issues



Taiwan, China, Indonesia, Thailand and the Philippines produce over 83% of Asia's cultured shrimp. Malaysia produces less than 1%.

A comparison of Johore's aquaculture sector with that of other Asian countries will provide a useful perspective of its economic viability. Total world production of cultured shrimp grew from 30,000 t in 1975 to about 560,000 t in 1988, at an average annual rate of 25%. Most of this growth occurred in Asia, which now produces about 75% of the world output. Taiwan had been the leading Asian producer until 1988, when disease-related technical problems and high production costs combined to cut production by 50%. The other countries that have experienced the most significant growth in recent years include China, Indonesia, Thailand and the Philippines, where production almost doubled from 1986 to 1988. These five countries produce over 83% of Asia's cultured shrimp. Malaysia produces less than 1% (AFL 1989).

This increase in the supply of cultured shrimp exceeded increases in the demand for them and caused downward pressure on prices. Fierce competition in the world market as a result of the increased supply puts the extensive/semi-intensive producers at an advantage, as they are lower cost producers than intensive operators. Data indicate that production from intensive operations declined when prices decreased, but production from extensive/semi-intensive operations continued to grow (AFL 1989).

With an estimated annual growth of 5-7% in shrimp supply, the real market price of shrimp could drop by an average of 6-10% yearly over the next few years. This could mean a declining profit margin with a corresponding decrease in investment on new shrimp culture ponds. Intensive farmers may also have to revert to lower cost semi-intensive production systems (AFL 1989).

For Johore, the shrimp industry caters mainly to the local and Singaporean markets, with some exportation to Japan. The effects of the increasingly competitive world market will be felt more by the large producers involved in international trade. This makes investment more risky in aquaculture operations for new, intensive ponds rather than existing extensive or semi-intensive ponds.

**LEGAL AND
INSTITUTIONAL ISSUES**

Jurisdiction over aquaculture activities is provided for in the Fisheries Act (1985). Section 11(1) of the Act prescribes for the licensing of aquaculture systems in marine waters, which may have accompanying conditions. On the other hand, Section 61(r) allows the Minister of Aquaculture to make regulations for the promotion of marine aquaculture and control of its activities. The state government formulates regulations to control aquaculture activities in riverine waters, as stipulated in Sec. 38(1a). This includes all freshwater pools, swamps, lakes and rivers.

The Fisheries Act (1985) also provides for licensing of aquaculture activities on state land. Jurisdiction extends to the rivers and marine waters within 3 nautical miles of the foreshore from the low-water mark (state territorial waters), and allows for the attachment of conditions in the licenses issued.

Regulations for the establishment and management of aquaculture activities in estuarine and marine waters under the Fisheries Act (1985) have been legislated for implementation in 1990. Those for operations in the riverine systems, however, have yet to be established by the state government.

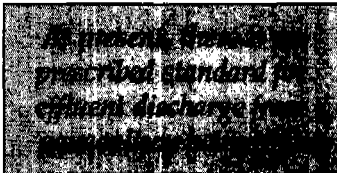
In the interim period before regulations for aquaculture in rivers, estuarine and marine waters are promulgated, controls are already being administratively imposed by the state government via the issue of Temporary Occupation Licenses (TOLs). The views of DOF and the various relevant agencies are sought before the approval of any TOL application for aquaculture purposes, and conditions are imposed by the state government upon issue of the license.

However, there is presently no prescribed standard for effluent discharge from aquaculture activities. Without such standards, the regulating legislations being developed under the Fisheries Act (1985) would be unable to address pollution problems brought about by aquaculture effluent discharge.

The 1987 Environmental Quality (Prescribed Activities) (EIA) Order requires EIAs for development on land of more than 50 ha and of any size in mangrove areas adjacent to marine parks. However, enforcement of this provision has yet to become a routine in any project assessment.

The above discussion shows that several agencies on both state and federal levels have jurisdiction over aquaculture activities. The various agencies/individuals involved and their respective roles in this field are:

- DOF - provides technical advice on aquaculture development, conducts research on techniques and identification of suitable sites, and regulates aquaculture operations.
- DOFor - provides technical input for any proposed aquaculture development located within the Permanent Forest Estate. Its policy is to oppose the conversion of mangrove areas.



Chapter 4. Management Plan for Aquaculture

- DTCP - has a role in aquaculture development planning in the formulation of structural plans for local authority areas within the state.
- SDLM - involved in approving land acquisition, conversion and excision of Mangrove Forest Reserves or Stateland Mangrove Forests for aquaculture development. This Department also acts as the coordinator or secretariat for SNRC, which makes decisions regarding state land.
- SEPU - undertakes aquaculture development planning and programs. It is also the secretariat for several executive council committees involved in decisionmaking regarding land use.
- Harbour Master - approves any aquaculture operation in a waterway, ensuring that navigation is not obstructed.
- DOE - requires an EIA for any large-scale conversion of mangrove forests greater than 50 ha and of mangroves adjacent to marine parks.
- DDI - has a leading role in decisions to build bunds and drain land, and to change the natural water flow through an area to make the land more suitable for aquaculture or agriculture.
- KEJORA - undertakes aquaculture development planning in the South-east Johore region.
- Johore SEDC - Undertakes joint shrimp aquaculture projects with private investors, e.g., EAMF.

MANAGEMENT GOAL AND OBJECTIVES

The goal of the CRM plan in aquaculture development in Johore is to ensure the sustainability of the industry, environmentally and economically.

The plan's objectives are to:

1. identify and zone areas where aquaculture development is suitable, relative to other uses and values of the area;
2. minimize the environmental impacts of adjacent developments on aquaculture operations;
3. minimize the environmental impacts of aquaculture on other coastal systems and developments; and
4. reconcile the conflicts between mangrove management and aquaculture development.

**RECOMMENDATIONS
FOR MANAGEMENT**

Management Zones

1. Certain areas in the districts of Johore Bahru, Pontian and Kota Tinggi have been identified, zoned and recommended as physically and biologically suitable areas for cage, raft (Figs. 4.1-4.3) and pond cultures.
2. All aquaculture activities should be banned in marine park areas.

General Guidelines

Mangrove conversions

The following are recommendations based on the NATMANCOM guidelines:

1. No mangrove land should be used for large- and small-scale aquaculture.
2. Former mangrove lands, already reclaimed for agricultural purposes and located behind the DDI bunds, especially those areas that are currently unused or abandoned due to poor soil conditions or unproductivity, are recommended for large-scale aquaculture development, i.e., where the total pond area exceeds 3 ha or the total area (including pond and buffer zone) exceeds 15 ha.
3. Stateland Mangrove Forests, excluding those proposed in Chapter 3 as Protective Forests and National Parks-Johor, are exclusively reserved for small-scale family unit aquaculture development.

Pollution control

1. Current laws and regulations should be strictly enforced to prevent pollution of rivers and coastal waters.
2. Standards for effluent discharge from aquaculture activities should be established.
3. Aquaculture operators should strictly monitor effluents from their own farms once effluent standards are established. This should be enforced especially for large shrimp farms where the effluent load is potentially very high. The monitoring program should pay special attention to BOD and dissolved oxygen (DO) levels. Cage culture operations should also be closely watched to ensure that there is no buildup of nutrients below the cages. Siting them in areas of adequate depth and current will help prevent these problems.

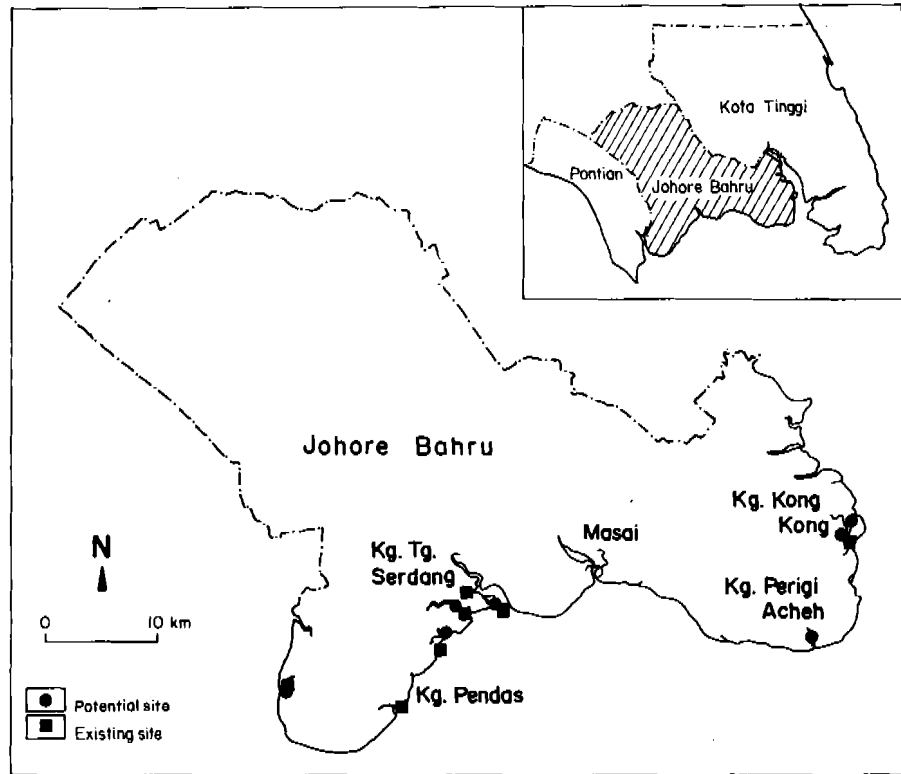


Fig. 4.1. Existing and potential sites for cage and raft culture in Johore Bahru District.

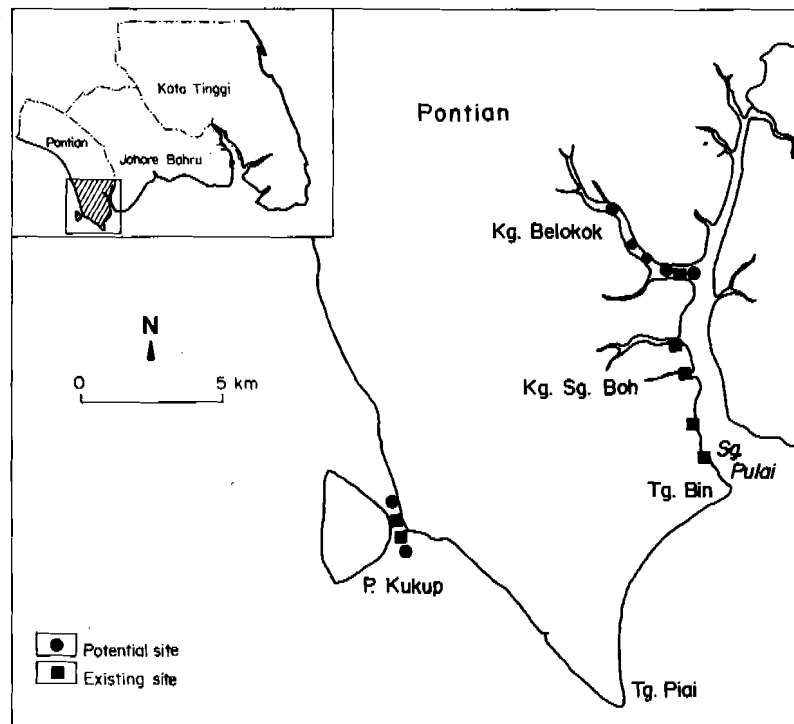


Fig. 4.2. Existing and potential sites for cage and raft culture in Pontian District.

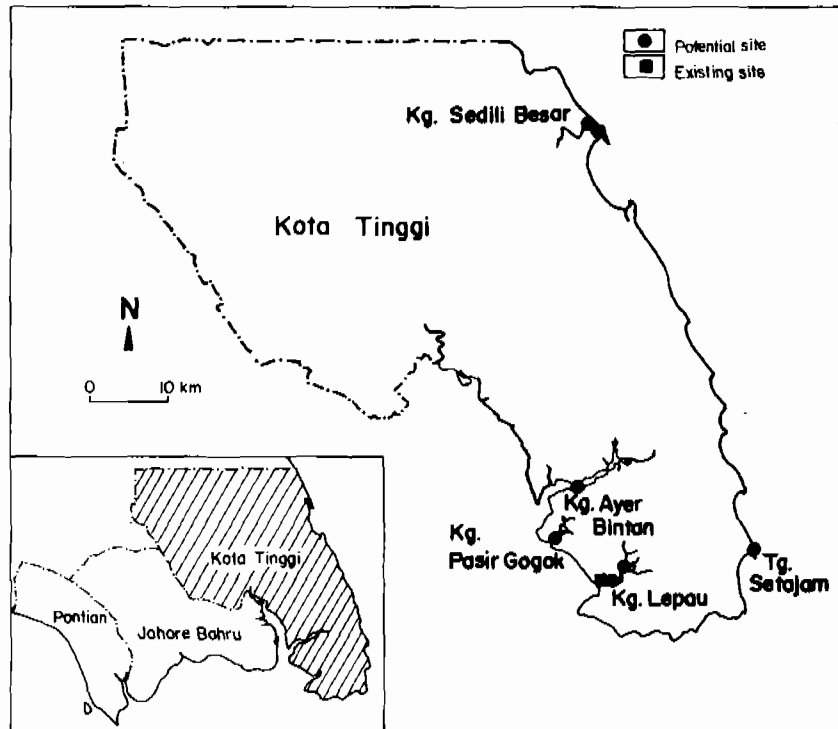


Fig. 4.3. Existing and potential sites for cage and raft culture in Kota Tinggi District.

4. There should be integrated planning in the siting of industrial and residential developments away from areas identified for aquaculture development. It should be noted that industrial development would be potentially incompatible with aquaculture development on former mangrove land.
5. Recommendations for improving and maintaining water quality (see Chapter 7) should be implemented.

Developments adjacent to aquaculture sites

The recommended construction setbacks from potential aquaculture sites are:

Industrial development	100 m
Housing estates	500 m
Tourism developments	100 m

Integrated planning

To establish an integrated management plan for aquaculture development, which is important in minimizing resource use conflicts, the following recommendations are made:

Chapter 4. Management Plan for Aquaculture

1. Pontian District should be considered a high priority area for aquaculture development. Therefore, any other development that may adversely affect this industry should be limited and strictly regulated.
2. In Johore Bahru District, industrial estates, particularly those housing major heavy industries, and population centers should be developed in accordance with the management guidelines as specified in Chapter 11.
3. In Kota Tinggi, aquaculture has significant development potential that should not be compromised by incompatible industrial, housing or tourism development.
4. In Johore Strait, the median fecal coliform (FC) bacterial concentration should not be allowed to exceed 14 mpn (most probable number)/100 ml to maintain the standard of water quality required for raft culture already operating here.

Area-specific action plans for the proposed developments around Sg. Pulai at Bandar Baru Piai as part of the second linkage project, and those around the Sg. Johore estuary (including the proposed petrochemical industrial estate at Tg. Langsat), are presented in Chapter 11. Implementation of these plans will be very helpful in the integrated CRM planning for aquaculture development.

Specific Guidelines

Small-scale aquaculture

The following recommended guidelines are for small-scale, family unit pond aquaculture on Stateland Mangrove Forests:

1. The total mangrove area should be at least 15 ha in size with a minimum width of 400 m.
2. The maximum allowable size of area to be developed per family should be 3 ha. Following the NATMANCOM guidelines, the ratio of developed area against undeveloped/buffer area should be 1:4. Thus, 12 ha of surrounding buffer forest should remain untouched. Here, harvesting of forestry products should be prohibited. Traditional fishing methods, however, may be allowed.
3. A protective mangrove strip of 400 m from the mangrove's edge should be maintained to prevent erosion and help filter any discharge of pond water.
4. Hatcheries for small-scale aquaculture may be permitted on Stateland Mangrove Forests.

The maximum allowable size of area to be developed per family should be 3 ha, leaving 12 ha of surrounding buffer forest untouched.

5. The pond layout design, location and distribution of family units should be determined by DOF. Family hatchery units should be constructed at a distance of at least 700 m (four times the length of one side of a square 3-ha farm) from one another.
6. These small-scale developers should be encouraged to use pond construction techniques that disturb the soil as little as possible, e.g., digging only about 30 cm of topsoil and building dikes. This will reduce the acid sulfate problems (see "Issues and Problems" in Chapter 3). This technique would, however, require pumping the water into the ponds rather than using tidal exchange. Although it costs more initially, experience with ponds using this method has shown that it is more cost-effective in the long run.
7. Pathways leading to the family units should be restricted to jungle tracks or boardwalks. Where possible, waterways should be used. If roads are necessary, then the roads should be built parallel to the flow of water. If they run perpendicular, then there should be an adequate number of culverts to provide for the free flow of water in the mangroves.
8. There should be least possible disturbance to the surrounding mangroves during construction and operation of the farms.
9. No chemicals, such as piscicides, should be released outside the ponds until after these are inactive.
10. Banned piscicides should never be used.
11. Planting of mangroves along the bunds should be encouraged where these do not interfere with walkways or the integrity of the bunds.
12. There should be no dumping of plastics in the mangroves.
13. Pellet feeds, rather than raw trash fish, should be used.

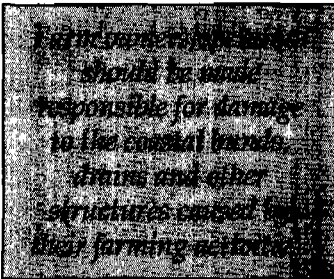
Large scale aquaculture

The recommended guidelines for large-scale aquaculture are:

1. Development should be limited to the coastal area inland of the DDI bunds, including former mangrove lands.
2. Entrepreneurs should be encouraged to venture into large-scale development of any of these two types:
 - a. that undertaken by a private developer or conglomerate with or without foreign investment; or

Chapter 4. Management Plan for Aquaculture

- b. a group aquaculture area (GAA), where a group of small individual landowners form a cooperative along the lines of a FELDA scheme. The government could provide assistance in this venture.
3. Conditions to be followed by large-scale aquaculture operators are as follows:
- a. The DOF should first approve the pond layout design of any proposed development. Use of the design established by DOF should be encouraged.
 - b. The aquaculture farms should be set at least 30 m from the borrow-pit drains behind the coastal bunds.
 - c. Just like in small-scale aquaculture, excavation in pond construction should be limited only to the top 30 cm of soil, and dikes should be built to avoid acid sulfate problems. The bunds should be planted with mangroves or other suitable crops.
 - d. In pond construction, the existing freshwater drain should be preserved by rerouting the ditch. Any brackishwater influx into these drains should be prohibited.
 - e. Seawater required by the farm should be supplied by pumps that draw it directly from the sea. Gates are not allowed to be constructed at bunds for the purpose.
 - f. Similarly, the waste discharged from the farms to the sea should be pumped.
 - g. Coastal bunds should not be used as access roads to the farms, and activities on these structures should be minimized to protect them from breaching.
 - h. Farm owners/operators should be made responsible for damage to the coastal bunds, drains and other structures due to their farming activities.
 - i. Use of pellet feeds should be encouraged and use of banned piscicides should be prohibited. This will require further education programs and extension work by DOF.
 - j. An EIA should be prepared for large-scale aquaculture operations.



RECOMMENDATIONS FOR LEGAL AND INSTITUTIONAL ARRANGEMENTS

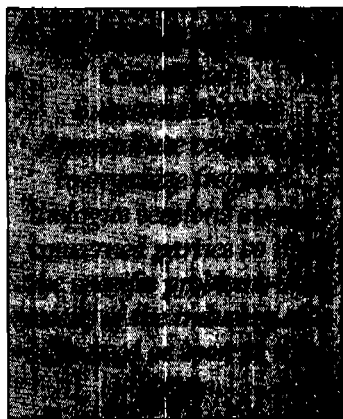
Legal aspect

1. The State Authority, as empowered by Section 38 of the Fisheries Act (1985), should make regulations to manage aquaculture in rivers, pools and swamps.
2. These regulations should specify standards for construction, operation and pollution control. The recommended aquaculture zones should be incorporated in the structural plan for the local authority areas in the state of Johore.

These regulations, which should include all the recommendations made in this management plan, may be modelled after the Fisheries (Marine Culture) System Regulations (1990).

3. The State Authority should also invoke its powers under Section 52(1), 62, 79, 121 and 122 of the National Land Code (1965) to require construction setbacks and buffer zones (as recommended in the general management guidelines of this plan) for developments adjacent to aquaculture farms.

Institutional aspect



1. The CRC Subcommittee on Aquaculture should consist of administrators, scientists and representatives from relevant agencies, including the proposed Environmental Officer of SEPU, who will monitor the implementation of the aquaculture management plan and develop annual reports giving the current status of the industry, its trends and any recommended changes in the plan. This report should be submitted to the CRC. The subcommittee should make sure that an up-to-date inventory and mapping of established, proposed and potential aquaculture sites are maintained.

This subcommittee could also help to organize frequent dialogue sessions among individual members and organizations, as well as with government representatives, so that the specific problems and needs of the industry are properly identified and addressed as soon as they emerge.

2. For GAA farmers:

The overall coordination of all GAA activities should be provided by DOF. The specific responsibilities of cooperating relevant agencies should be as follows:

Chapter 4. Management Plan for Aquaculture

- a. In establishing GAAs, DOF will assist the private farmers in certain aspects, such as site suitability analysis, pond farm design and layout (which will require DOF's approval), and farm operations.
- b. The Lembaga Kemajuan Ikan Malaysia (LKIM) will be responsible for marketing aspects, credit needs and negotiations with DDI for canal construction.
- c. The DDI will be responsible for canal construction and maintenance.

3. For small-scale family unit aquaculture ventures:

- a. The DOF should develop manuals and guidelines for aquaculture operators, particularly on sound farm management techniques, pond development and maintenance, and pond record-keeping. It should continue its research and development efforts in: aquaculture, especially in the engineering aspect; methods of seed production; pond and cage culture management; soil and water analyses; feeding techniques; fish nutrition; disease prevention and control; harvest and post-harvest operations; and marketing. The department should also investigate the economic aspects of alternative aquaculture practices.
- b. The LKIM should make sure that small-scale farmers are fully aware of the financial feasibility of their proposed venture. They should be given adequate financial advice and assistance in handling the business side of the operations.

4. It is essential to establish a national aquaculture coordinating committee, along the lines of NATMANCOM. This committee should be comprised of agencies involved in aquaculture research planning, development and management, such as MOA, DOF, LKIM, the Federal Agricultural Marketing Authority, the Fisheries Research Institute (FRI), DOFor, Universiti Pertanian Malaysia (UPM) and Universiti Sains Malaysia (USM). The following objectives should be pursued by the committee:

- a. to establish research priorities according to national needs. The research areas will include:
 - the economics of using marginally productive agricultural land in reclaimed areas for aquaculture development;
 - EIAs of aquaculture development;
 - assessment of the socioeconomic impacts on and the extent of the benefits of aquaculture development accruing to the coastal population, particularly fishing and farming communities; and
 - forecasting the likely effects of sea level rise and climatic change on the aquaculture industry.
- b. to facilitate proper collaboration and coordination among government agencies; and
- c. to ensure the effective utilization of existing manpower and facilities.

The Department of Fisheries should continue its research and development efforts in aquaculture; methods of seed production; pond and cage culture management; soil and water analyses; feeding techniques; fish nutrition; disease prevention and control; harvest and post-harvest operations; and marketing.

CHAPTER 5

MANAGEMENT PLAN FOR COASTAL/OFFSHORE SAND MINING

INTRODUCTION

A thriving industry in Johore, sand mining is viewed by local entrepreneurs as a lucrative venture. With the projected national economic recovery and the attendant buoyant local construction market in Malaysia, the demand for sand aggregates is certain to increase. At the same time, there is a huge demand for sand as fill material for land reclamation operations in Singapore. The availability of these ready markets is likely to cause an increase in applications for sand mining concession.

Sand dredging operations, however, often cause adverse impacts such as shoreline change as a result of altered sediment transport, lower productivity, direct loss of living aquatic resources and other problems that will be detailed later in this chapter. Therefore, regulation and proper management of the industry are necessary.

SITUATIONAL ANALYSIS

Analysis of the current status of sand mining and the development of the management guidelines for the industry are based on the technical work of Zamali and Lee (1991b).

Current Status

Sand mining is governed by licenses issued by the Johore state government. Fig. 5.1 shows the areas for which TOLs for sand mining were given out in 1989. Most of these leases are within the area of coastal waters (along Sg. Johore and the seabed off Southeast Johore) under state jurisdiction, i.e., within 3 nautical miles from the shore.

Sand mining also occurs in some of the rivers of the Sg. Johore basin and on the riverbanks of other South Johore rivers, although operations here are not as extensive.

Currently, there is an expressed interest to dredge in virtually all the nearshore areas of East Johore from Tg. Siang southward to and including the Sg. Johore estuary.

Economic Benefits

The south coast and the eastern part of Johore Strait are estimated to have tremendous deposits of sand amounting to 100 million m³ (based on sand extraction applications), which can be extracted for export purposes. An

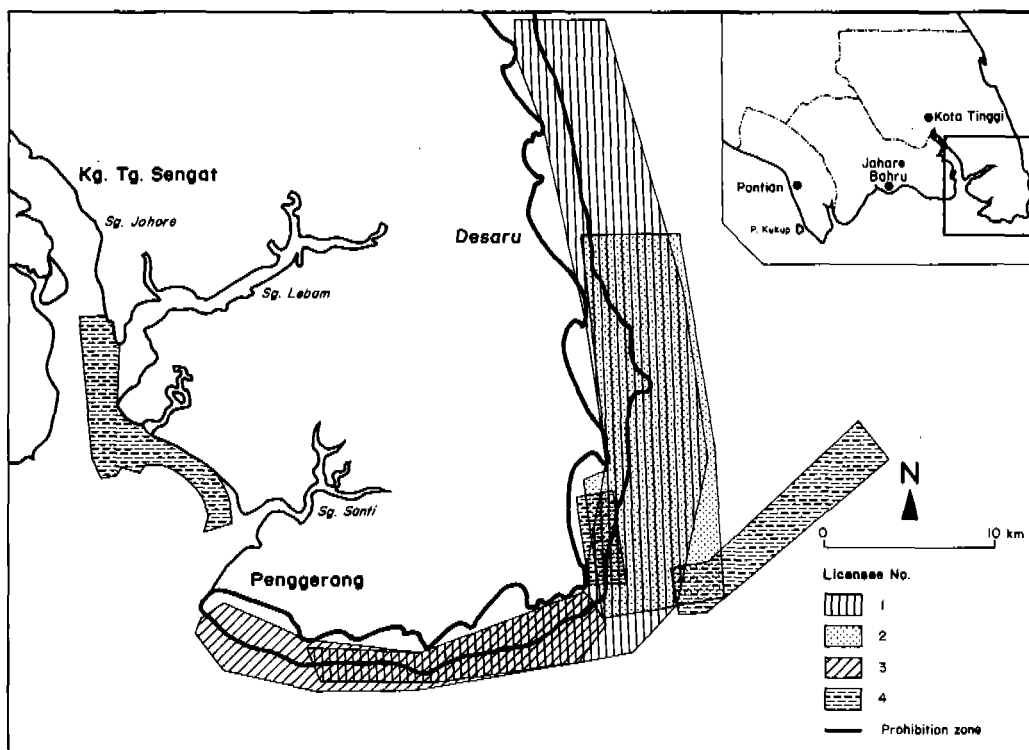


Fig. 5.1. Sea-based sand mining operations, Southeast Johore.

additional 9 million m³ are estimated to be available at the various river mouths. Revenues accruing to the state government can be substantial, with royalties ranging from M\$0.70/m³ for marine sand to M\$1.20/m³ for river sand, if exported. In recent years, M\$5-6 million in royalties have been brought in annually from sand mining, with about 4-5 million m³ in yearly production.

MANAGEMENT ISSUES AND PROBLEMS

Impacts of Offshore Sand Mining

Ecological Impacts

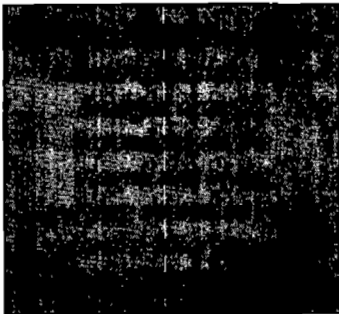
Offshore dredging often causes the suspension of sediments and the release of absorbed pollutants from the disturbed sediments. Dredging-induced suspensions have the potential to change water quality and affect local biota. Thus, the impacts of dredging on the biological environment are determined by the operational design, scale and duration of the mining activity. While the direct environmental effects of offshore dredging are attributed to the

Chapter 5. Management Plan for Coastal/Offshore Sand Mining

massive displacement of the substrate and the subsequent destruction of nonmotile benthic communities, its more subtle impacts may escape recognition and detection. These include:

1. restriction of feeding and respiratory efficiencies and induced mortalities in bottom-dwelling biota (e.g., bivalve mollusks) as a result of the smothering effect of sedimentation;
2. reduction of primary productivity (photosynthesis) due to turbidity in the water column;
3. introduction of abnormal volumes of organic material and nutrients, which increase BOD, in turn, reducing oxygen levels and productivity;
4. re-introduction of toxic substances uncovered by mining activities;
5. inadvertent destruction of the adjacent habitat critical to the life cycles of certain organisms; and
6. disruption of migratory routes of motile marine organisms.

A concentration of resuspended sediments and their subsequent distribution and deposition are the primary causative agents of the biological stresses mentioned above. Survival under these conditions depends largely on the specific living requirements of the marine communities affected and a host of extraneous factors such as depth of sediment, length of time under burial, time of year, and sediment grain size and quality.



Another cause for concern is the resulting physical reduction in habitat area, which affects the rate of repopulation in the dredged area. Sea bottom borrow pits remain intact for long periods unless backfilling occurs from current-induced sediment movement. If the sediments are organic-laden, the subsequent decomposition may lead to anaerobic conditions and deteriorating quality of the water. Hence, the reestablishment of marine habitats at dredged areas is, again, dependent on the magnitude of the dredging operation, new sediment interface and water quality.

Physical impacts

Offshore mining activity normally incurs the risk of altering beach dynamics, waves and swell patterns, as well as coastal current circulation, which may lead to erosion or sedimentation. Dredging can influence the coastal physical processes through:

1. erosion of beaches from drawdown due to the backfilling of the dredged pit during calm periods;
2. interception of sediment movement by the dredged pit, which results in sand depletion onshore or downdrift;

3. removal of protection afforded by offshore banks, which leads to bigger waves impinging on the coast; and
4. changes in the wave refraction pattern, which concentrates wave energy at a particular place.

Socioeconomic Impacts

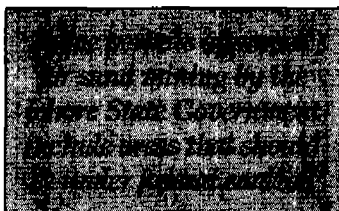
Sand mining is the cause of high turbidity in some areas. This results in reduced fish catches, which mean economic losses for the local fishers. In fact, a riverine sand mining operation in Sg. Lebam was closed down, and the fishers were given compensation for the loss in catch. At Tg. Surat, half of the fishers reported a decrease in fish yield (Wong and Chang 1989a). The fishers in Sg. Silong, which flows through Kampong (which means "village"; "Kg." from here) Pelentong, also had the same experience because of increased turbidity due to soil erosion caused by a sand mining operation on the banks of the river. The firm was directed to install sediment traps and silt fences to reduce the erosion.

Impacts of Land-based and Riverine Sand Mining

Land-based and riverine sand extraction serve as alternatives to offshore sand mining and engender a different scenario of environmental impacts due primarily to the absence of wave influence on river current flow. Reworking of tin mine tailings is unlikely to generate adverse impacts except for the introduction of fine sediments into the streams from surface runoff, which is deemed minimal due to the localized extent of the working area. Stripping of old alluvium, provided that the area is worked incrementally, also produces localized impacts. Only river dredging, which is usually conducted at the lower reaches, has the greatest potential of inducing changes in river and coastal morphology, and affecting such activities as capture fisheries and aquaculture due to the resulting turbidity.

LEGAL AND INSTITUTIONAL ISSUES

Federal and State Jurisdiction



Either federal or state jurisdiction can have authority over sand mining, depending on the site of the operation. All land, including the foreshore up to 3 nautical miles seaward from the low-water mark, is controlled by the state. The seabed and waters beyond this limit, up to the continental shelf boundary, falls under federal jurisdiction.

However, it has been observed that some of the permits approved for sand mining by the Johore State Government include areas that should be under federal control.

The problem of overlapping leases is the result of the lack of understanding by the State Government of the extent of its jurisdiction over the foreshore and the waters above it. Under Emergency (Essential Powers) Ordinance No. 7/1969, the territorial sea is extended to 12 miles measured from the low-water mark, in all states except Sabah and Sarawak. This law applies to all purposes except for those covered under the Continental Shelf Act (1966), the Petroleum Mining Act (1966), the National Land Code (1965) and written laws relating to land in Sabah and Sarawak. On the other hand, Section 4(2) of the Ordinance states the 3-nautical mile limit (from the low-water mark) of state jurisdiction. Thus, the law is very clear as to what constitutes federal and state jurisdiction over minerals and sand extraction.

This problem of dual jurisdiction is compounded by the lack of coordination and consultation in the issuance of permits. Problems caused by sand mining can transcend jurisdictional boundaries. Nevertheless, a permit for operation in an area under state jurisdiction is issued without prior consideration for its possible impacts on the area under federal control.

On the operational level, the lack of monitoring of field dredging operations (before, during and after mining) is due to staff shortages and the absence of competent personnel. Frequently, it is left to the dredging operators to provide information on the quantity of sand dredged, mainly for revenue computation purposes. This passive monitoring overlooks the transient nature of the dredging-induced turbidity, its subsequent dispersion pattern and the long-term deleterious effects, which may only become evident after the cessation of operations.

Permitting Processes

Under the federal permitting process, sand mining applications should be submitted to the Ministry of Land and Cooperative Development (MLCD), where a committee chaired by its Secretary General and comprised by representatives from the various relevant agencies process these applications. This committee also recommends to MLCD the conditions to be attached to sand mining operations. Fig. 5.2 shows the current application approval process for sand mining. The technical departments that are consulted are found in Table 5.1.

Licenses for the mining leases of sites under federal jurisdiction fall under the Continental Shelf Act (1966, revised 1972). Section 4 of the Act empowers the federal authority to impose any of the committee's conditions that the federal government sees fit, including those for environmental safety. Conditions pertaining to the safety of the environment, whether it be within the mining or adjacent areas, are not explicitly spelt out in the Act. Annex D gives some of the conditions currently attached to federal licenses.

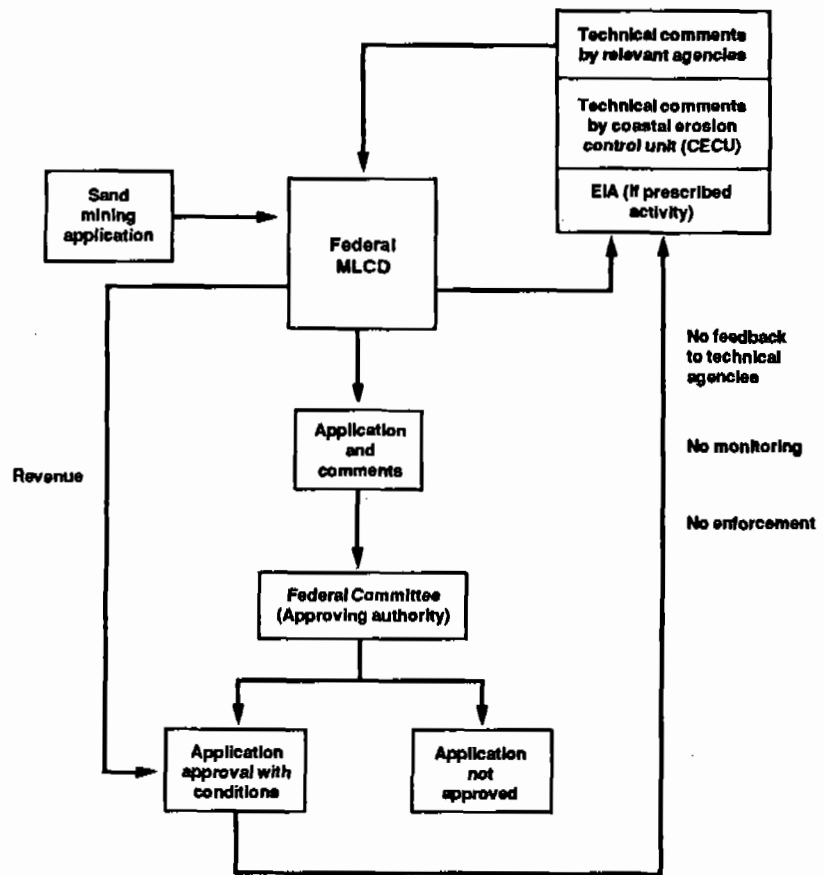
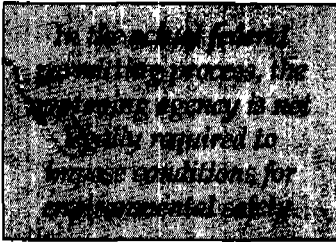


Fig. 5.2. Current application approval process for sand mining on the federal level.

Table 5.1. Agencies to be consulted for offshore sand mining applications under the federal permitting process.

1. Malaysian Mines Department	Chief Mines Inspector (representing the Secretary General of MLCD)
2. Department of Geological Survey (DGS)	Director General
3. Ministry of Transportation	Secretary General
4. Ministry of Defense (MOD)	Secretary General
5. DOE	Director General
6. DOF	Director General
7. Royal Custom and Excise Department	Director General
8. Ministry of Trade and Industries	Secretary General
9. Marine Police	Inspector General of Police
10. Survey Department	Director General



In the actual federal permitting process, the imposition of such environmental conditions depends very much on the agency empowered to issue the licenses, and on whether the relevant agencies are given sufficient time to carry out the appropriate evaluation. This is because the approving agency is not legally required to impose these conditions.

Currently, the federal government imposes some semblance of regulatory control with respect to sand mining activities causing coastal erosion through the General Circular No. 5/1987, which requires all heads of federal departments, statutory bodies and the state authority to inform the Coastal Engineering Technical Centre (CETC) of such activities within their respective jurisdictions (Table 5.2). The center services the National Council's section that deals with coastal areas, including the foreshore. The objective of this circular is to allow the council to give advice regarding conditions to be imposed on coastal projects for the prevention of coastal erosion. Since the circular is administrative in nature, it is not legally binding. Besides, the general opinion of the state authority is that it has sole prerogative over land matters.

Table 5.2. Technical departments to be consulted for offshore sand mining applications under the state permitting process.

1. SDLM/Land Offices (Coordinating Agencies)
2. DGS
3. CETC
4. DOE
5. DOF
6. DOFor
7. MOD
8. Other line departments whose interests or missions such as waterfront/coastal installations and submarine cables may be jeopardized by the application.

Under the state permitting process, sand mining leases are given TOLs under Section 69 of the National Land Code (1965) for a period of five years, subject to renewal annually. The final administrative approving authority for leases is SEC. The SDLM processes and coordinates all applications and acts as the secretariat for the council in that matter (Fig. 5.3).

Conditions attached to TOLs pursuant to Section 14 of the National Land Code (1965) are purely administrative (e.g., fees, etc.). There are no conditions found in the Act pertaining to the protection of the environment. In practice, requirements that provide for the safety of navigation under the Merchant Shipping Ordinance 70 (1952) are merely additional conditions attached to a TOL.

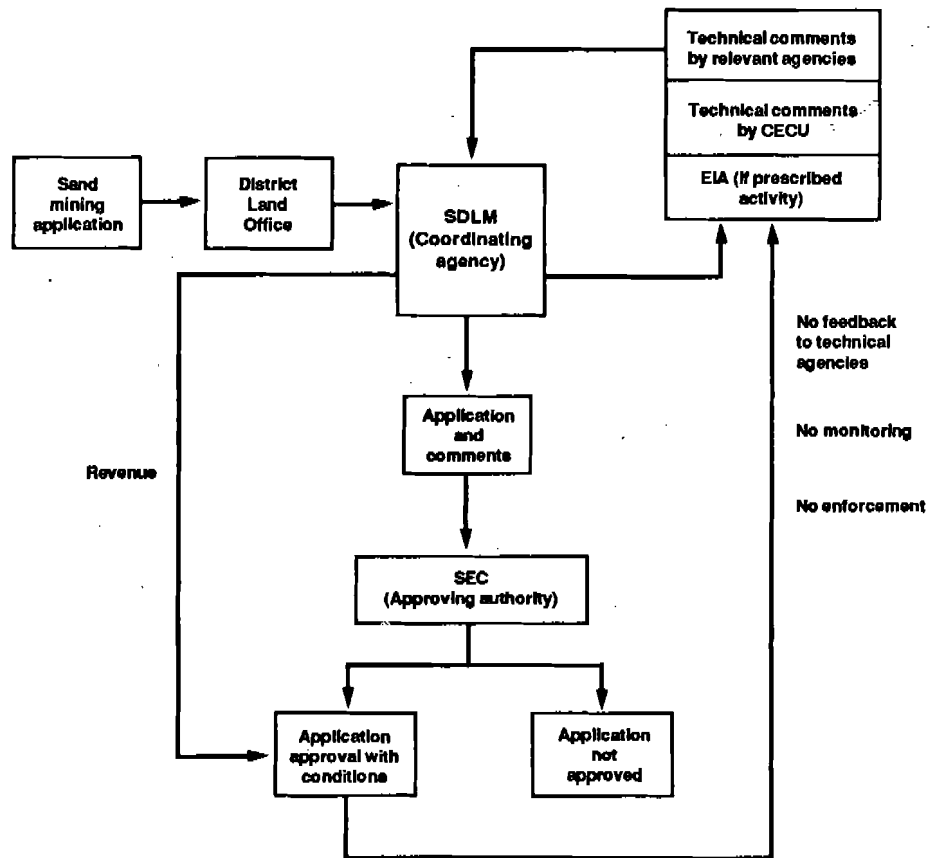


Fig. 5.3. Current application approval process for sand mining on the state level.

The only legislation that prescribes conditions pertaining to environmental safety for sand mining operations is the Environmental Quality Act (1974).

The only legislation that prescribes conditions for the protection of the environment in sand mining operations is the Environmental Quality Act (1974), whereby Section 34A authorizes the Director General of Environment to approve only those projects that take adequate measures to prevent or control any resulting adverse environmental impacts. Subsidiary legislation pursuant to that section, namely, the 1987 Environmental Quality (Prescribed Activities) (EIA) Order, requires all sand mining applications for leases above 50 ha to submit EIAs along with recommendations for the control, regulation and minimization of any adverse impacts on the environment. Any subsequent approval by the Director General would normally incorporate conditions that are regarded as necessary to safeguard the environment.

To date, however, there is no established framework or channel whereby the state authority is required to submit all the applications on sand mining to DOE for approval. No attempt is made to ensure that the applicants comply with the EIA requirements. Even the approving agency for permits to operate on sites under federal control does not always require EIAs for sites above 50 ha.

There is a lack of baseline data on proposals partly because no guidelines or rules are established to compel the applicants to submit the appropriate information.

In the normal practice, all applications received are submitted by the state authority to relevant federal and state agencies for their comments before they are presented to SEC for approval. The agencies concerned, however, find it hard to make competent comments for a number of reasons. First, there is a lack of baseline data on proposals partly because no guidelines or rules are established to compel the applicants to submit the appropriate information. Applications with insufficient data are normally entertained. Another problem is that agencies are not given enough time to conduct a proper assessment. The agencies concerned, not to mention the private sector, also lack competently trained manpower to conduct EIAs. Moreover, no feedback is given to any of the agencies concerned on action taken by the state authority (i.e., actual licenses issued and conditions imposed) with respect to each application. Thus, they are not able to assist in monitoring or enforcing the imposed conditions. The same operational problems also ail the federal permitting process.

For better permit processing and coordination on the state level, there is currently a proposal to establish a State Mineral Resources Committee (SMRC), which will be responsible for the administration, including the processing of sea- or river-based mineral mining operations in the state.

Review of the EIA

Currently, the EIA guidelines under the legal requirement of the 1987 Environmental Quality (Prescribed Activities) (EIA) Order are not technically sound. Both the assessment and the review authority do not take into account the cumulative impacts of adjacent or multiple sand mining operations that are already in existence.

MANAGEMENT GOAL AND OBJECTIVES

The main goal of this plan is to aid in the management of offshore and coastal sand mining operations so that their adverse effects on the rivers and coastal morphology, the environment and any other adjacent economic activity are minimized.

The objectives of the plan are to:

- delineate specific areas, based on a set of physical criteria, where sand mining is not permitted;
- identify alternative, potential areas for sand mining;
- recommend standards and guidelines for dredging;
- make an assessment of the biological impacts of dredging operations; and
- recommend improvements to the procedures for lease approval and monitoring.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

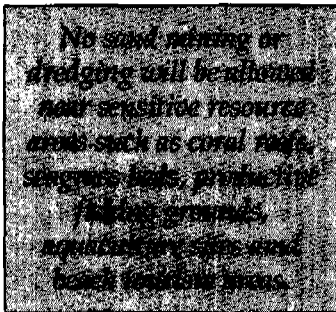
1. Sand mining is prohibited shoreward of 1.5 km from the mean low-water line, or the 10-m depth contour measured from the lowest astronomical tide, whichever is farther from the shore (Fig. 5.1).

This 10-m water depth/1.5-km boundary from shore restriction is not directly patterned after that of any country, but is more an adaptation of practices in such countries as Japan, United Kingdom and some in Central America, after giving due regard to the differences in wave climate, bathymetry and textural properties of the sand. Active sediment transport and the mechanics of incipient sediment motion under wave/current action, as contained in the Shore Protection Manual (1984), have also been adequately considered.

2. No sand mining will be allowed in rivers where there are significant fishery and aquaculture operations, and/or drinking water intake points. These include sections of Sg. Johore, Sg. Lebam, Sg. Belungkor, Sg. Buah Besar and Sg. Santi.

This prohibition should be reevaluated if mining technology has so improved that the potential impacts of sand mining on the environment, specifically, increasing turbidity of water and habitat destruction, are substantially reduced.

3. No sand mining or dredging will be allowed near sensitive resource areas such as coral reefs, seagrass beds, productive fishing grounds, aquaculture sites and beach tourism areas.
4. River sand mining, when allowed, will be restricted to the middle one-third section of the river. This implies that different operations will be allowed at variable distances from the bank, depending on the width of the river concerned. The main concern here is the stability of the riverbanks, which can be disturbed by machinery movement or nearby physical dredging.



Alternative Sources of Sand

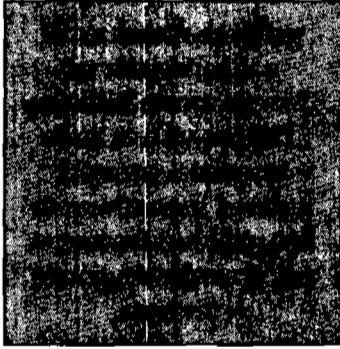
The state should consider alternative sites for sand mining (Fig. 5.4). Fig. 5.5 shows the land use of the potential areas of sand sources.

Alternative sand sources may come from:

1. reworking of tin mine tailings;
2. dry stripping of old alluvium;

3. dredging on riverbeds using pumps; and
4. river mouth dredging for navigational purposes.

The first three forms are found in the Kota Tinggi district, which produces the highest quantity of sand based on 1987 production figures released by the respective land offices. This amounted to 3,000,000 m³, which was more than the combined output of other districts.



River mouth dredging for navigation is a potential source of sand, albeit as a by-product. However, it must be cautioned that since estuaries serve as rich nursery and breeding grounds for inshore fishery stocks, stringent measures must be taken in any dredging activity to prevent turbidity and toxicity problems.

In evaluating the feasibility of mining these alternative sources, site-specific studies must be carried out to ascertain current land use as well as to identify sensitive ecosystems that might be affected by the mining activity.

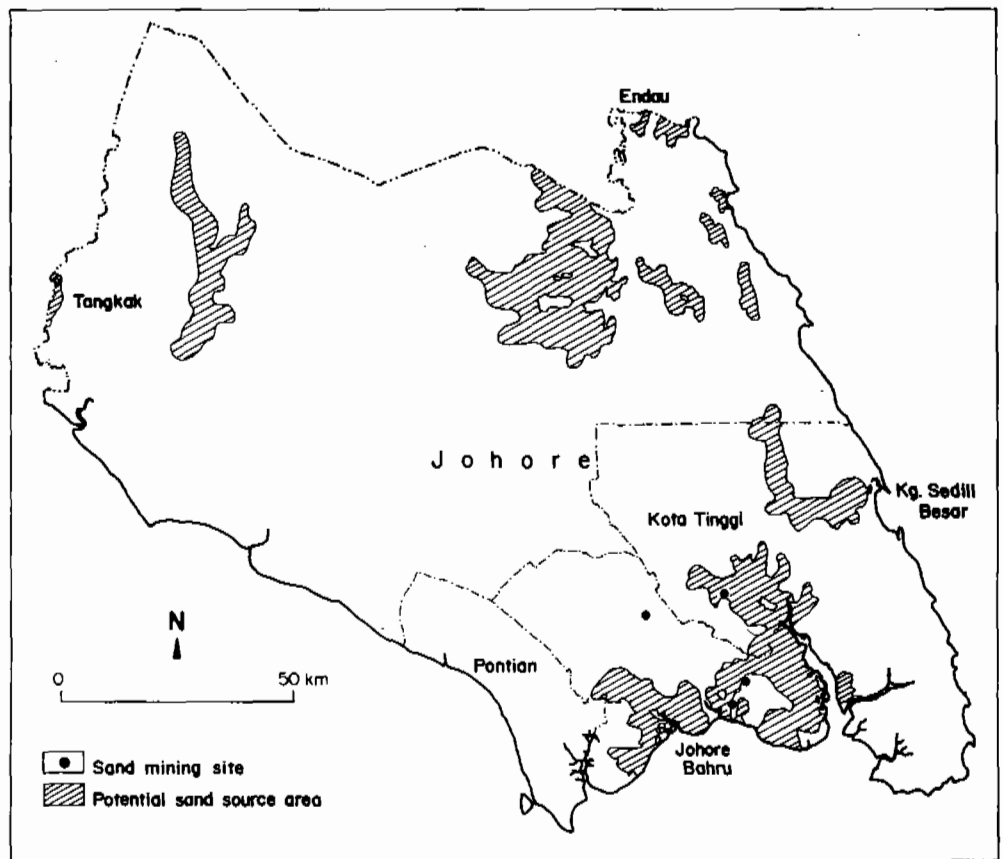


Fig. 5.4. Land-based sand mining operations and potential sand source areas, South Johore.

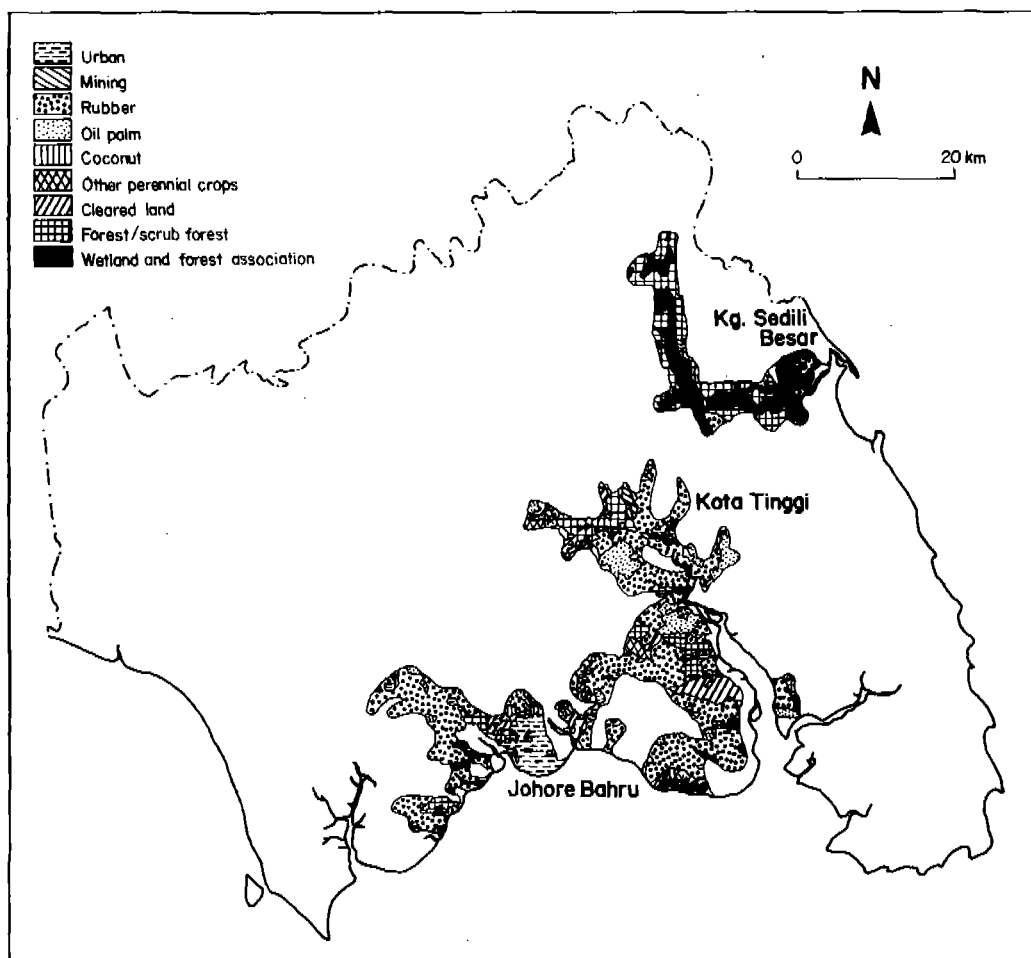


Fig. 5.5. Land use in potential sand source areas, South Johore, 1974.

General Guidelines

For any sand mining activity, the following general guidelines are recommended:

1. Dredges that are the most harmful to the environment should be prohibited. The use of suction dredges is preferred over mechanical ones. If possible, plain suction dredges rather than the cutter suction type should be used.
2. The DOF should identify and classify sensitive marine/riverine areas and make it known to planning and approving committees/agencies that these are sand mining prohibited areas. If dredging must take place close to these sites, a barrier such as a silt fence should be erected between them. The impact of dredging on these resource areas should be closely monitored.

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3. The dredge should be accurately positioned in the designated area and the anchors/cables/discharge pipes should be placed in the sand or other nonsensitive habitats.
4. Shallow dredging over a large area will be permitted but deep dredging should be prohibited as it results in the formation of a stagnant dredged pit, which requires a long period of time to recover. Dredging must also proceed by layers.
5. All leaking joints in delivery pipelines should be repaired immediately to prevent the release of large quantities of sediments in the water column.
6. Dragging anchors and cables on the seabed is prohibited.
7. An EIA conducted by a competent firm should be required of all sea-based or riverine sand extraction and mining proposals.
 - a. For sand mining proposals involving an area of 50 ha or more, the EIA will be undertaken by the operator as required under the 1987 Environmental Quality (Prescribed Activities) (EIA) Order. For proposals involving an area less than 50 ha, the EIA will be undertaken by DOE.
 - b. The EIA will include: a resource survey; the identification/delineation of natural resources, critical and sensitive habitats, and adjacent economic activities; an estimate of the proposal's potential damage on these resource sites/economic activities; and the recommended mitigating measures to be taken.
 - c. An EIA should take into consideration the cumulative impacts of adjacent multiple sand mining operations across jurisdictional boundaries.
 - d. Evaluation of EIA reports on sand mining must be undertaken by competent technical staff from all relevant agencies concerned with the management of natural resources and physical habitats that may be affected by mining operations.
 - e. Evaluating and monitoring agencies should be informed of the conditions attached to issued licenses.
8. The current conditions being imposed on offshore sand mining operators who were issued licenses (Annex D) should be expanded to include environmental considerations and compensatory measures, such as those for riverine sand mining (to be discussed shortly). These conditions should be imposed by both federal and state licensing authorities.

An environmental impact assessment should take into consideration the cumulative impacts of adjacent multiple sand mining operations across jurisdictional boundaries.

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9. In the case of riverine sand mining, a set of operational conditions (Annex E) is recommended to be imposed on operators upon issuance of their licenses.
10. All sand mining operations are required to be subjected to monitoring programs in accordance with the following guidelines:
 - a. For large sand mining operations (50 ha or more):
 - The monitoring program will be undertaken before, during and after the sand mining operation. Data should be submitted on a quarterly basis to DOE.
 - Operators should shoulder monitoring costs.
 - b. For small sand mining operations (less than 50 ha):
 - The DOE will be responsible for monitoring.
 - c. The DOE will be responsible for designing and approving the monitoring program.
 - d. The results of the monitoring program will be evaluated as follows:
 - In state waters: by DOE, the proposed Environmental Section of SEPU and SDLM.
 - In federal waters: by DOE, the proposed Environmental Section of SEPU and MLCD.
11. In issuing riverine sand mining permits, there should be specific conditions that stipulate mitigating measures and compensation rates to be imposed once an adverse environmental impact is confirmed by monitoring. The mitigating measures will include installing silt fences and traps, and restoring banks, should they collapse. Compensation rates and independent valuation by the Socioeconomic Research Unit will be determined prior to the granting of TOLs based on the EIA.
12. The DOF will be the agency to verify if there has been an adverse impact on fisheries in a river or coastal area. The SDLM and MLCD will coordinate the compensation program in state and federal waters, respectively.
13. A plan for public education on the potential adverse impacts arising from offshore/land-based sand mining should be developed and implemented. This may be incorporated into the educational signs, brochures, and programs for Desaru, for example.

In issuing riverine sand mining permits, there should be specific conditions that stipulate mitigating measures and compensation rates to be imposed once an adverse environmental impact is confirmed by monitoring.

**RECOMMENDATIONS FOR
LEGAL AND INSTITUTIONAL
ARRANGEMENTS**

Legal Aspect

1. The National Land Code should be amended to give express authority to DOE and SDLM to monitor and enforce the conditions attached to state TOLs for sand mining operations. The recommended process to be followed for state approval is given in Fig. 5.6.

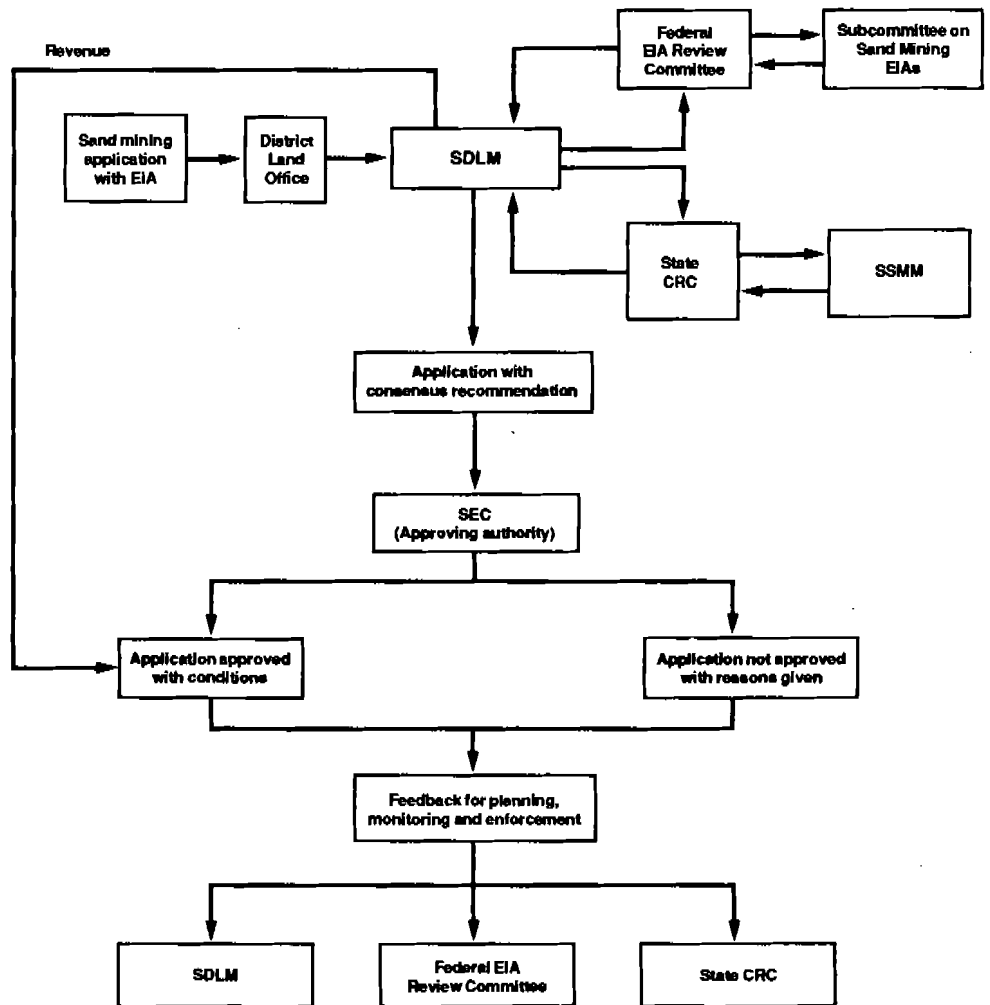


Fig. 5.6. The proposed application approval process for sand mining on the state level.

- The Continental Shelf Act (1966) should be amended to give express authority to DOE and MLCD to monitor and enforce the conditions attached to federal sand mining licenses. The recommended process to be followed for federal approval is given in Fig. 5.7.

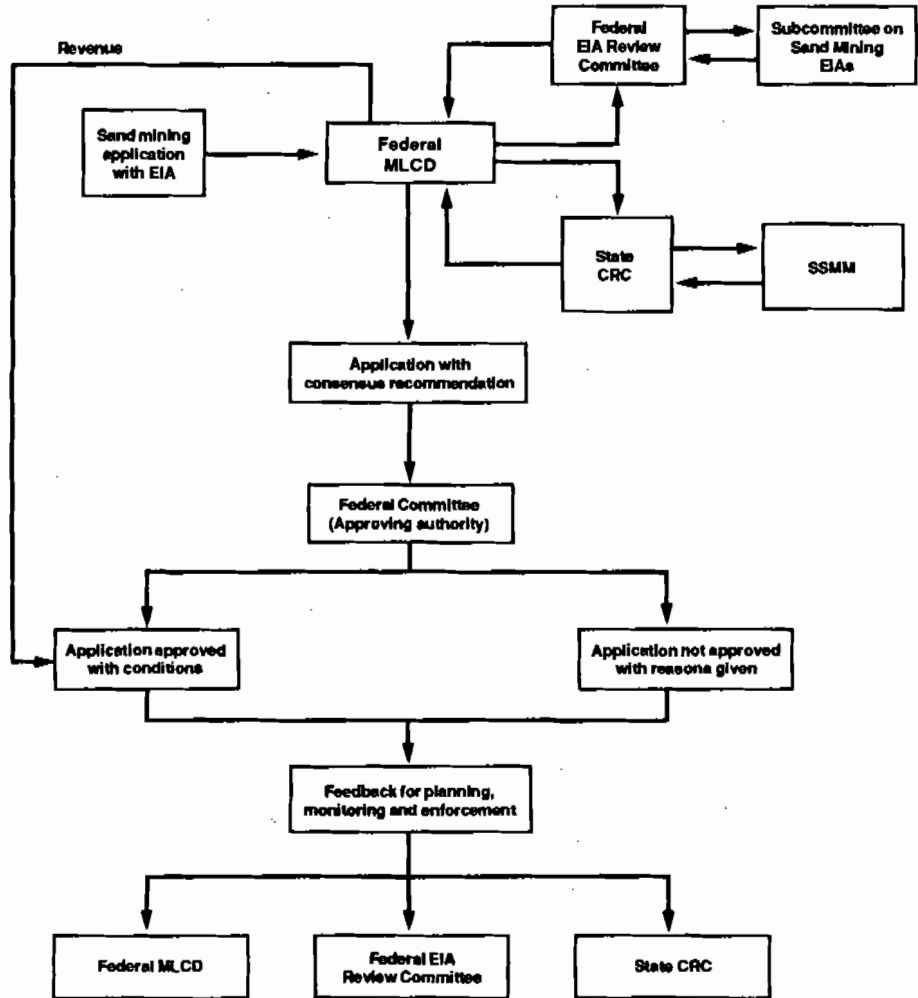


Fig. 5.7. The proposed application approval process for sand mining on the federal level.

- The sample conditions issued by the federal committee for offshore sand mining operations (Annex D) after incorporating the recommended environmental guidelines could be adapted for use by SDLM. Annex E is a preliminary list of conditions that could be used as a guide for riverine sand mining operations.
- The Environmental Quality Act (1984) should be amended to require that EIAs be done by agencies that are registered and duly licensed by DOE.

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5. Section 11c of the Environmental Quality Act (Prescribed Activities) (EIA) Order should be amended to classify all riverine, land-based and offshore sand mining operations as "prescribed activities." This will then require all sand mining proposals to undergo EIAs that will be financed by either the operators or DOE, depending on area size. Classifying all sand mining activities as "prescribed activities" will put sand mining under the purview of the Environmental Quality Act (1974). By virtue of the delegation of power by the Director General of Environment under Section 49 of this Act, SDLM and MLCD are, again, given the authority to monitor and enforce conditions attached to state and federal sand mining licenses, respectively. They will perform these functions jointly with DOE.
6. The federally issued General Circular No. 5/1987 should be either issued as a state circular or be made into a state law to ensure compliance of its requirements.
7. The Conservation Act (1972) should be reviewed and updated in the light of Administrative Circular No. 5/1987 and should assign enforcement responsibilities to a technically competent agency that has yet to be identified.
8. Since licenses for sand mining in state waters are awarded annually for a duration up to five years, pursuant to the National Land Code 1965 (Section 67(2)), mitigating and compensatory measures may be added to the conditions of new and existing licenses if deemed necessary, based on the results of monitoring.
9. Both the state and federal sand mining approving committees should be formalized in law. This will ensure that only personnel who are technically competent and trained to evaluate the adverse impacts of such operations are involved in the approval process. The TOR for the committee should also be stated clearly in the same legislation.
10. The review and evaluation committee for EIAs should also be formalized in law for the same reason stated above. This committee should be composed of various technical subcommittees categorized by the type of activity. The TOR for the committee and each subcommittee should be stated clearly, and membership appointed by name and on a three-year basis.

Since licenses for sand mining in state waters are awarded annually for a duration up to five years, mitigating and compensatory measures may be added to the conditions of new and existing licenses if deemed necessary, based on the results of monitoring.

Institutional Aspect

1. Departments responsible for planning, application approval, monitoring and enforcement of conditions in sand mining (e.g., MLCD, SDLM and DOE) should have additional trained personnel.

The Environmental Section in the State Economic Planning Unit should keep a central databank of sand mining leases and the monitoring program, which can be used to update the information in the geographic information system (GIS). This will allow a quick assessment of the status and the potential environmental impacts of the sand mining industry.

2. The Environmental Section in SEPU should keep a central databank of sand mining leases and the monitoring program, which can be used to update the information in the GIS. This will allow a quick assessment of the status and potential impacts of the sand mining industry. Similarly, the SDLM should also set up its own environmental section that will have the same functions and will also ensure the feedback of information to the relevant technical departments.
3. The SDLM should remain the overall coordinating agency for the sand mining permit approval process in state territorial waters.
4. The permit applications for sand mining should use specific plans from DGS, using the 1-km RSO grid system. This standard map system may be computerized as input into the GIS, which is already being used in state planning.
5. For any project classified as a "prescribed activity," DOE is recommended to issue an administrative circular to specify all practical procedures required by law that will be followed in submitting an EIA prior to approval.
6. The CRC should meet to review and discuss the acceptability of the application and add any necessary conditions.
 - a. This review should include the overall planning scenario of riverine/land-based or offshore sand mining in the state, that is, where it is being done, the amount of sand produced, and trends in environmental monitoring, with reports from DOE and DOF.
 - b. The same information will be needed for other sea- or riverine-based mining operations. Thus, it is important that the proposed SMRC coordinates with CRC.
 - c. Once a decision has been made by CRC, the committee will then be able to submit its consensus recommendation to SEC through SDLM.
 - d. All CRC members should be kept informed of sand mining operations around the state. They should also be notified about the decision of both the state (SEC) and federal governments (MLCD) on permit applications and conditions, the results of ongoing monitoring and the success of conditions set for the mining operations. This will enable the state to have a regular review of the implementation of the sand mining policy, including its environmental aspects.

Chapter 5. Management Plan for Coastal/Offshore Sand Mining

7. The DDI should provide SDLM personnel with technical training to enable them to estimate the quantity of sand mined by the operators so that royalties may be quantified. Current quantification methods, e.g., monitoring the number of lorries used to transfer the material, should be complemented by estimating the production capabilities of the sand mining operation through an analysis of the equipment specifications given in the application.
8. DDI could also assist in monitoring the dredging and mining operations to ensure that the requirements for erosion control are being met.
9. There is a need to review the royalties paid by operators on the sand mined, based on the profitability of the operation.
10. A state tax on sand should be increased to help pay for the additional monitoring and enforcement on the state level. Guidelines are as follows:
 - a. The exact amount should be determined by SDLM in conjunction with DOE and SEPU. It should be based on the profit as determined by area leased and size of operation.
 - b. This money should be set aside as a special fund to be used only for the purpose of paying for the additional monitoring of sand mining and for the training of personnel.
 - c. The disbursement of money from this fund should be governed by the Subcommittee on Sand Mining Management (SSMM), together with financial officers of other relevant agencies, and may also include a representative of MLCD.
11. The following are institutional recommendations for monitoring and enforcement on the state level:
 - a. The SDLM should remain the lead agency in all these matters.
 - b. Monitoring results indicating adverse environmental impacts should be reviewed by SSMM, whose recommendations should then be forwarded to CRC.
 - c. Interagency agreements should be reached to monitor sand mining operations and determine if these have brought about adverse impacts.
 - d. The recommendations of CRC should be passed on to SDLM for follow-up action at the time the license is revised.
 - e. The relevant agencies should be informed of the action taken.

A state tax on sand should be increased to help pay for the additional monitoring of and law enforcement in sand mining operations on the state level.

12. Universities are recommended to conduct EIA courses as part of the normal curriculum of full-time students, as well as external short-term EIA courses for professionals.
13. The National Scientific Research Council (NSRC) or MOSTE should identify the EIA as a priority research area for local university courses and government agencies dealing with developments that may affect the environment. Funding for this research can come through NSRC or through the surcharge tax on sand. This basic research on the impacts of sand mining on the marine environment is described below.

RECOMMENDATIONS FOR FURTHER RESEARCH

There is a lack of basic knowledge about the physical and biological impacts of coastal/offshore sand mining, and the effects of sand mining-induced turbidity in rivers on capture fisheries and aquaculture.

Determining the Limiting Water Depth

Sand mining removes sand and alters bathymetry. Although prevailing practices in other countries indicate that physical impacts on the shoreline can be avoided by specifying a limiting water depth shoreward within which dredging is allowed, the various methods for doing so have not been conclusively proven and none is universally applicable. Similar guidelines in the case of mud coasts are practically nonexistent. Thus, the guidelines proposed in this study should be taken as conservative interim measures that may be subject to further study. Through the monitoring program, these may be evaluated and revised as necessary in consultation with the relevant agencies.

Biological Impacts

There are many specific issues involving the biological impacts of sand mining, which are more critically felt than its physical impacts. Coastal dredging disturbs marine habitats and exerts stresses on marine communities. Riverine sand dredging affects the local river environment. Analysis of the problem is disadvantaged by the dearth of biological baseline information on areas within which dredging is confined. Another complication is the potentially nonlinear nature of the cumulative effect of extensive dredging operations conducted simultaneously. Furthermore, there are no available standards for the levels of sediment that produce an acute or chronic impact on various biological communities.

To address these research needs, biotic surveys of the nearshore and offshore areas contiguous to the shoreline in the management area should be conducted. These will provide an up-to-date inventory and mapping of marine life, especially the bottom-dwelling and sedentary species, and will establish and identify critical habitat areas. Research on the impact levels of sediment on various biological communities, and on the movement and deposition of

silt (direction and amount) should be undertaken. This may serve as the master baseline plan on which the evaluation of any application for sand extraction or mining concessions may be based. Similar studies need to be done of the rivers as well.

It will also be useful to obtain documentation from project-based studies on the response of marine organisms (such as coral reefs and seagrass beds), to physical damage, sediment burial, increased turbidity level and duration of disturbance, as well as their recovery after the cessation of dredging operations.

Physical Impacts

There is a lack of knowledge on the generation of dredge-induced turbidity. Thus, it will be useful to document past studies on this effect based on the type of seabed and dredge, and other parameters. On-site monitoring/research should also be conducted. Currently, the cumulative impacts of multiple sand mining operations have not yet been studied or quantified.

CHAPTER 6

MANAGEMENT PLAN FOR COASTAL EROSION

INTRODUCTION

Coastal erosion is a significant environmental issue in South Johore since it poses a potential threat to the numerous valuable resources and economic activities within and adjacent to coastal areas. These include: mangroves and sandy beaches; agriculture; aquaculture; residential tourism and industrial development; communication links; and other infrastructure.

Unplanned development, modification of the shoreline and mining or dredging may cause short- and long-term negative effects on shoreline stability. This damage may be prevented or at least minimized by careful planning, taking into consideration development needs, physical characteristics of both the shoreline and current patterns, and implications of projected sea level rise.

SITUATIONAL ANALYSIS

The analysis of the current status of coastal erosion and the development of guidelines for its management is based on Zamali and Lee (1991a).

Current Status

It is observed that coastal erosion experienced along the coastline of South Johore is largely wave-induced. On the west coast, however, it is further aggravated by human intervention in the form of coastal reclamation for agriculture and mangrove conversion for agriculture and aquaculture purposes. Here, marginal coastal land (amounting to 7,260 ha) that had been susceptible to tidal flooding was transformed into arable land. Seawater intrusion was prevented by the construction of a protective coastal bund about 400 m landward from the outer (seaward) edge of the mangrove area. Since 1974, a total of 66 km of this earth bund has been completed along Johore's west coast at a cost of M\$50/m run¹.

¹1974: M\$2.31 = US\$1.00.

Chapter 6. Management Plan for Coastal Erosion

The National Coastal Erosion Study (EPU 1985) has identified 15.3 km of critically eroding area along Johore's western coastline and 3.7 km along the eastern portion (Fig. 3.4). Table 6.1 gives a detailed breakdown of the status of erosion along both parts of South Johore's coast.

Table 6.1. Extent of coastal erosion in South Johore.

Coast	Coastline length (km)	Coastline affected (km)		
		Critical	Significant	Acceptable
East	128	3.7	1.0	50.8
West	74	15.3	26.0	16.9

Causes

Coastal erosion is the result of any one or several of these factors:

- underwater migration of mud waves;
- loss or removal of mangroves;
- wave-induced scouring due to lower intrinsic mud strength in the presence of seawater; and
- modification of shoreline, especially construction of hardening structures.

MANAGEMENT ISSUES AND PROBLEMS

Role of Mangroves In Retarding the Erosion Process

It is well known that mangroves possess wave dissipating capabilities that retard the rate of erosion. In addition, they help to accelerate land accretion in depositional environments (Snedaker 1984). However, mangroves are only able to play these beneficial roles if a sufficiently wide belt of these is left along the coastline and if the natural drainage patterns are maintained to provide input of sediments and freshwater.

Impact of Bund Building on Mangroves

The physical and biological impact of bund construction on the environment is not well understood. There has been considerable speculation regarding the likely cause-and-effect relationship between coastal bunding and erosion along a mangrove-fringed coast. However, no concrete conclusion can be derived yet since there has not been any thorough study on this subject. Nevertheless, on-site observations have indicated some correlation between the alteration of natural drainage patterns (which causes a reduction in freshwater and sediment supply) and the demise of mangroves.

Implications of Sea Level Rise on Coastal Area Development

The projected 20- to 140-cm rise in sea level by the year 2030 may have a very profound impact on the coastline through current exacerbating coastal erosion processes. In general, its most significant physical impacts are predicted to be shoreline retreat, loss of mangroves, increased flooding and increased saline intrusion inland. Unprotected low-lying coastal and riverine areas may be permanently inundated, while sandy beaches and muddy coastlines may be eroded. In protected coastal areas, the rising sea level may overtop insufficient levees, while increased wave action may cause greater damage to these embankments. Coastal areas that are low-lying, of erodible substrate and presently evincing extensive erosion, which are typical of the west coast, are most vulnerable to these threats.

Due to the higher sea level, the discharge period for waters from existing urban and agricultural drainage systems would be reduced. This would lead to water retention in the drainage canals, rendering them useless.

Increased saline intrusion in the upper portions of rivers would also greatly reduce the efficiency and usefulness of the potable and irrigation water intake stations along the rivers. Some of these intake points may even have to be relocated further upstream to avoid pumping saline water.

These future scenarios for South Johore are real concerns that need to be viewed in totality with the other, more immediate coastal problems. Unfortunately, there is currently no cohesive planning that would address these issues.

LEGAL AND INSTITUTIONAL ISSUES

Legal Aspect

On the state level, regulatory control on coastal development with regard to coastal stability may be exercised via the government's adoption of a number of federal laws, by-laws and regulations through administrative or legal means. No single Act at present relates to the control of land use in the coastal area.

Control of coastal erosion on the federal level, on the other hand, is carried out via the federal administrative mechanism of General Circular 5/1987, established by the National Coastal Erosion Control Council (NCECC). This circular requires government and semi-government agencies, state or federal, to submit all development proposals along the coast to DDI's CECU. However, the states have so far not responded well to it. There is no formal channel or direct linkage with the various state governments regarding its implementation; NCECC only deals with policy matters. The successful

implementation of the circular, therefore, depends on the commitments of the various state governments to send DDI all development proposals for comments and then to act on the recommendations made by the department.

The NCECC has not established any other definitive policy or initiated any study with the objective of consolidating the means to control erosion in the coastal zone.

Section 34(A) of the 1987 Environmental Quality Act (Prescribed Activities) (EIA) Order requires every large-scale development project to prepare an EIA of its activities and to propose measures to prevent, reduce or control its adverse environmental impacts. However, there are cases wherein this provision is blatantly flouted.

Another means of federal control is through the enforcement of Section 34(A) of the 1987 Environmental Quality Act (Prescribed Activities) (EIA) Order, which requires every large-scale development project to prepare an EIA of its activities and to propose measures to prevent, reduce or control its adverse environmental impacts. This provision does not, however, encompass small-scale projects except those in protected areas, e.g., development on or adjacent to national land and marine parks. Since this is a federal law and there is no established mechanism between federal and state governments to ensure that all such projects prepare EIAs and submit them to the Director General of Environment for approval, there are cases where this provision is blatantly flouted. One particular example is the removal of mangrove by a private company on P. Redang Terengganu, after the Terengganu government had approved in principle its development of a holiday resort on 700 ha of land. The island is adjacent to the marine park of P. Redang and development on it is subject to an EIA by Section 34(A) of the Environmental Quality Act (1974).

Under this Section, the Director General, in his analysis of any EIA report, does not have to take into account the cumulative impacts of other projects and activities existing or proposed along the coasts.

The law that pertains specifically to erosion control is the Land Conservation Act (1960, revised 1989). It specifies provisions for the conservation of hilly land, and the protection of soil from erosion and the inroad of silt into other land and any watercourse, whether natural or artificial. Although this Act has been adopted by all the states in West Malaysia, it has not been utilized or enforced. The impacts of activities causing erosion are often not immediately perceived and because information on erosion causes is only available in technical reports, the land administrator, being a generalist, may not fully realize the potential consequences of not enforcing the Act.

One weakness of the Land Conservation Act (1960) with regard to coastal erosion is that it relates more to hilly land and has no provision for beach set-backs, etc. Nevertheless, revisions could be made here to help control the problem.

The most appropriate instrument to be used for planning purposes in the control of coastal erosion would be the Town and Country Planning Act (1976). The structural plan to be submitted by the local authority under Section 8(1) of this Act shall include the current policy on social, economic and

planning development, and the environmental protection of the state and the nation besides other matters. Since the structural plan consists of a map and written statements, zones such as beach setbacks could be incorporated for the protection of the coastline and other areas. Since planning permission and conformity with the plan are required of any proposed development, this Act could prove to be effective.

Institutional Aspect

The NCECC, which is chaired by the Director General of the Implementation and Coordination Unit of PMD, was established in 1987 to coordinate all erosion control activities in the different states of Malaysia. While Sabah and Sarawak are some of its permanent members, only two states in West Malaysia are represented at any one time on a rotational basis. Even DOE, which is responsible for maintaining the environmental quality in the country, is not a permanent member of the council.

The NCECC is assisted by CECU, which is presently staffed by seven engineers. There are plans to increase the number to 15 and to establish a special sub-unit for coastal monitoring and coastal zone management (CZM).

On the state level, coastal erosion control would presumably come under the State Action Committee, which is chaired by the Chief Minister. Recommendations to the committee with respect to coastal erosion control would therefore come from the various departments in charge of natural resources, DOE and especially DDI. The National Land Code (1965), the Town and Country Planning Act (1976), the Street Drainage and Building Act (1974) and its Uniform Building By-laws (1986) are administered by SDLM, the Johore Bahru municipality and the local councils for the various local authorities in Johore, respectively.

MANAGEMENT GOAL AND OBJECTIVES

The goal of this coastal erosion management plan is to protect the coastal land, its valuable natural resources and any development of this land or these resources against coastal erosion. This plan aims to achieve the following objectives:

- to identify and assess the coastline's vulnerability to erosion processes so that their potential impacts on the environment are predicted;
- to recommend appropriate mitigation measures for eroding areas along the coast;
- to formulate compatible development strategies that incorporate erosion prevention planning;
- to clarify and possibly improve the methodology of economic evaluation of a coastal protection strategy that incorporates CZM and CRM as preemptive actions against the incurring future cost of coastal protection;

- to promote research on mud coast dynamics;
- to heighten public awareness of the delicate balance of coastal processes and their susceptibility to human interference; and
- to sensitize the policymakers to the need for erosion prevention planning and for a consideration of the adverse impacts of a projected sea level rise in planning development.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

For management purposes, the coastline is categorized into zones of critical erosion, significant erosion and acceptable erosion. Fig. 3.4 shows the currently eroding areas in each zone. This categorization is based on the severity of erosion in conjunction with the economic, agricultural, transportation, recreational and demographic values of an area as well as the type of structures needed to protect these values.

Critical erosion zone

Areas in this category are currently experiencing erosion processes so serious that they pose a significant threat to the socioeconomic activities and values in their locality. Action to halt erosion in such areas is urgent.

Recommended strategies:

- Further development in these areas should be discouraged.
- Any development approved should have the appropriate construction setback as determined by the type of shoreline and construction (see General Management Guidelines in this chapter) to minimize the risks due to erosion.
- The cost of protective measures should be shouldered by the developer.
- The developer should initiate early feasibility studies to determine mitigating measures for the proposed development.
- EIAs should be made a requirement for any development along these coasts irrespective of size.

Significant erosion zone

Areas in this category are not presently experiencing critical erosion. However, in view of its potential threat to the economic activities and socioeconomic values of the area, it is necessary that the erosion rate here be monitored frequently and regularly.

Recommended strategy:

- The DDI should undertake reconnaissance at three-year intervals to determine changes in erosion rates and the need for implementation of erosion control measures.

Acceptable erosion zone

In the areas included in this zone, erosion rates pose no significant danger to the socioeconomic activities and values of the area. There is therefore no immediate requirement for protective measures to be instituted.

Recommended strategy:

- The DOE and the Johore State Government, through the Environmental Quality Act (1974) and the various state laws relating to the control of land use and building, should see to it that planning for development siting and construction along the shoreline incorporates environmental considerations in the design of the facilities to ensure shoreline stability.

General Guidelines

1. Coastal bunds and other developments proposed on mangrove-fringed coasts should be sited at least 400 m from the seaward edge of the mangrove (see Figs. 6.1 and 6.2).

This recommendation provides lead time for the implementation of appropriate mitigating measures in areas where the erosion trend is under periodic monitoring. This recommended buffer is based on field practice as supported by the following facts:

- a. On-site observations reveal that a 1-m high wave is essentially attenuated after traversing through a mangrove belt 50 m wide.

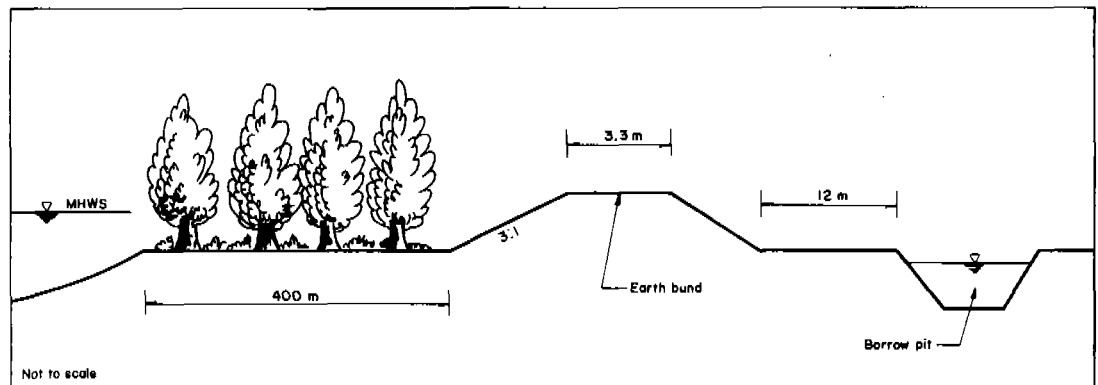


Fig. 6.1. A cross-section of a traditional earth bund.

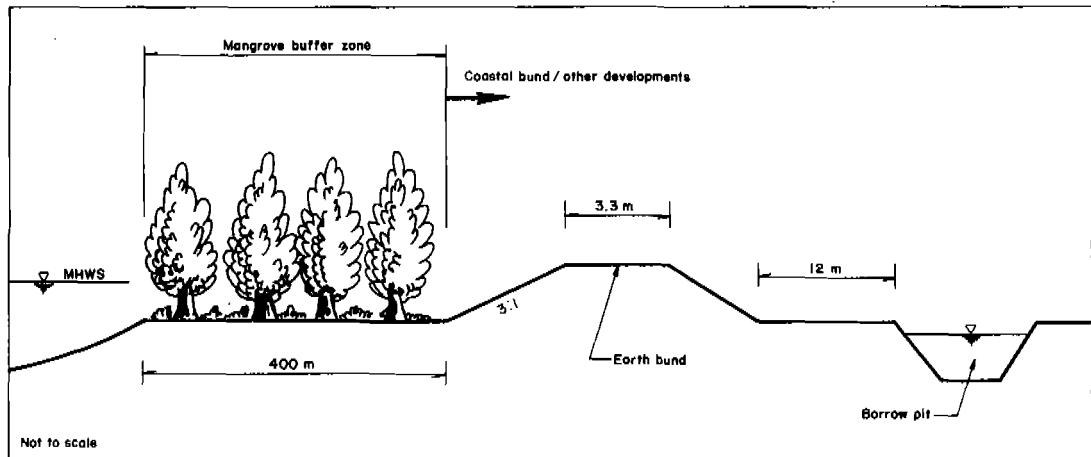


Fig. 6.2. The proposed plan for coastal erosion control management on a muddy beach (west coast).

- b. The NATMANCOM guidelines (1986) recommend a minimum coastal mangrove buffer of 100 m.
 - c. The provision of a minimum 400-m mangrove buffer is the traditional DDI design practice when reclaiming tidal swamps for agriculture.
2. For shoreline protection structures along eroding coasts:
 - a. In areas where the width of the mangrove belt exceeds 100 m, protection of the retreating scarp is recommended.
 - b. In areas where there are no mangroves or the mangrove belt width is less than 100 m, escarpment safety measures in combination with direct bund protection or bund protection alone, depending on which is cost-effective, are recommended.
 3. All coastal vegetation such as forests and mangroves should be retained to act as a natural coastal erosion control mechanism.
 4. Recommended construction setbacks from riverbanks and coasts (excluding mangroves, crenulate bays and beaches) for different types of development are as follows:

Industrial development	1,000 m
Housing development	500 m
Tourist development	100 m
Aquaculture development	100 m

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5. Recommended construction setbacks for beaches and crenulate bays are as follows:
- a. For crenulate bays, where the tangent portion is within a few degrees of deviation from the normal to the predominant wave approach angle, the construction setback from the mean high water line should be at least 60 m.
 - b. For island beaches, the minimum construction setback should be 60 m from the mean high water line.
 - c. For island beaches where development has maintained a construction setback exceeding the required 60 m, the whole beach width should be preserved. Also, all relict dune complexes should be preserved in their natural state.

Areas within crenulate bays that erode less rapidly than others should be the preferred construction locations. The other areas will probably require wider setbacks.

KEJORA is currently applying this 60-m (or 3-chain) construction setback in its planning. Short of field evidence to indicate otherwise, it is prudent to make 60 m the minimum setback while its feasibility is being investigated on a case-to-case basis.

Regular flushing through the coastal bunds, i.e., opening of the freshwater gates, will help maintain the inflow of freshwater and sediments into the mangrove ecosystem.

6. Regular flushing through the coastal bunds, i.e., opening of the freshwater gates, should be required. This will help maintain the inflow of freshwater and sediments into the mangrove ecosystem to ensure the survival of these protective forests seaward of the coastal bunds.
7. Reclamation of newly accreted areas should be prohibited. This is due to the fact that these mud coasts are highly dynamic and exhibit alternate erosion and accretion processes over time, and are therefore unstable.
8. The developer of any project along the beach should be financially responsible for any additional protective structures for the coastline that will be required in the future.
9. No beach sand mining should be permitted where beach ridges and dunes are to be preserved in their natural state.
10. For waterfront development, an open piling system for the support of jetties or other normal shore structures is recommended instead of solid barriers that interrupt littoral sediment transport. Silt curtains should be erected to contain the sediment within the construction site.
11. In critically eroding areas, immediate construction of structures for shore protection should be required.

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The implications of climatic change on coastal zone planning should be considered, particularly the risk of sea level rise and the potential need to locate new developments inland.

12. In significantly eroding areas, close monitoring of shoreline change should be required.
13. In acceptably eroding areas and other sites not covered by this zonation, monitoring of the shoreline should still be required.
14. The implications of climatic change on coastal zone planning should be considered, particularly the risk of sea level rise and the potential need to locate new developments inland.
15. In view of the projected sea level rise, the existing drainage schemes in South Johore should be evaluated and, if necessary, upgraded and reconstructed:
 - a. Coastal bunds should be enlarged and topped in stages by at least 1.5 m.
 - b. Defective hydraulic and drainage structures should be replaced and drainage systems upgraded.
16. Coastal erosion control measures should be considered in any development planning through the organized study of coastal processes and the provision of an adequate shore buffer.
17. EIA studies of coastal developments should incorporate cost-benefit analyses that compare the benefits of a proposed development against the costs incurred in undertaking control measures for the erosion it has caused. The EIA should also incorporate erosion control measures that might need to be undertaken in the future.

RECOMMENDATIONS FOR LEGAL AND INSTITUTIONAL ARRANGEMENTS

Legal Aspect

The NCECC should establish a comprehensive national policy and action plan for the control of coastal erosion. The action plan should incorporate a mechanism for the establishment of General Circular 5/1987 to ensure that all project proposals, whether on the state or federal level, will reach CECU for comments and recommendations. There is also the need to delineate the coastal zones to be covered by the circular.

The NCECC should also initiate a study that will work for an effective coordination of coastal erosion control measures and that will tell whether there is a need for a special legal instrument for this purpose.

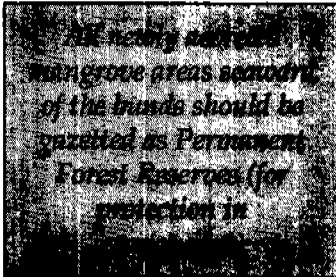
A formal mechanism should be established to ensure that the various state governments are well versed with the requirements of Section 34(A) of the Environmental Quality Act (1974), and that all project proposals falling under the prescribed activities of the 1987 Environmental Quality (Prescribed Activities) (EIA) Order are submitted, together with the required EIA reports, to DOE before being finally approved by the state authority concerned.

Section 34(A) should be amended to see to it that the approval of an EIA for a certain project in any area takes into consideration the cumulative impacts of other projects existing or being proposed in the same common coastal area.

The Land Conservation Act (1960) should be reviewed to incorporate provisions for land conservation in the coastal zone, including the requirements for coastal erosion control (e.g., beach setbacks).

Action should be taken by the state government to incorporate this plan's recommended management guidelines for coastal erosion control (particularly the mangrove buffer zones and construction setbacks for beaches/riverbanks and mangroves) in the structural plan required under Section 8(4)(a) of the Town and Country Planning Act (1976) for South Johore, and wherever appropriate in the National Land Code (1965).

It is also recommended that all newly accreted mangrove areas seaward of the bunds be gazetted as Permanent Forest Reserves (for protection in perpetuity).



Institutional Aspect

The NCECC should have all the state governments and DOE as its permanent members.

There is also a need to study the financial and manpower requirements on the state level for effective monitoring of the developer's compliance with the recommendations of CECU and with Section 34(A) of the Environmental Quality Act (1974). This is for both ongoing and new projects.

The proposed CRC should ensure that all proposals to be sited in the state's coastal zone are submitted to CECU for comments and that developers have conformed with the recommendations of the unit.

The following are recommendations for institutional arrangements:

1. The CRC should be made the coordinating body of the state coastal erosion control program, with technical assistance provided by agencies such as DDI, SEPU, DOF, DOFor, DOE, DOA, DTCP, the local councils and the regional development authorities.

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2. An environmental section should be established in SEPU to act as the technical secretariat to CRC. This section should also coordinate the use of the state's GIS.
3. The DDI should be made responsible for the technical management of the coastal erosion management plan.
4. Construction of shore protection structures for existing developments should be within the purview of DDI's activities. However, for all future developments, it must be made the responsibility of the developers.
5. A program for the regular flushing through coastal bunds (i.e., by opening the freshwater gates) should be developed through the cooperative efforts of DDI, DOFor, FRIM and DOA.
6. Massive redevelopment funds will be needed by DDI (or any relevant authority) for upgrading and reconstructing the existing drainage infrastructure and facilities to meet the impacts of the projected sea level rise. Site-specific studies should be undertaken to prepare other recommendations.
7. Coastal engineering research, either in DDI or in the universities, should be initiated to develop an adequate understanding of mud coast dynamics.

RECOMMENDATIONS FOR FURTHER RESEARCH

At the moment, there is little organized university research in mud coast dynamics. A policy statement highlighting the imperative need for a concerted research effort and for trained professional resource personnel in this field may be necessary to provide the requisite orientation.

Since this research need cuts across administrative and political boundaries, it will be appropriate for the policy statement to be issued by a central organization such as NCECC.

One of the objectives of the council is to ensure that there is sufficient upgrading of knowledge and trained personnel in the field of coastal engineering. This is the rationale for including the university sector in the council's membership.

The MOSTE should initiate this research undertaking through the Intensification of Research in Priority Areas (IRPA) program.

Research should cover these specific areas:

1. the mechanics of mud coast erosion in particular, and mud transport in coastal waters in general, to predict areas prone to erosion;

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2. the role of mangroves in enhancing the stability of mud coasts;
3. cost-effective methods of construction over soft marine clay;
4. the causal relationship between coastal bunding and mangrove mortality;
5. wave dissipation characteristics of a mangrove belt in terms of its width, stages of growth and density;
6. monitoring of biotic changes induced by rock revetments and the rate and pattern of species reestablishment;
7. effects of shoreline modification on the morphology of crenulate bays, including the proper delineation of "safe zones" that are most stable from a geomorphological standpoint;
8. periodic mapping of shoreline changes for updating the list of eroding areas and quantifying long-term shoreline changes;
9. the physical response of mud and sandy coasts to sea level rise; and
10. the appropriate policy responses to various scenarios of an accelerated sea level rise.

AREA-SPECIFIC PLANS

Critically Eroding Area in the West Coast

The National Coastal Erosion Study (EPU 1985) has identified a total length of 13.7 km of critically eroding coastline on Johore's west coast. If nothing is done in the next 25 years, erosion will lead to the loss of agriculture and village (*kampung*) land, and the damage of commercial buildings, private and public houses, fish farms and other amenities, which are estimated to have a value of about M\$39 million. Furthermore, in the event of bund breach due to erosion, about 1,050 ha of farmland will be inundated by seawater during high tide. Yields from these periodically submerged croplands will definitely plummet and continue to decrease over the years.

Maintaining an adequate construction setback from the shore for development has always been emphasized, and the need for this may be illustrated in this example. Between Tg. Piai and the Sg. Pulai Mangrove Forest Reserve is a stretch of critically eroding coastline that is threatening a large aquaculture farm. With the serious condition of the eroding area, a setback even much wider than the recommended 400 m should have been maintained. However, the construction setback was only 300 m from the shore when the ponds were initially built. To protect this farm, the bunds

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will need to be armored and maintained. Since this is a private project, the cost of this coastal erosion control measure should be shouldered by the developer rather than the government. At this time, no government support is recommended.

Project costs

The total length of the coastline in Johore's west coast that requires bund protection is 13.7 km, out of which 4.8 km have been completed at a cost of about M\$2.5 million. However, additional cost may be needed for the structural upgrading of these rock bunds, which may be required as part of the maintenance program.

The proposed revetment with a typical cross-section, as shown in Fig. 6.3, costs about M\$1,600/m. Hence, a total of M\$14.24 million is required for the balance of 8.9 km of eroding coast with a construction period that may spread over five years. Based on the scouring rate at a nearby site, the existing revetment may need to be upgraded in ten years' time, the cost of which is assumed to be M\$1,000/m. The total revetment cost is then the sum of the capital construction cost of armoring existing earth bunds and the cost of upgrading the existing revetment.

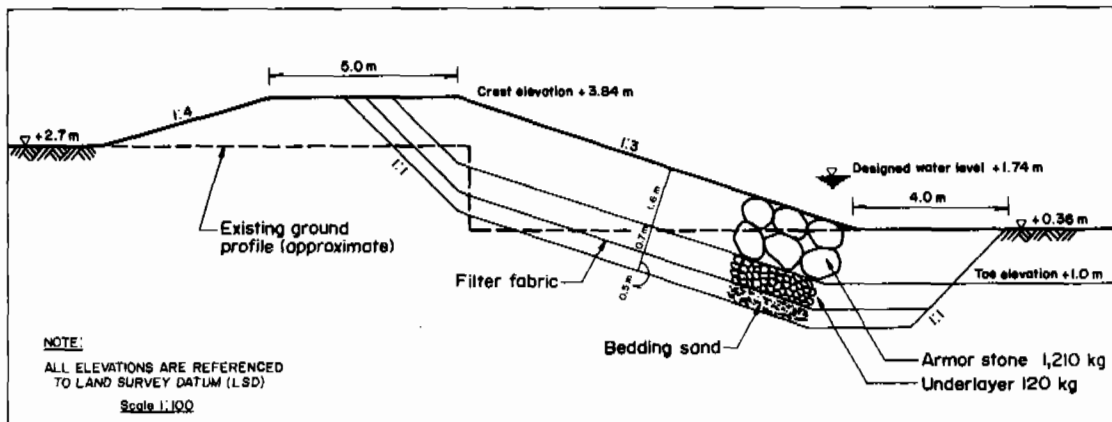


Fig. 6.3. A cross-section of a rock revetment for direct bund protection. ..

Additional funds will be necessary in the future for improving the protective infrastructure for the coast against the impact of the projected sea level rise. The DDI should work toward assessing these costs for future planning.

Cost-benefit analysis

The benefits accruing from the construction of the bund protection revetments along the 13.7-km coastline will amount to M\$17.84 million in 5 years, M\$25.87 million in 10 years, and M\$38.76 million in 25 years. This gives a present value of M\$17.73 million at a discount rate of 8%. The capital cost to protect 8.9 km of coastline is estimated at M\$14.24 million spread over the first 5 years, and upgrading cost for the existing revetment totalling M\$4.8 million will be required after 10 years. In addition, a sum of M\$2.5 million has been spent in constructing a 4.8 km-long existing revetment. The total present value of all costs is then M\$14.42 million, at the same discount rate of 8%. Therefore, the benefit-cost ratio of the project is 1.23 at the discount rate of 8%. Funding for continuing these west coast projects has already been budgeted, but additional financial resources will be needed for upgrading purposes. This should be sought under the Sixth Malaysian Plan.

Critically Eroding Area In the East Coast

On the east coast, a stretch of shoreline in the Desaru area has been identified as critically eroding, but currently, only monitoring is being done since there is little construction on land. However, the erosion potential at Desaru should be taken into account in the area's coastal erosion control planning for development, such as the proposed Desaru International Resort. No construction should be allowed in the critically eroding sites unless the setback is adequate to protect the development for the entire duration of its operations. A 60-m setback or more (if the beach is wider) should be required (Fig. 6.4). Since the Desaru International Resort is planning construction along many different areas of the crenulate bay, some of these areas will certainly be eroding more rapidly and therefore should have a much greater setback. The construction of jetties, marinas and shore breaks should be evaluated in terms of their potential impact on coastal erosion. All expenses for this assessment should be borne by the private developer. EIAs should also be made mandatory for all projects to be sited along critically eroding coastlines.

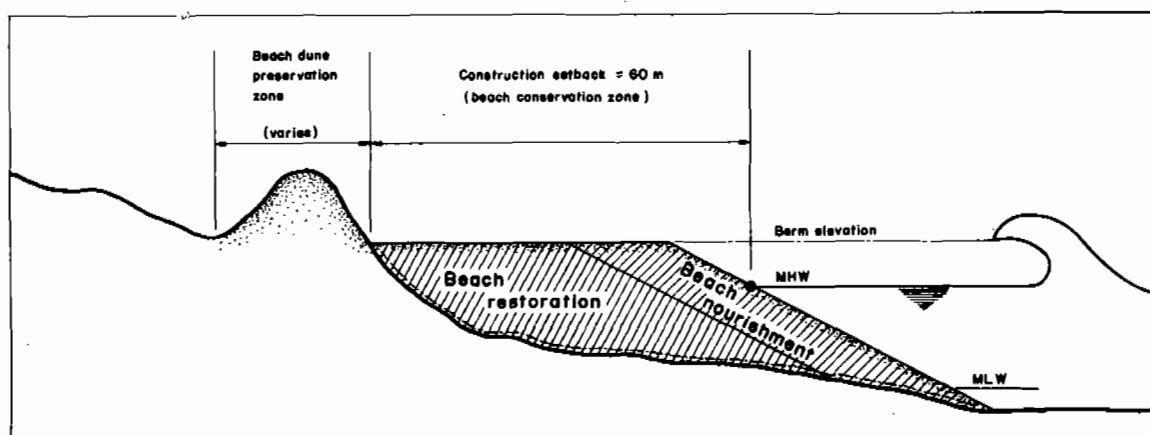


Fig. 6.4. The proposed plan for coastal erosion control management on a sandy beach (east coast).

MANAGEMENT PLAN FOR WATER QUALITY AND LAND USE

INTRODUCTION

One factor critical to a healthy environment is water quality, which is affected by land- as well as water-based activities. Management of water quality should take into account the land use pattern of the whole river basin. Impacts of any uncontrolled development on one part of a river basin can affect or even preclude another activity downstream, thus causing not only environmental degradation but also economic loss. If a development is incompatible with the surrounding land use, the costs for mitigating measures or rehabilitative actions could be prohibitive.

Current Status

The analysis of the current status of land use patterns is based on Kam (1989), while that of water quality in South Johore, on Koh (1989) and Lim (1989).

The nine major basins of the rivers flowing into the coastal zone of South Johore (Fig. 7.1) cover a total area of 733,613 ha (Table 7.1).

The 1974 land use pattern of South Johore (Fig. A.5) shows that much of the western portion was under agricultural use, mainly in small holdings of several crops, namely: rubber, oil palm, coconut, pineapple and sugarcane. The forest areas, which account for 35% of South Johore, were confined to the eastern and upper parts of the Johore and Sedili Besar river basins. However, from 1974 to 1986, 57% of this forested area had been cleared for agriculture under land development schemes.

The changes in land use in South Johore over the past decade and a half have been both rapid and extensive. The present land use pattern may be characterized by:

1. Small-scale agriculture of a more mixed nature in the west. There is not much forest land remaining for agricultural expansion. In fact, the mangrove strip along the west coast that has already been reduced by bunds is pushed seaward to reclaim more land for agriculture. The west coast is also more densely populated, supporting many agro-based industries such as rubber and palm oil processing, as well as animal husbandry.

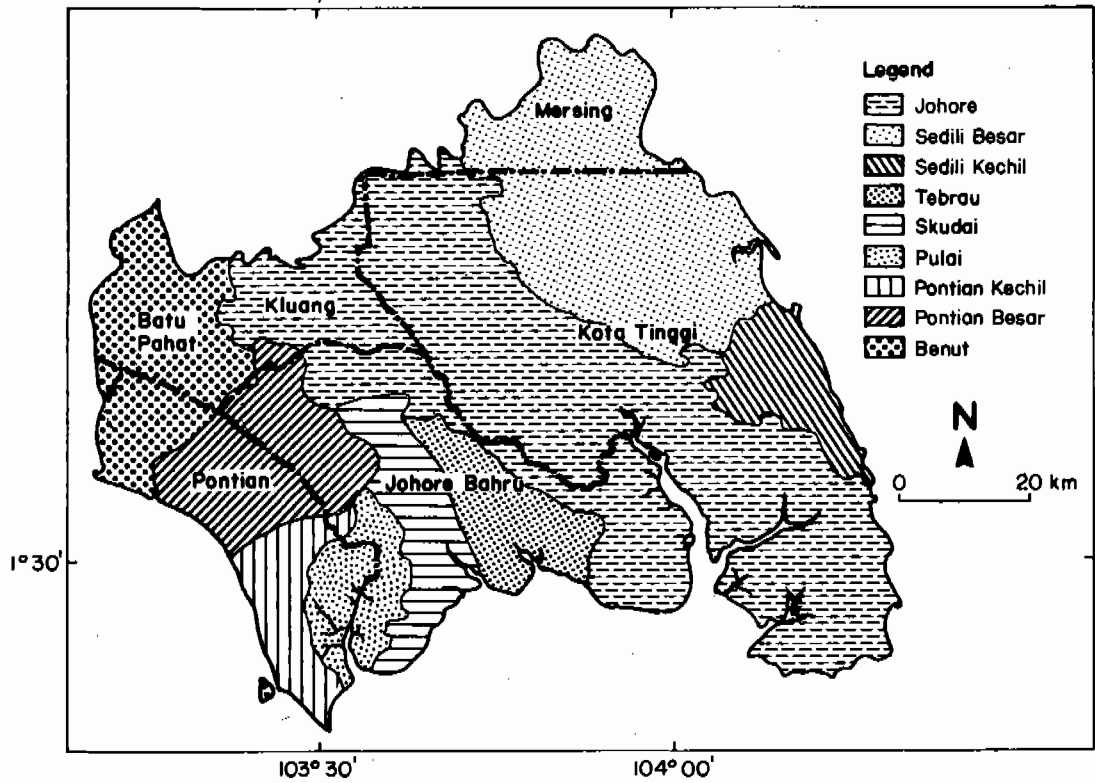


Fig. 7.1. The river basins of South Johore.

Table 7.1. The river basins of South Johore, 1986.

Benut	67,016	9.1
Pontian Besar	59,526	8.1
Pontian Kechil	28,458	3.9
Pulai	29,554	4.0
Skudai	36,593	5.0
Tebrau	35,572	4.8
Johore	309,210	42.2
Sedili Kechil	30,879	4.2
Sedili Besar	136,805	18.7

2. Expanding large-scale plantations, mainly of oil palm, in the east. The utilization of land for agricultural land development schemes has been progressing from the interior toward the coast and has caused the dwindling of the strip of coastal forest land, particularly in the Sedili Kechil river basin.
3. Rapid urbanization in the south, radiating northward and eastward from Johore Bahru. This includes the expansion of residential and industrial land uses at the expense of agricultural land, mainly rubber, in the vicinity of the Johore Bahru-Skudai, Johore Bahru-Kota Tinggi and Johore Bahru-Masai axes. The loss of mangroves in the Pasir Gudang area has also resulted from this increased land use due to urbanization.
4. Intensified development of recreational areas along the coast close to Johore Bahru, and more extensively in Desaru along the east coast as well as on the offshore islands.

This expanded land use of different economic activities has caused significant pollution in the region. The main point pollution sources are (Fig. 7.2):

1. domestic waste from urban areas;
2. agro-based wastes from palm oil mills, and rubber and pineapple factories;
3. industrial wastes from factories and industrial estates; and
4. animal waste from stock farms.

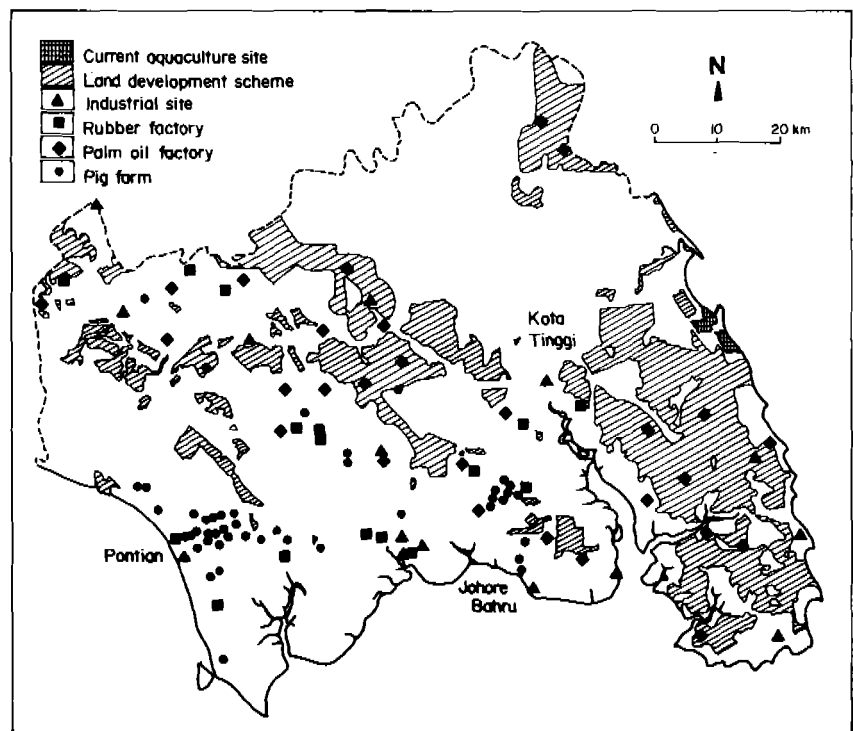
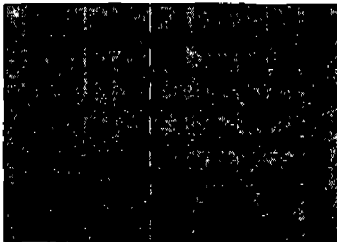


Fig. 7.2. Point pollution sources in South Johore, 1986.

Chapter 7. Management Plan for Water Quality and Land Use

The nonpoint or diffused pollution sources in the region include runoff from urban areas and uncontrolled land development.

Organic wastes are the most significant pollutants of inland waters from point pollution sources. Nonpoint sources contribute to an increase in the levels of sediment and trace metals in the rivers and coastal waters.

An assessment of the water quality of individual rivers in 1987 shows that most of the river stretches can be classified as "good" and "medium" based on the general water quality index categories (Table 7.2). Only the middle stretch of Sg. Air Baloi and the downstream stretch of Sg. Skudai belong to the "bad" category. The water quality of Sg. Tebrau, Sg. Johore and Sg. Sedili Besar are consistently better than that of Sg. Benut, Sg. Pontian Besar, Sg. Pontian Kechil and Sg. Skudai from 1985 to 1987.

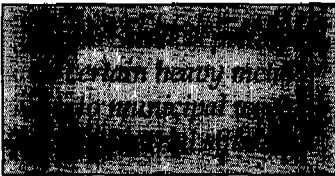
The coastal waters receive pollutants directly through discharges from coastal activities, and indirectly, through discharges from upstream activities. In South Johore, the coastal water quality monitoring is based on microbial indicator systems, specifically the one that determines the acceptable FC level of a body of water for its current and future beneficial uses. A study conducted from 1985 to 1987 showed a decrease in FC levels along most of the coast (Table 7.3).

The heavy metal concentration in Johore Strait is shown in Table 7.4. The copper (Cu) and nickel (Ni) concentration levels are within the levels of unpolluted seawater, while those of lead (Pb) and zinc (Zc) are much higher by unpolluted seawater standards. Overall concentration levels of these heavy metals, including cadmium (Cd), are higher in the strait than those in the Juru estuary and Batu Maung of Penang, both of which are known to receive industrial effluents, and municipal and pig wastes (Table 7.5).

There is a buildup of trace metals such as Pb, Cu, Zn and mercury (Hg) in sediments near the causeway due to the limited tidal flushing action in that area (Table 7.6). The mean concentrations of Cu, Zn, Ni and Cd here are comparable to the mean values found in other polluted estuaries (Table 7.7). It was thus concluded that Johore Strait is polluted by selected heavy metals due to municipal wastes and industrial effluents.

Without having a baseline figure for the presence of these metals before industrialization or rapid population growth in the area, it is difficult to assess the historical trends in the levels of contamination of these waters. In addition, the specific point sources of these heavy metals are difficult to locate.

The Johore Strait, on the whole, has a relatively low suspended sediment (SS) load. At Pasir Gudang, there is no increase in the amount of oil and grease detected in the water. However, the available data do not distinguish between types of oil and grease, such as motor oil, diesel, gas, oil sludge, palm oil or other edible oils. In Malacca Strait and in Johore Strait off Tg. Piai, periodic oil spills are reported.



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Table 7.2. River sections requiring improvement of water quality, South Johore.

Benut	Upstream of SNO 1833603	I	II
	Between SNO 1833602 / 1833605 and 1732606	II	III
	Downstream of SNO 1632601	III	V
Air Baloi	Upstream of SNO 1633603	I	IV
	Between SNO 1633603 and 1633602	II	V
Pontian Besar	Upstream of SNO 1534605	I	IV
	Between SNO 1534606 and 1534604	II	IV
	Downstream of SNO 1534604	II	IV
Pontian Kechil	Downstream of SNO 1534605	II	V
	Upstream of SNO 1534603	I	II
Pontian Kechil	Between SNO 1534603 and 1434602	II	III
	Upstream of SNO 1534603	I	II
Skudai	Between SNO 1536609 and 1536610	III	V
Tributaries of Sg. Johore			
Temon	Upstream of SNO 1640601	II	III
	Downstream of SNO 1640601	III	IV
Berangan	Upstream of SNO 1638611	II	IV
	Downstream of SNO 1638611	III	V
Remis	Upstream of SNO 1835611	I	II
Sebol	Upstream of SNO 1836601	I	II
Johore	Between SNO 1834609/ 1835611 and 1739604	II	III
Sedili Besar	Upstream of SNO 1840602	I	II
	Upstream of SNO 1839604	I	II
	Between SNO 1839604 and 1941601	II and V	III

^a Water quality index ratings:

- I - Excellent
- II - Good
- III - Medium
- IV - Bad
- V - Very bad

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Table 7.3. Mean FC levels in the coastal waters of South Johore.

Luar Pantai Kukup (L)	1334925	3.0×10^0	3.8×10^1	3.0×10^0
Kuala Sg. Melayu (A)	1437946	1.5×10^2	4.7×10^1	4.3×10^1
Kuala Sg. Skudai (B)	1437922	4.0×10^3	3.2×10^3	6.9×10^2
Pantai Lido (C)	1437921	2.2×10^4	9.8×10^2	6.5×10^2
Hospital (D)	1437920	7.3×10^3	6.9×10^3	6.6×10^3
Kuala Sg. Segget (E)	1437919	1.2×10^4	1.5×10^4	1.3×10^4
Tunku Ismail Power Station (F)	1437951	6.8×10^2	5.5×10^2	3.5×10^2
Kuala Sg. Tebrau (G)	1438943	2.9×10^2	3.4×10^3	8.4×10^2
Kuala Sg. Masai (H)	1438918	2.8×10^1	3.4×10^2	7.0×10^1
Pasir Gudang (I)	1438939	1.6×10^2	1.1×10^3	7.4×10^2
Kuala Sg. Johore (J)	1440916	5.0×10^0	7.0×10^0	4.0×10^0
Pantai Desaru (P)	1542914	1.7×10^1	1.4×10^2	0
Teluk Mahkota (T)	1841911	-	2.5×10^1	1.0×10^2

^aWQMS - water quality monitoring station.

Source: Statistics from DOE.

Table 7.4. Mean concentrations of heavy metals ($\mu\text{g/l}$) in the coastal waters of South Johore.

Kuala Sg. Melayu	1437946	3.9	2.5	40	4.0	0.9	0.1
Kuala Sg. Skudai	1437922	3.8	2.6	26	4.2	0.7	<0.1
Pantai Lido	1437921	3.3	2.9	40	4.3	0.7	0.1
Hospital	1437920	4.0	3.0	86	4.0	0.8	<0.1
Kuala Sg. Segget	1437919	3.7	2.7	66	4.2	0.7	0.1
Tunku Ismail Power Station	1437951	4.6	2.7	58	4.9	0.9	<0.1
Kuala Sg. Tebrau	1437943	4.8	2.7	34	4.6	0.9	<0.1
Kuala Sg. Masai	1437918	4.1	2.9	66	5.2	0.9	<0.1
Pasir Gudang	1437939	3.9	2.5	21	5.2	0.9	<0.1
Kuala Sg. Johore	1437916	3.9	1.9	39	4.2	0.9	<0.1

Table 7.5. A comparison of heavy metal concentrations ($\mu\text{g/l}$) in different coastal waters.

Metal	National seawater standard	Drinking seawater standards	Body of water					
			Jaya estuary, Penang	Batu Lintang Penang	Kuala estuary, Penang	Johore Straits	Selangor Penang Strait	Malacca
Pb	0.03	50	2.0-2.8	3.0-4.1	2.9-6.0	3.3-4.8	1.5-4.1	2.1-11.4
Cu	3.0	100	0.6-0.8	0.8-1.4	1.7-2.7	1.9-3.0	2.2-4.2	0.8-31.2
Zn	10.0	1,000	4.0-10.6	17-46	15-490	21-86	11.0-22.0	1.0-256.0
Ni	0.7-7.0	100	1.6-1.8	1.3-2.0	2.3-2.4	4.0-5.2	1.9-3.6	2.0-5.4
Cd	0.11	100	0.6-0.8	0.4-1.1	N.D. ^a -1.9	0.7-0.9	0.31-1.48	0.6-2.9
Hg	-	-	-	-	N.D.	<0.1-0.1	-	-

^aN.D. - not detectable.

Table 7.6. Mean concentrations ($\mu\text{g/g}$ dry wt) of heavy metals in surface sediments, South Johore.

Location	Station	Pb	Cu	Zn	Ni	Cd	Hg
Kuala Sg. Melayu	1437946	34	16	102	33	1.0	0.20
Kuala Sg. Skudai	1437922	40	22	148	38	2.7	0.30
Pantai Lido	1437921	41	25	149	42	2.8	0.30
Hospital	1437920	42	25	142	29	2.6	0.45
Kuala Sg. Segget	1437919	128	50	470	36	2.4	1.00
Tunku Ismail Power Station	1437951	68	49	208	57	2.8	0.40
Kuala Sg. Tebrau	1437943	33	23	163	22	1.0	0.20
Kuala Sg. Masai	1437918	49	52	204	44	2.7	0.25
Pasir Gudang	1437939	87	47	151	36	3.0	0.20
Kuala Sg. Johore	1437916	37	13	123	35	1.8	0.20

Source: DOE.

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Table 7.7. A comparison of heavy metal concentrations ($\mu\text{g/g}$ dry wt) in sediments collected in various marine areas of the world.

	Heavy metal					
	Pb	Cd	Zn	Ni	Cu	Hg
Johore Strait	56 (33-128)	32 (13-52)	186 (102-470)	37 (22-57)	2.3 (1-3)	0.35 (0.20-1.00)
Juru estuary, Penang	28 (21-33)	12 (9-14)	91 (74-110)	38 (25-47)	2.1 (N.D.-6.8)	- -
Batu Maung, Penang	59 (45-82)	23 (13-38)	357 (113-1,217)	20 (15-25)	2.7 (2.2-3.3)	- -
Chao Phrya estuary, Thailand	140(\pm 28)	26(\pm 10)	71(\pm 6.9)	-	1.20(\pm 0.5)	-
St. John Harbour, Canada Inner Harbour	24.3 (6.3-66.8)	15.9 (5.8-40.7)	53.3 (23.6-106)	16.3 (5.2-40.0)	0.16 (0.01-0.61)	0.05 (0.01-0.3)
Outer Harbour	21.9 (16.8-30.4)	15.1 (7.7-106)	69.2 (29.2-442)	- -	0.08 (0.01-0.40)	0.03 (0.01-0.09)
Severn estuary, U.K.	119	38	280	36	-	-

ND - not detectable.

Note: Values in parentheses are ranges.

MANAGEMENT ISSUES AND PROBLEMS

Cost of Maintaining/ Reinstating Good Water Quality

There is no doubt about the economic value of nonpolluted waters. However, its use for waste disposal is viewed as a free good that anyone can easily avail of. No industry or municipality pays to dump wastes in waterways since it is considered a public resource. Hence, dealing with the problem of deteriorating water quality becomes a public burden, without any financial accountability on the part of those who have individually or collectively, and directly or indirectly, caused it.

The cost of cleaning up a river or any other waterway depends on the extent of the pollution problem, the amount and type of pollutants to be reduced, and the number and type of pollution sources. Some heavily contaminated waterways that are being revitalized are the Singapore and Thames Rivers, and Lake Erie. Each requires the following:

1. significant financial investment;
2. removal and relocation of pollutive sources;
3. strict regulations and their enforcement;
4. public support and political will; and
5. the cooperative efforts of the local, state and federal governments, and the local communities.

Nonpoint Pollution Sources

Land development

Land development that did not adhere to appropriate erosion preventive measures has resulted in increased sediment loads in rivers, causing more turbidity and siltation. Forests that are protected as water catchment areas continue to be alienated and converted into other uses. This reduces the ability of the area to collect, retain and filter water, therefore causing more soil erosion, flooding and sediment loading.

Agriculture

Agricultural activities can cause soil erosion and runoff, which contribute to the SS problem of the rivers. In addition, the increasing use of pesticides results in pesticide residues being washed into inland and coastal waters.

The potential impact of pesticide runoff has intensified due to the:

1. overapplication of pesticides;
2. use of banned pesticides, especially Polidon and Molithol, due to lack of enforcement of laws against smuggling these from neighboring countries, such as Thailand; and
3. the reckless use, handling, storage and disposal of these pesticides by farmers, which may be caused by the lack of public awareness of their effects on the environment.

Point Pollution Sources

Domestic sewage

Domestic sewage is the biggest contributor to the water quality problem in South Johore, which has worsened with the continuing population growth in the coastal area. This has caused not only an increase in human waste discharge, but also in the household and commercial use of toxic compounds, such as insecticides and detergents.

The inadequacy of the existing sewage treatment systems in Johore Bahru and other urban centers does nothing to alleviate the problem. Only 12% of the populated area is connected to a sewer system. Thus, almost all the sullage wastes are discharged directly into the watercourses. In the case of Johore Bahru and its surrounding area, all of the discharged wastes eventually reach Johore Strait, placing great stress on the strait and rivers.

The sewerage treatment systems are inadequate because of the:

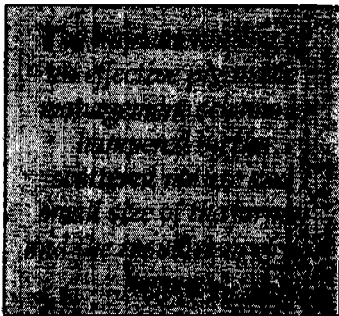
1. lack of public and government awareness about the seriousness of the water quality problem and the importance of good water quality;
2. insufficient financial resources being allocated for the construction of a sewerage system or for sewage treatment; and
3. rapid economic growth leading to an accelerated population increase, which has caused more illegal settlements that do not own sewage treatment facilities.

Animal wastes

Pig farming is considered to be the most important agricultural activity in the animal husbandry sector of the state. However, with the exception of some overloaded holding ponds for solid waste retention, disposal of pig waste is done in the receiving watercourses without being properly treated. This has caused a very serious organic pollution problem in these waters. Downstream aquaculture operations on Sg. Gelang Patah have also been adversely affected by this pollution. According to DOE (1988), pig waste now ranks second to domestic sewage in its contribution to the total BOD load discharged into rivers (26% of the total).

Three features of pig farming have hampered the implementation of an effective pig waste management scheme:

1. the scattered nature of the farms, which is not conducive to the installation of centralized treatment facilities;
2. the relatively small size of most of the farms, which has made the setting up of individual waste treatment facilities economically nonviable; and
3. the insular nature of pig farmers, which makes them unreceptive to alternative technology in pig farming.



Industrial wastes

The DOE (1988) has estimated that the industrial effluents' contribution to the total organic load discharged into the rivers amounts to 16.9%. This figure probably includes the waste discharged from the Pasir Gudang industrial estate. In terms of waste load, it is estimated that Pasir Gudang generated more than 20 times the combined BOD load from all the industrial estates located in the Skudai valley. Among the various types of industrial facilities, the palm oil refineries are the single most important generator of BOD loads (Bumi-Watson 1982).

Sg. Segget is, as has already been described, the most severely polluted of all the rivers flowing into Johore Strait. An Envilab (1985) report states that the upstream catchment area of this river receives wastes from industries such as: textile and garments; textile dyeing; softdrink bottling; rubber works; and insecticide refilling.

The report identifies the problems created by these industries and recommends solutions, such as the pretreatment of wastewater from the textile dyeing operation; the study of the effluent characteristics of the softdrink bottling plant; determination of the types of pretreatment to be used; and the installment of grills or traps to prevent solid waste from being carried along the river.

The industrial expansion in South Johore in the next years will mean an increase in the demand for water to sustain such activities as transportation, processing and waste disposal. The proposed site of the 2,400-ha petrochemical industrial estate at Tg. Langsat, for instance, is the Sg. Johore estuary, where there exist a significant capture fishery, aquaculture development, some mangrove reserves and various tourism resources. There is a large tract licensed for sand mining in the estuary. The proposed development of the petrochemical plant, which will be using or producing very hazardous and persistent chemicals, will put at risk millions of dollars in investment in aquaculture and tourism, many valuable natural resources and the people's livelihood.

A great deal of solid waste is disposed directly into open drains or waterways. Most *kampong* and small towns have inadequate waste collection programs. Even in the cities, the municipal waste collection system does not cover all areas, particularly the urban squatter communities. All of these problems will worsen with the projected population growth.

Proper siting and maintenance of sanitary landfills are also problems faced by large cities and small towns alike. Construction of these landfills requires a lining to control the leaching of hazardous materials into the groundwater, while an even more effective system includes treatment for the leachate. These features, however, are very expensive to install. Currently, the federal and state governments do not provide financial assistance to communities for such operations, thus the inadequacy of these sanitary structures.

Sand mining

Indiscriminate riverine and land-based mining of sand contributes to the increasing turbidity of the inland waters, adversely affecting fisheries and aquaculture in Sg. Lebam and Sg. Silong. In addition, the dredged sediment is contaminated with heavy metals that have been brought up and resuspended in the water by the dredging. This increases the risk of heavy metal contamination of fish, shellfish and humans.

Shipping activities

All shipping has its risks of accidental pollution, but the greatest concern is that from hazardous cargoes, such as petroleum and chemicals. There is currently a problem with vessel discharges in Malacca Strait as well as in Johore Strait, especially along Tg. Piai and in the vicinity of the industrial port of Tuas in Singapore, where there is a shipbuilding and refurbishing industry. The periodic oil spills are suspected to be from ships cleaning their tanks of sludge or changing their engine oil. Over the last few years, ship collisions causing spillage of oil into the sea have occurred. Currently, enforcement of marine pollution regulations in international waters is very difficult.

LEGAL AND INSTITUTIONAL ISSUES

Legal Aspect

Six main laws relate directly to water quality control. Four of these come under the jurisdiction of the local government: The Local Government Act (1976), together with the Disposal of Rubbish Enactment; the Street, Drainage and Building Act (1974); the Land Conservation Act (1960, revised 1989); and the Town and Country Planning Act (1976). At the federal level, the Environmental Quality Act (1974) and the Exclusive Economic Zone Act (1984) are both administered by DOE, the latter only with respect to the provisions on the protection and preservation of the marine environment.

Several other federal and state laws are also relevant in some way to the control of water quality in Malaysia. These include the:

- Mining Enactment No. 69;
- National Land Code (1965);
- National Forestry Act (1974) (State Enactment 1985);
- Water Enactment No. 66;
- Animal Ordinance (1953);
- Fisheries Act (1985) (State Enactment 1985);
- Irrigation Areas Ordinance 31 (1953);
- Rearing of Pigs Enactment (1975); and
- River Constructions Enactment No. 46.

Town and Country Planning Act (1976)

This Act specifically incorporates conservation and environmental protection concepts within its objectives. However, in its by-laws and subsequent provisions, the objectives of such concepts are completely absent. Therefore, although Section 18 of the Act stipulates that no person shall use any land or building in a manner that is not in accordance with the development plan of the local authority, and Section 22 stipulates that any development should first receive the approval of the local authority, the dimensions of environmental protection and conservation are not addressed.

The Local Government Act (1976)

The Local Government Act (1976) is narrow in its scope with respect to environmental considerations. It provides the local authority with control over any activity that affects the health, property or safety of the community, but not the environment. The provisions with respect to the control of pollution in streams and to food, markets, sanitation and nuisance pertain only to the disposal of common domestic waste and filth. The proper storage and disposal of toxic materials and oil wastes, for instance, are not specifically covered by the Act.

Provisions 69 and 70 prohibit any discharge or deposition of liquid or solid refuse on riverbanks, waterways and drains. In addition to imprisonment and the imposition of fines, penalties include the shouldering of costs incurred in clearing up the pollution by the offender, as stated in Provision 71. The quantum of fines imposed, however, is not sufficient to act as a deterrent to future violators. Moreover, the law is very loosely applied in most cases, resulting in the blatant pollutive acts on rivers not only by the local community but also by the local authority.

The Street, Drainage and Building Act (1974)

Like the above laws, the Street, Drainage and Building Act (1974) was established solely to properly control sanitary conditions, and to ensure public safety, convenience and health via the regulation of street, drainage and building works. The Act also provides for the proper maintenance of these facilities. Section 51 empowers the local authority to build and maintain sewerage systems and recover their costs by charging appropriate fees. The law also prohibits the discharge of soil waste in sewers and drains without permission.

Section 70A of the Act allows the local authority to make by-laws to govern earthworks. No guidelines, however, are given for the establishment of these by-laws.

The Environmental Quality Act (1974)

This Act is a comprehensive piece of federal legislation covering all types of environmental protection measures to be imposed on any activity, with the **main objective of enhancing the general quality of the environment**. The agency specifically responsible for the management of water quality is DOE, under MOSTE. The following legislative rules specify its jurisdiction:

1. 1987 Environmental Quality (Prescribed Activities) (EIA) Order, enforced on 1 April 1988;

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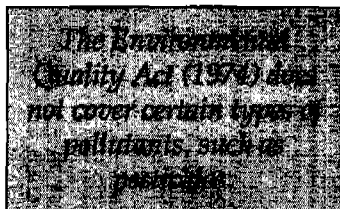
2. Environmental Quality (Sewage and Industrial Effluents) Regulations (1979), enforced on 1 January 1979 for new factories, and on 1 January 1981, for existing factories;
3. 1977 Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations, enforced on 1 July 1978;
4. 1979 Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations, enforced on 1 April 1979; and
5. Toxic Waste Regulations (1989), specifically:
 - a. Environmental Quality (Scheduled Wastes) Regulations, enforced on 1 May 1989;
 - b. Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Order, enforced on 1 May 1989; and
 - c. Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Regulations, enforced on 1 May 1989.

Under Section 21 of the Act, the Minister of MOSTE can specify acceptable conditions for the emission of wastes into any inland or coastal waters. All waste discharges contravening such conditions are prohibited, except those having licenses issued by DOE. The Environmental Quality Order (1987) specifies prescribed activities for which EIAs are required. The other regulations set standards for the discharge of sewage, industrial effluents from palm oil and rubber processing, and toxic wastes.

The Environmental Quality Act (1974), however, does not cover certain types of pollutants, such as pesticides.

The pig-rearing industry is classified as a "backyard agricultural venture" as opposed to being an "agro-based" industry, as are rubber and palm oil processing. As such, the pig farms are outside the jurisdiction of the Environmental Quality Act (Sewage and Industrial Effluent Regulations) (1979), which DOE enforces.

Toxic wastes were only just recently included in the subsidiary legislation of the Act. To date, DOE has been using the Interim National Water Quality Standards (INWQS). The enforceability of these interim standards is not defined in the Act and is therefore uncertain. Another problem is that these are effluent, and not water quality, standards. Hence, it is possible for all factories to comply with these measures and yet, the total levels in the environment would still be unacceptable when all the discharges are added up. In addition, the water quality standards for recreational uses in marine waters or for aquaculture are not yet established.



Another problem with the Act is that environmental considerations in programs and policies on the state level have not been made legally mandatory, although these are defined as an objective of the Town and Country Planning Act (1974). Neither are these environmental concerns incorporated in the subsequent provisions of the Act, or for that matter, in any of the local government laws and by-laws pertaining to the use and development of land. Control of pollution and the protection of the environment are found only on the individual project level, through the enforcement of the EIA requirement for specific projects.

Environmental protection is not reflected in any of the criteria used in the planning of land development schemes.

Environmental protection, therefore, is not reflected in any of the criteria used in the planning of land development schemes, and in the implementation of industrialization policies and regional development plans and the like on either the state or federal level. Although DOE has published classification guidelines for the siting and zoning of industries to assist in planning and policy implementation, there is no urgency in using these.

Because planning on the macrolevel does not take into account environmental considerations and EIAs are required only on the project level, it is possible that environmental conflicts would still occur even if these assessments were conducted for individual projects. In the preliminary screening for the establishment of new industries, the applicant is required to identify the land use and surrounding infrastructure of the site within a radius determined by DOE, depending on the type of industry. Nonetheless, at a larger scale of planning, such as evaluating the downstream effects of a development on a river or coastline, conflicts can still arise.

The Land Conservation Act (1960, Revised 1989)

The Land Conservation Act (1960, revised 1989) provides for the conservation of hill land, the protection of soil from erosion and the prevention of soil runoff into rivers. As stated in Chapter 6, the state authority has not seen it fit to impose the requirements of this law on the use and development of land. Moreover, the Act pertains more to hills and inland areas than the coastal zone.

The Exclusive Economic Zone Act (1984)

The Exclusive Economic Zone Act (1984) has jurisdiction over the protection and preservation of the marine environment in waters beyond the 12-mile territorial limit. Since pollution in the sea could be very widespread, the enforcement of this Act would be required for the preservation of the quality of the waters in the coastal zone. Under the Act, it is an offense for any vessel, land-based source, installation, device or aircraft to discharge oil, oil

mixtures or pollutants into the Exclusive Economic Zone of Malaysia. The government is also permitted to enforce measures to contain any maritime casualty that threatens to pollute or is already polluting Malaysia's coastline. The government can also take action to mitigate the damage or threat of damage posed by any polluting discharge. It has the power to detain vessels guilty of discharging pollutants, as provided in the Act.

Institutional Aspect

Manpower in EIA preparation and review

The EIA process is new and may serve its purpose adequately for certain projects. However, without much history of implementation, it is difficult to judge its effectiveness, which would depend on a number of factors. These include the availability of adequate and competently trained manpower, both in the private and government sectors, to prepare and analyze the assessments. There have been several cases wherein the preliminary EIAs submitted were observed to be very cursory due probably to the lack of competent personnel to evaluate them.

For a review of an EIA on the federal government level, an ad hoc panel is assembled by DOE from the relevant agencies and universities representing different disciplines. Because this is an ad hoc panel, the members may not always be qualified to review the EIA reports. Furthermore, key agencies are sometimes inadvertently left out of the panel due to oversight and the short time frame given for review. There is also a lack of trained individuals to assess the violation of conditions attached to approved proposals.

Legal channel for the submission of proposals to DOE

There is no official channel established either legally or administratively to ensure that all project proposals required to submit EIAs to DOE actually do so. This has resulted in several cases of noncompliance to this requirement by the state government and the private sector, whether through ignorance or otherwise. In the latter cases, there were instances of land alienation by the state government for a proposed project even though the EIA requirements had not been met. This type of action imposes a pressure on DOE to approve the proposal.

Interagency liaison for integrated planning and management

The land- and resource-use conflicts discussed above result from the lack of integration of the sectoral plans for different land, river and marine resources. This involves decisions about resource use and industrial development.

For example, SIDC, which has members from SEC, is the decisionmaking body in the issuance of permits for major land development projects. The SEPU is the secretariat for this committee. For some projects, SDLM operates

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as the coordinator and seeks advisory inputs from relevant agencies such as DOF, DOFor, DDI, DOWW and others. As stated earlier, very little time is given to the said agencies to make their evaluation. There is also limited interagency discussion and interaction, with most of the comments given by correspondence. Despite the meetings regularly held by DOE to discuss all the comments of the reviewers, the latter do not receive any feedback regarding the applications that have been approved, the conditions attached to the approval, or whether the developer has met the conditions before being allowed to go on with operation. Without knowledge of these accompanying conditions, it is impossible to monitor and enforce compliance to these.

Pollution from ships and port facilities

Three matters should be discussed regarding the legal and institutional aspects of the enforcement of measures to control pollution from ships and port facilities:

1. the capability of the oil spill contingency plan to be operational, which is the most pressing concern;
2. the need for an emergency response plan (at the Johore Port) for chemicals in addition to oil; and
3. the need to adopt the provisions of Annexes I and II of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).

Water catchment management

The excision of forests from water catchment areas is subject to the decision of SNRC, with advice from the relevant agencies, including DOFor and DOWW. However, the state does not have a clear policy on the maintenance of water catchment areas under forest cover. A comprehensive water catchment management program is thus needed. The protection of forests in the water catchment areas has already been addressed in Chapter 2 (Management Plan for Coastal Forests).

Soil erosion management

Although the federal government categorizes coastal erosion as a national priority, the coordination between and within the state and federal governments to address the problem has yet to be established on a sound basis. Within the state, no single agency is authorized to plan and coordinate soil erosion management. (See Chapter 6 for the institutional issues in soil erosion management.)

Municipal waste management

Despite the power given the authority concerned by the Town and Country Planning Act (1976), the Local Government Act (1976), the Street, Drainage and Building Act (1974) and the Land Conservation Act (1960, revised 1989) to control water pollution from domestic waste and filth, effective sewage treatment systems, soil erosion control management or municipal waste collection and management programs are nonexistent. The main reason for this is the lack of money and expertise to deal with the issue.

MANAGEMENT GOAL AND OBJECTIVES

The goal of water quality and land use management is to preserve and improve the environmental conditions in South Johore, specifically the quality of inland and coastal waters, through integrated land and resource use planning.

Its objectives are to:

- classify the water quality of the waterways and identify areas that are in critical need of action to improve water quality;
- identify the causes of the pollution problem and develop action plans for the development, maintenance and enforcement of a water quality improvement program (in most critical areas, domestic sewage and soil erosion runoff from uncontrolled land development should be addressed first);
- identify the compatible uses for each river basin in spatial relationship with each other, given current land use patterns and water quality, and the various potential uses of present resources; and
- establish a public education program to raise the people's awareness of the importance of water quality and the responsibility of each individual to help maintain it.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

Rivers

All rivers in South Johore should be classified based on the INWQS. Rivers are rated to determine the priority areas that require immediate action. This can also be used as a basis for the analysis of proposed development projects to ascertain their potential impacts on and the carrying capacities of the river systems.

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Table 7.8. Format used in the classification of rivers according to their beneficial uses.

I	Conservation of the environment	Water supply (WS) I: practically no treatment necessary Fishery (F) I: very sensitive aquatic species
IIA	Potable water	WS II: conventional treatment needed F II: sensitive aquatic species
B	Recreational use (with body contact)	
III	Livestock drinking	WS III: extensive treatment needed F III: common and tolerant species
IV	Irrigation	
V	Navigation only	

Source: DOE-UM (1986).

The rivers are classified into five categories according to their beneficial uses, as proposed in the DOE-University of Malaya (DOE-UM 1986). This classification is shown in Table 7.8.

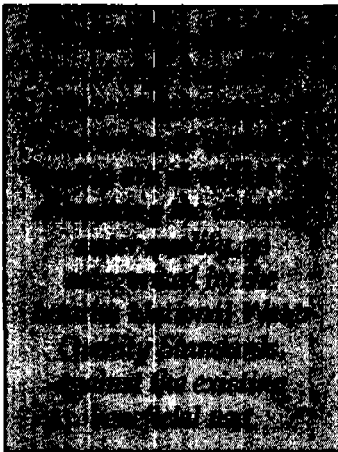
The DOE study (1989) proposed the following:

1. Classes IIA and IIB should be coalesced into a single Class II. The difference involved is only a stringent limit on FC for IIA.
2. Three lists of parameters should be used to classify the rivers according to their existing water quality. List 1 parameters are pH, DO, chemical oxygen demand (COD), BOD, SS and ammonia-nitrogen ($\text{NH}_3\text{-N}$). Lists 2 and 3 involve parameters such as FC levels, total coliform bacteria, salinity, nitrate nitrogen and certain heavy metals. Greater weight is given to List 1 classification in determining the overall class.

Based on these standards and criteria, the inland rivers are classified according to the existing water quality as shown in Fig. 7.3 (Lim 1989).

The next step is to classify these same waterways based on their existing beneficial uses, using the same scale, as shown in Fig. 7.4.

Critically polluted waterways requiring either maintenance or improvement in water quality are identified by comparing the existing water quality (as categorized by the INWQS) and the existing beneficial use.



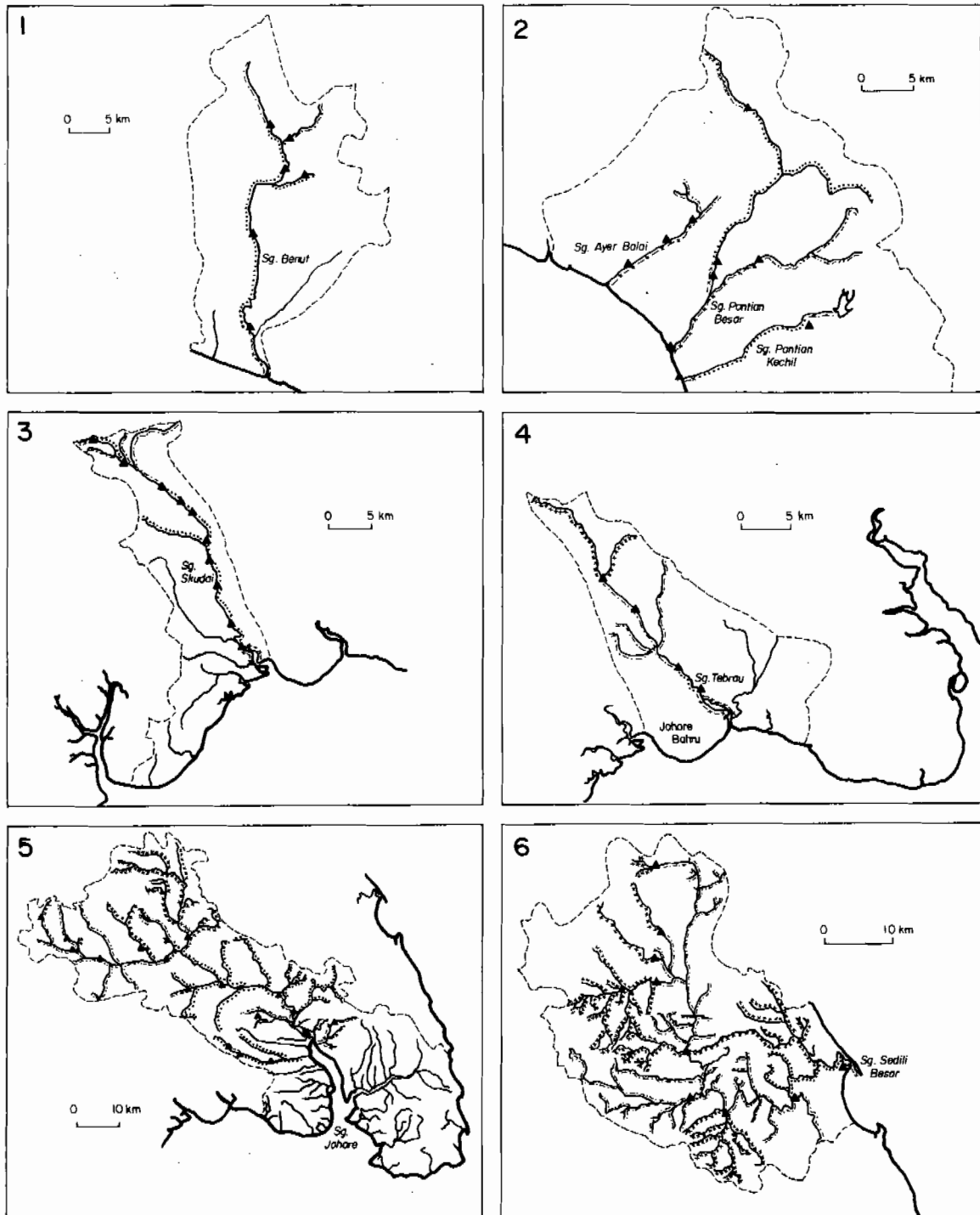
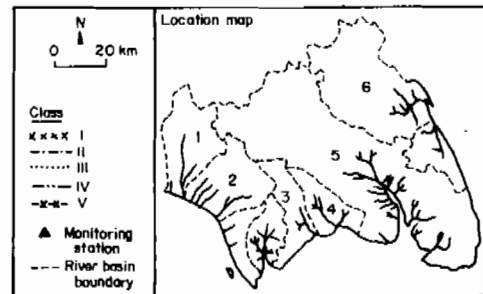


Fig. 7.3. Classification of South Johore rivers based on water quality standards and criteria.



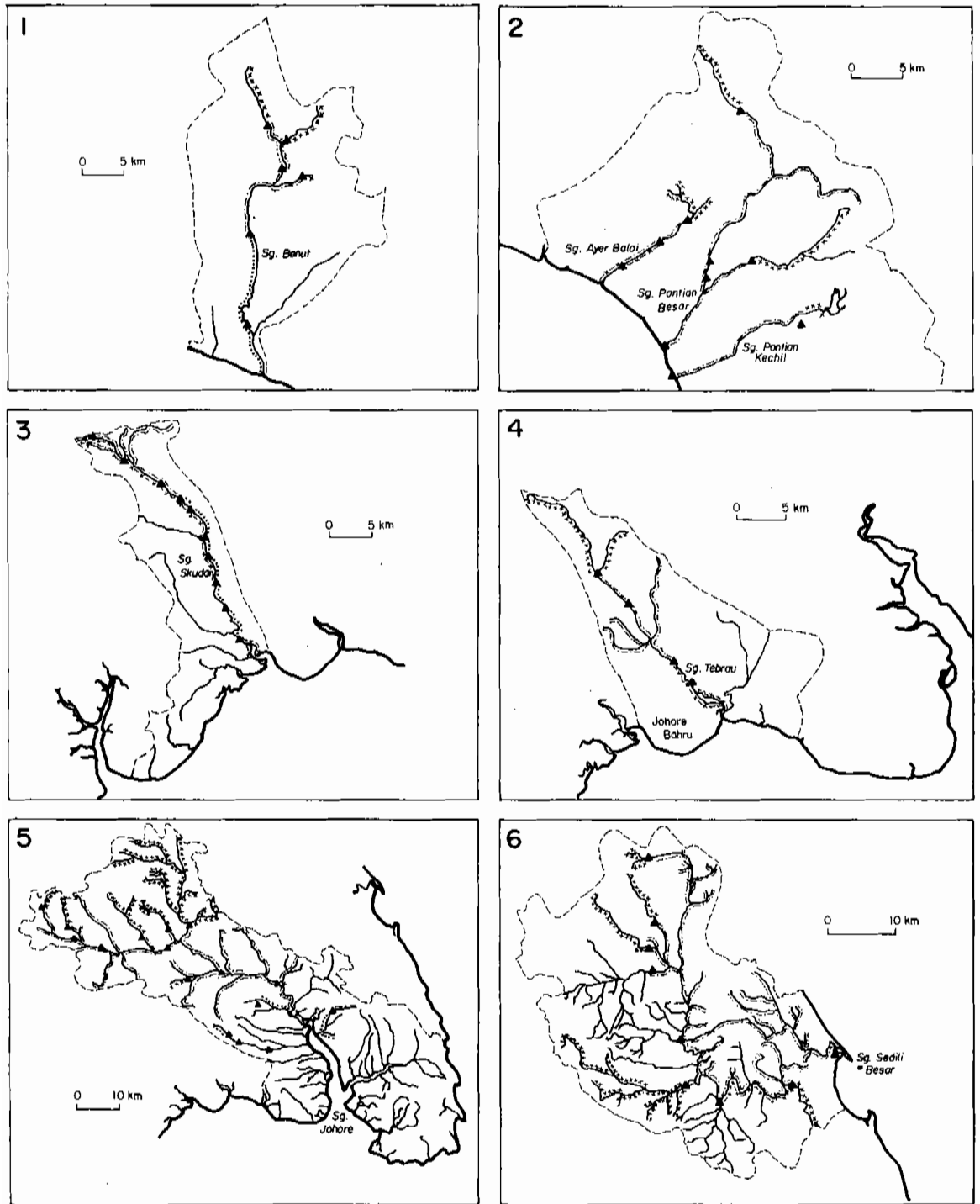


Fig. 7.4. Classification of South Johore rivers based on beneficial uses.

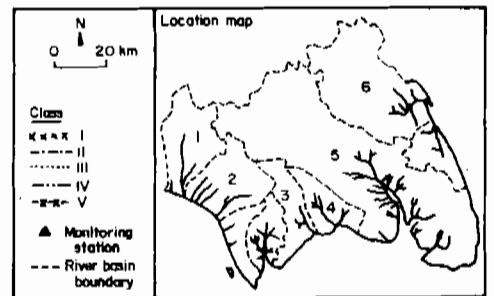


Table 7.9. Suitability of the coastal waters of South Johore for existing beneficial uses and the corresponding actions to be taken.

Lido Beach	Recreation (primary contact)	Does not satisfy criteria	Improvement of water quality
Stulang Laut	Recreation (primary contact)	Does not satisfy criteria	Improvement of water quality
Desaru	Recreation (primary contact)	Satisfies criteria	Maintenance of water quality
Kukup	Aquaculture (fish culture)	Satisfies criteria	Maintenance of water quality
Sg. Johore estuary	Aquaculture (fish culture)	Satisfies criteria	Maintenance of water quality
Teluk Mahkota	Aquaculture (fish culture)	Satisfies criteria	Maintenance of water quality
Johore Strait, between Sg. Skudai and Sg. Melayu estuaries	Aquaculture (mussel culture)	Does not satisfy criteria	Improvement of water quality

In areas where the water quality classification is lower than that required by the existing beneficial use, the water quality should be improved. If the water quality classification is the same as that required by the existing use, then, water quality should be maintained (Lim 1989).

Based on this analysis, the critically polluted areas requiring maintenance or improvement of water quality are identified in Table 7.9. The existing beneficial uses are not commensurate with the water quality for the majority, if not all sections of Sg. Benut, Sg. Air Baloi, Sg. Pontian Kechil, Sg. Pontian Besar and Sg. Johore. In almost all cases, the water quality is at least one class lower than the existing beneficial uses.

Coastal waters

A similar system of comparing existing water quality to beneficial uses can be used in the marine waters along the coast of South Johore as was done by Lim (1989). The beneficial uses of coastal waters in South Johore are primarily for recreation, aquaculture, fisheries, navigation and waste disposal. For recreation and aquaculture (Fig. 7.5), it is essential to maintain an acceptable level of water quality. A waterway, such as Johore Strait, could be zoned according to its use for recreation or aquaculture and monitored to ensure that these minimum criteria are maintained. These criteria have been established on the basis of microbial indicators, primarily the presence of FC. Figs. 7.6 to 7.8 show the locations of areas with suitable water quality for aquaculture and recreational use.

The other beneficial uses of coastal waters, such as navigation and waste disposal, should use the same water quality standards already developed for recreational and aquaculture activities (Table 7.2).

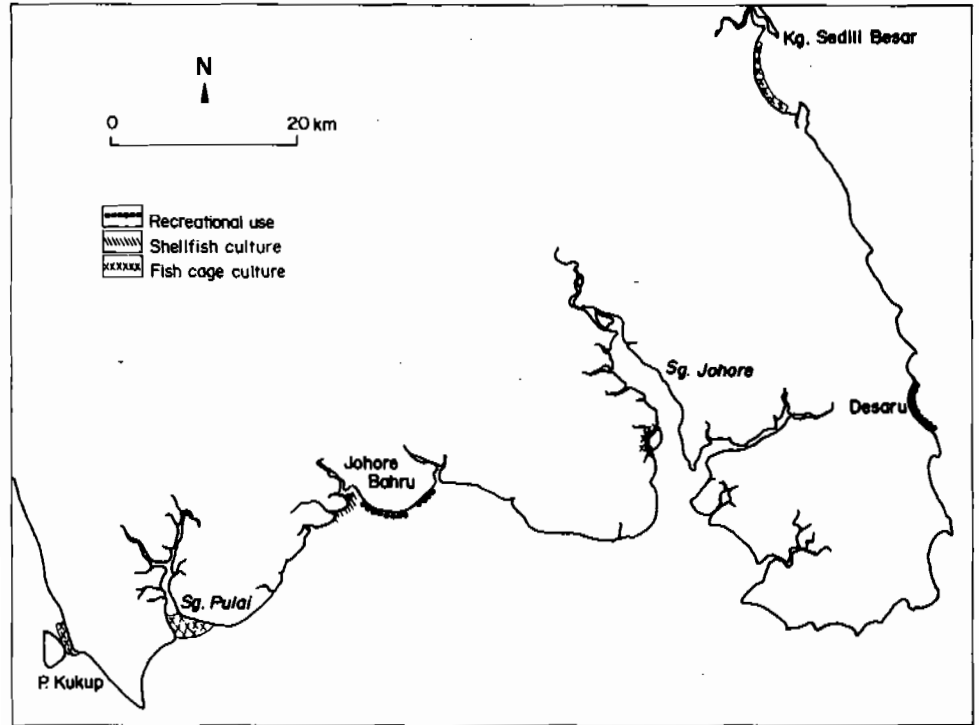


Fig. 7.5. Existing beneficial uses of South Johore's coastal waters.

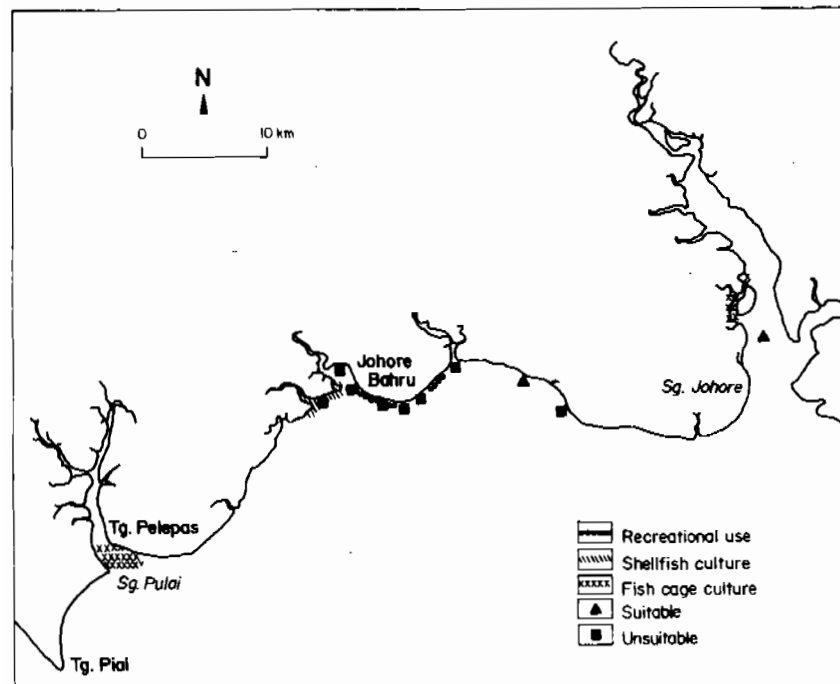


Fig. 7.6. Existing uses and suitability for recreational purposes of South Johore's coastal waters.

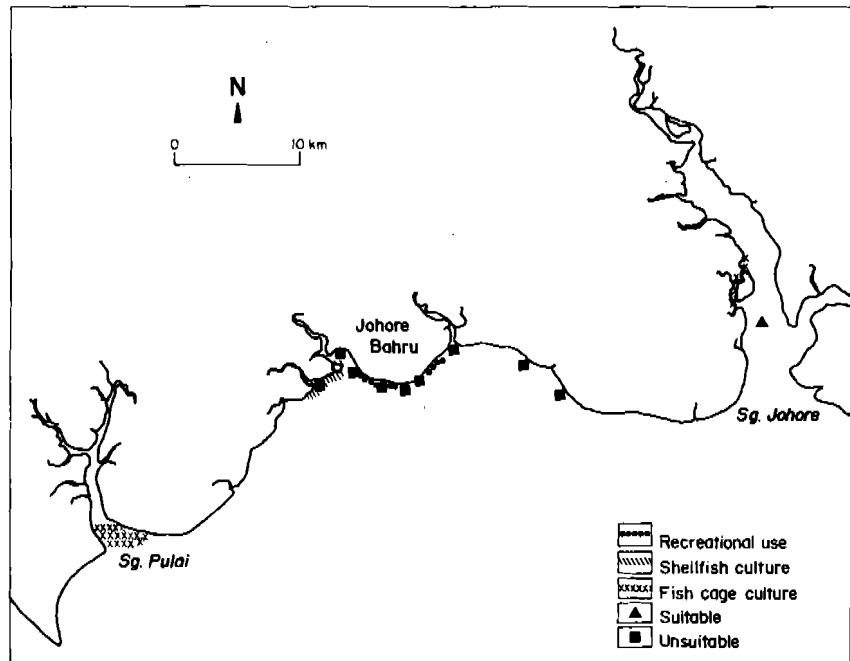


Fig. 7.7. Existing uses and suitability for shellfish culture of South Johore's coastal waters, based on USEPA criteria.

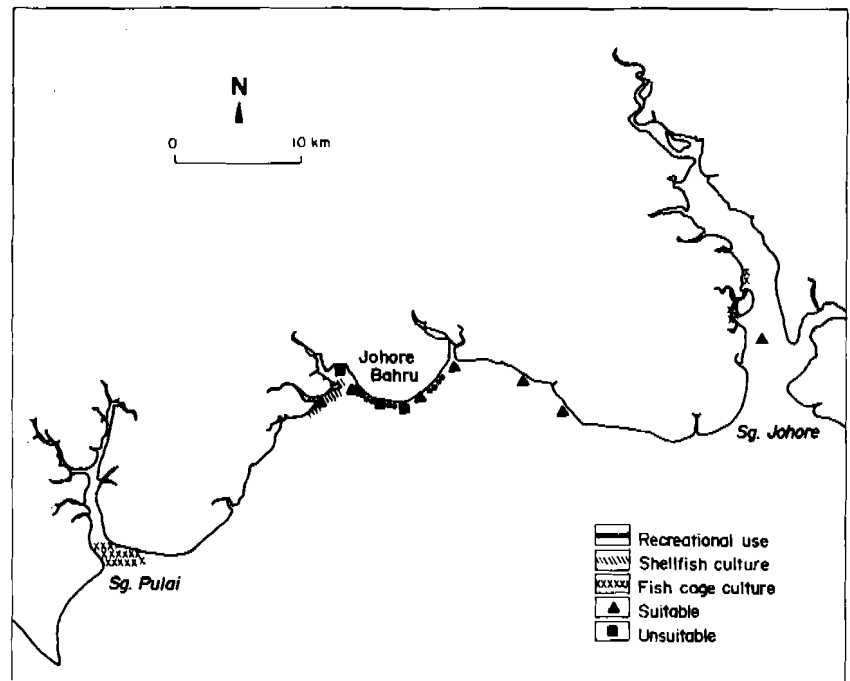


Fig. 7.8. Existing uses and suitability for aquaculture of South Johore's coastal waters (Liong 1984 and Hassan 1989).

General Guidelines

Watershed protection and management

1. All existing forests in water catchment areas should be gazetted as Permanent Protective Forests (for water catchment) to preserve them in perpetuity for future water supply. Fig. 2.1 shows the water catchment areas of South Johore.
2. A master plan for watershed protection and management should be developed in the form of an overall land use plan that takes into account the linkages between development and impacts within as well as outside the watershed area. This would provide greater and more comprehensive protection and management of the entire water catchment area in South Johore, including forested and nonforested areas.
3. Restrictions should be placed on developments in watersheds. The following conditions are based on the study by Akbar (1989), which analyzed the protection of watersheds and proposed control actions by the state of Negeri Sembilan.
4. All watersheds should be classified on the basis of the capabilities of the treatment systems that abstract water for each of the catchment areas, and the existence of storage impoundments as part of the catchment area. These classifications are:
 - a. Class A: Watersheds acting as raw water sources to treatment plants that are conventional or more advanced in design and treatment capability.
 - b. Class B: Watersheds providing raw water to treatment plants that are subconventional in design and treatment capability, including a direct supply system that only disinfects.
 - c. Class C: Watersheds providing raw water sources to treatment plants from storage impoundments.
5. The above classification imposes the following restrictions:
 - a. Sources of discharges above any water intake for drinking water for all watersheds should comply with Standard A of the Environmental Quality (Sewage and Industrial Effluents) Regulations (1979).
 - b. A buffer zone should be created around the vicinity of the main drinking water extraction points. In general, the buffer zone would consist of a setback distance of 500 ft on both sides of the river, extending about half a mile upstream and downstream of the extraction point. These buffer zones should be designated and managed as DOWW reserves. The DOWW should establish a wider buffer zone, if deemed necessary, depending on the surrounding land uses (see Fig. 7.9 for a conceptual drawing of this buffer zone).

A buffer zone, to be designated and managed as Department of Waterworks reserves, should be created around the vicinity of the main drinking water extraction points.

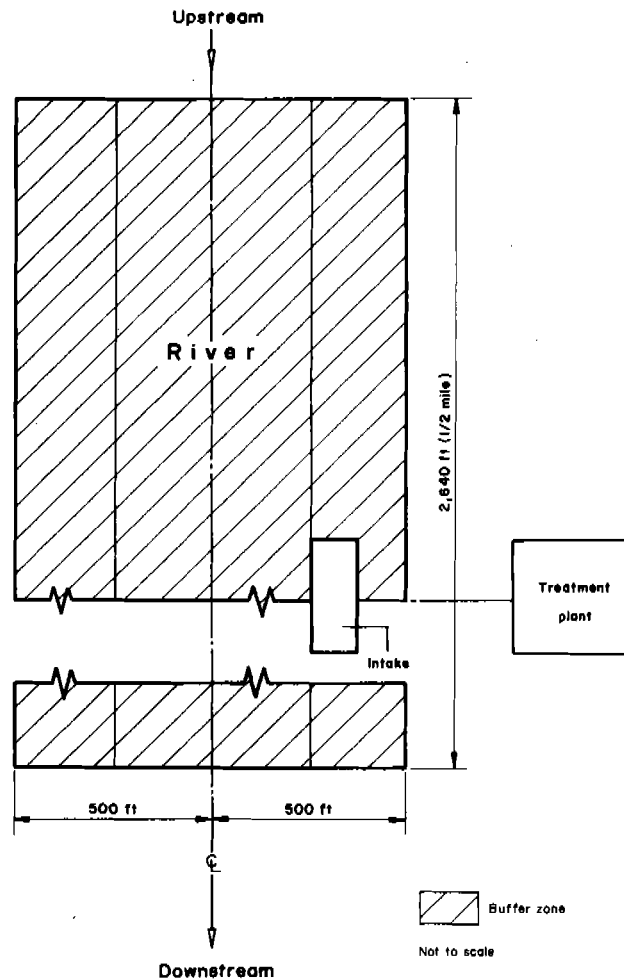


Fig. 7.9. A conceptual illustration of a buffer zone.

- c. No logging should be allowed in the forested portion of the water catchment areas as they are Permanent Protective Forests.
6. Agricultural activities near water intake points should be regulated by the following guidelines:
 - a. A 500-ft minimum setback should be maintained from the boundary of the buffer zone.
 - b. A 1,000-ft minimum setback should be maintained from the main drainage channel, its tributaries and subtributaries outside the buffer zone.
 - c. Logging should only be allowed on slopes not exceeding 20%.

- d. Sediment traps should be provided and maintained throughout the logging operation to prevent sediment runoff into the waterways.
 - e. The logged area should be replanted not later than six months from the cessation of the logging operation. In addition, the use of pesticides, insecticides, rodenticides and other toxic chemicals should be subject to control.
7. Any animal rearing should be subject to the buffer zone requirement of 6 (a) and (b). Effluent waste from these activities should be adequately treated in settling ponds and other treatment methods that meet DOE's requirements.
 8. Mining activities should not be permitted in a watershed under any circumstances.
 9. Urban development, such as housing and industrial activities, should not be permitted in water catchment areas.
 10. No activities using radioactive materials should be allowed in any watershed.
 11. All water intake points should be placed far upstream.

**Soil erosion measures
for land development**

1. Conditions should be attached to the approvals given for land development, as provided for in the National Land Code (1965) and the Land Conservation Act (1960, revised 1989), to ensure the incorporation of adequate erosion prevention measures, such as the provision of sediment traps and the practice of cover cropping exposed ground. These may be based on the silt control guidelines of DOE, and the soil erosion control guidelines of DOA and DDI. The Land Conservation Act (1960, revised 1989) should be strictly enforced. Action should be taken to map hill land for protection under this Act.
2. A phased development approach, based on the type of terrain, should be taken in land development projects, especially those along rivers, to reduce and control sediment loading due to land clearing. The Land Conservation Act (1960, revised 1989) should again be applied here.

Agriculture

1. A coordinated national program of research on the presence and health risks of pesticides in water should be established. This should be undertaken as a collaborative effort among the National Pesticide Board, MOA, Ministry of Health, MOSTE and the local universities.

Chapter 7. Management Plan for Water Quality and Land Use

2. The Pesticide Act (1974) should be strictly enforced, especially with regard to the smuggling and use of illegal pesticides.
3. The MOA should continue its programs that encourage farmers to substitute the use of persistent types of pesticides with the less persistent types.
4. The MOA should continue conducting public education programs to ensure the safe use of pesticides since the use of the household variety is a potentially significant contributor to the problem.

Aquaculture

1. Water quality criteria for aquaculture and the harvest of seafood for human consumption should be developed.
2. The DOE should establish and enforce standards of allowable quality of effluent discharged from aquaculture farms.

Domestic sewage

JOHORE BAHRU

1. It is strongly recommended that the proposal for the Johore Bahru sewerage and drainage project submitted by ADB in its study "Development of selected urban centers in Peninsular Malaysia" (BKH 1989) be implemented as soon as possible.

This recommendation is the most reasonable approach to cleaning up Sg. Segget and Johore Strait.

2. Alternative sites for the sewage treatment plant should be investigated. Sites farther west could be considered, such as the land between Sg. Skudai and Sg. Danga, or the land between Sg. Danga and Sg. Melayu. The additional pumping, construction and land purchase costs would need to be estimated.
3. To decentralize the Central Market, the merchants from here should be relocated to the smaller markets within the housing estates.
4. No new licenses for merchants in the Central Market should be approved. There should also be no renewal of licenses.

THE CAUSEWAY

1. The remaining culverts in the causeway should be open. Aside from reducing the pollution load entering Johore Strait, improving the flow of water under the causeway is also needed, although this is a major task.
2. Further studies should be done to evaluate the options of improving the flow of water under the causeway, such as removing part of the structure and installing a short-span bridge. In analyzing these options, models may be developed to predict the improvements in current flow and water quality. All costs of each structural improvement should be carefully evaluated in terms of the resulting benefits to determine if it would be a worthwhile investment. These studies should be done soon so that their results may be used right away to analyze the potential impacts of Phase II of the causeway expansion project. Substantial reclamation on the eastern side of the causeway will block the culverts. A decision should be made to determine the most cost-effective way to improve current flow for this new development.
3. An EIA will be required of the Phase II causeway expansion project since over 50 ha of land are to be reclaimed. Measures, such as using silt fences, should be implemented to minimize the increase in turbidity of the waters. This is especially important because of the presence of a popular recreational beach just east of this site at Stulang Laut, Tg. Puteri. All buildings covered by Phase II of the project, such as hotels, visitor centers and customs buildings, should have adequate and well-maintained sewage treatment systems. In the proposed marina, disposal facilities for the boats' human waste tanks, used oil and solid waste should be provided to prevent dumping of these wastes into Johore Strait.

**CLOSE COOPERATION
WITH SINGAPORE**

1. A joint international working group should be established, with the priority set by the highest national authorities in each country, to address the water quality problem in the strait.
2. The TORs for the group should include planning to reduce the pollutant load of the strait, improve the current flow under the causeway, and establish a program for zoning the uses of the strait and for monitoring its water quality.
3. Data on waste discharges in Johore Strait (for both Singapore and Johore shores) should be gathered and analyzed.

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**OTHER AREAS IN
SOUTH JOHORE**

The recommendations by Bumi-Watson (1982) concerning the small communities around the Johore Bahru area should be implemented.

Programs, such as the Kampong Atas Air project being carried out by the Federal Economic Planning Unit (FEPU), which addresses the problems of pollution, hygiene and sanitation within the *kampong*, should be fully encouraged and efficiently implemented.

Animal wastes

1. Priority areas should be identified where management and enforcement of relevant laws are required without delay.
2. Pig farmers should be required to follow guidelines developed by the Department of Veterinary Services (DVS) to achieve compliance with effluent standards as part of the condition for licenses.

Industrial development

1. The recommendations of the report on Sg. Segget (Envilab 1985) should be updated and implemented.
2. The accruing pollution load from any proposed project in conjunction with all other pollution loads in the area should be evaluated based on its cumulative impact on the environment prior to the approval of new proposals. In this respect, the Water Quality Management Scheme (Table 7.9), which identifies river stretches where improvements in water quality are needed or where water quality should be maintained, may be used as a guide for siting industries based on compatibility with water quality requirements.
3. The requirement of an EIA should be strictly enforced. Siting alternatives should be considered in the EIA of any proposed industrial development.
4. Heavy and pollutive industries located on the coast should be concentrated specifically in the Pasir Gudang and Tg. Langsat areas rather than spread along the coast, so that less of the coast is affected. The action plan for the Sg. Johore estuary addressing the potential problems from the Tg. Langsat industrial estate should be followed (see the area-specific plan for the Sg. Johore basin in this chapter).
5. A 1,000-m buffer of natural land along the shoreline should be provided for in the site plan for an industrial plant, except where water access requires piers and roads.

The Department of Environment guidelines for the siting and zoning of industries have recommended that similar industries be grouped together. This will facilitate the establishment of centralized wastewater treatment facilities.

Sand mining

6. Within an industrial estate, the DOE guidelines for the siting and zoning of industries should be followed. The guidelines have recommended, among other things, that industrial areas be divided into various zones in which industries of similar types are grouped together, e.g., food zone, chemical zone, etc. Green spaces at least 50 m wide should be provided between the zones. Siting similar kinds of industries in the same zone would facilitate the establishment of centralized wastewater treatment facilities.
7. In planning for industrial development, the DOE classification of industries into heavy, medium or light industries should be used as a standard.
8. Strict pollution controls should be enforced by the local authorities and DOF.

1. The SDLM should demand a satisfactory mining scheme, such as the one currently done for mining ores, for inland sand mining activities. The conditions attached to the approvals should be strictly enforced.
2. Soil stabilization steps to be undertaken by the miner, such as planting and the use of silt curtains, should be imposed as part of the conditions for the issuance of permits. This would reduce the soil erosion caused by sand or other mineral mining that is taking place near any waterway or seashore. The local authority should monitor these operations to ensure the adequate implementation of the soil erosion control measures.
3. When the mining activity is terminated, the land should be rehabilitated by planting to prevent erosion and to improve the quality of the land so that it can be used for other productive purposes. A deposit should be required from each mining concern that would be forfeited if this rehabilitation is not carried out.
4. For coastal and offshore sand mining, recommendations for management are given in the sand mining management plan (see Chapter 5).

Shipping

OIL SPILL RESPONSE

1. The recommendations contained in the evaluation report of the last emergency response exercise should be implemented. This will be for the benefit of the next regular exercise to ensure that the Strait of Malacca Oil Spill Contingency Plan can be readily applied in case of an accidental spill. This includes improvements in the communication network contained in the DOE report on Marine Pollution Communication and Response Procedures (DOE 1989), which complements the contingency plan for both accidental and operational discharges enforceable under the Environmental Quality Act (1974).

2. The South China Sea Oil Spill Contingency Plan should be implemented.
3. The DOE should develop the means to predict the pattern in the spread of oil spills in marine waters.
4. The DOE should develop the means to estimate the economic and ecological costs of oil spills to ensure proper compensation. This could be done by conducting a study of the level of risk for oil spill accidents, the traffic volume in Malacca Strait, the types of cargo, especially the volume of the different types of oil transported, and the identification of potentially critical impact areas.

**HAZARDOUS CHEMICAL
EMERGENCY RESPONSE**

1. The Johore Port Authority (JPA) should improve its hazardous chemical emergency response plan to complement its oil spill response plan. This should be done with the cooperation and participation of the private companies involved in handling or producing this material.

This should be done with the cooperation and participation of the private companies involved in handling or producing this material.

2. The DOE should consider having a representative at Pasir Gudang and the proposed petrochemical industrial estate at Tg. Langsat should be monitored on a 24-hour basis to respond rapidly to an emergency.
3. In any new petrochemical development, either at Pasir Gudang or at the new petrochemical industrial estate, JPA and the private companies involved should have an adequate hazardous chemical emergency response plan ready. It should also be tested.
4. Local authorities and fire brigades should coordinate with JPA and the private industrial companies to develop adequate emergency response plans. Specifically, at Pasir Gudang, the fire brigade should be expanded to deal with the increased number of hazardous chemical operations. This should be based on the format developed in the Awareness and Preparedness for Emergencies at the Local Level (or APELL) program currently being conducted with DOE.

**Environmental
monitoring**

1. Additional monitoring stations should be established by DOE in Sg. Pulai, Sg. Lebam, Sg. Belungkor, Sg. Santi, Sg. Sedili Kechil and in at least one small waterway within the Pasir Gudang industrial estate. These areas are sites of major development pressures. In the future, additional monitoring should be developed for such sites.

2. All new industrial estates, such as those in Senai III and Tg. Langsat, and the one that is part of the second linkage development, should have individual monitoring stations established and maintained at the cost of the estate developers. Duplicate samples should be taken monthly, with one copy sent to DOE for spot checks on quality control.
3. Additional tests should be conducted on the samples from the monitoring stations at Pasir Gudang and the proposed Tg. Langsat petrochemical industrial estate. This should include gas chromatography, which is useful in distinguishing between types of oil contamination.
4. All large-scale, effluent-producing industries should be required to have only one discharge point, or more, if written permission is given by DOE. They should have their own weir and flow meter to determine the rate of discharge of treated effluents. Currently, DOE is having difficulty in obtaining such information since there are multiple discharge points and no weirs to consolidate the flow.
5. The DOE should require all analytical testing to be done in an accredited laboratory under the supervision of a registered chemist. This will ensure high quality monitoring data, since there will be an increased amount of monitoring done in private laboratories. Laboratory accreditation and chemists' registration are given by the Malaysian Institute of Chemistry (MIC).
6. Chemical analyses for EIAs should be done by a registered chemist in a certified laboratory.

RECOMMENDATIONS FOR LEGAL AND INSTITUTIONAL ARRANGEMENTS

Legal Aspect

The Town and Country Planning Act (1976), the Local Government Act (1976), the Street, Drainage and Building Act (1974) and the relevant by-laws should be reviewed to incorporate the dimensions of environmental protection, which have been highlighted in the objectives of the Town and Country Planning Act (1976) but are absent in subsequent provisions and relevant laws.

The local authority should utilize the Land Conservation Act (1960, revised 1989) consistently in all planning approvals for the use and development of land in the local authority areas. The State Planning Committee should initiate a survey to list all hill land to be protected under the Land Conservation Act (1960, revised 1989) and gazette them for protection under the Act as hill land.

The Environmental Quality Act (1974) should be reviewed to address the problem of waste from the pig-rearing industry. The review should also consider whether it would be possible to make it mandatory in law to incorporate environmental considerations into national and state policies, plans and programs for the development of natural resources (including land) and industries.

Institutional Aspect

1. There should be interagency coordination for integrated resource use planning and management within river basins. This could be done by following these recommendations:

- a. The CRC for Johore should be formed to coordinate the various state government agencies.
- b. An environmental section should be established in the SEPUs of the different states in Malaysia, and in PMD. Trained and competent manpower should be assigned in this section. An environmental officer should also be assigned in each land office on both the state and district levels and in the local authority office to assist in the evaluation and enforcement of, and monitoring of compliance with, environmental measures instituted by the relevant laws.

The Environmental Section in SEPU will provide the technical expertise as the secretariat for CRC. The SEPU-Johore will require at least two additional officers specifically to evaluate the environmental aspects of planning and development proposals and incorporate these into the integrated planning process. These officers should be given adequate training in cost-benefit analysis, particularly in the economic valuation of the environment and in the dimensions of integrated coastal resources planning.

- c. The GIS established for the Integrated Coastal Resources Management Plan for Johore should be based in the SEPU office and staffed with adequately trained manpower. The data collected for this management plan should be updated regularly and used in the review of annual plans.

The GIS is a useful tool in the integrated planning and in the assessment of development proposals by the different agencies. The use of GIS should be coordinated by SEPU.

An official channel, preferably mandated by law, should be established to ensure that all project proposals on the federal and state levels, prior to approval, promptly submit EIAs to the Department of Environment.

2. An official channel, preferably mandated by law, should be established to ensure that all project proposals on the federal and state levels promptly submit EIAs to DOE, as required under the Environmental Quality Act (1974). This should be done before any approval, including land alienation or agreement, is made by the state or federal governments, statutory bodies or subsidiary companies.
3. For watershed protection and management:

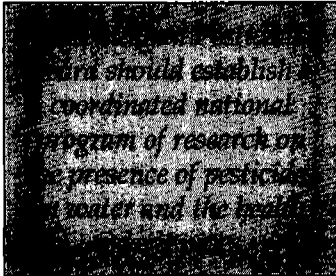
- a. The SEC should take legislative action to set the priority and direction for the protection and management of watersheds, based on a program to be developed by MLCD. This program should be in line with the recommendations for the protection of forests in watershed areas in this chapter.

This could be done by following the example set by the Negeri Sembilan Executive Council in a meeting held on 10 June 1987 (Negeri Sembilan 1987), where the State Director of Waterworks was enjoined to identify all existing and potential water catchment areas for the purpose of gazettement these as permanent reserves under Section 62(1) of the National Land Code (1965). The council also directed that the gazetted list be sent to the State Director of Land and Mines and all land administrators in the state of Negeri Sembilan for further action.

- b. A subcommittee on water catchment areas in CRC should be established to facilitate the development of a master plan for the effective protection and management of watersheds in South Johore. The responsibility of this subcommittee would include the planning, development and implementation (and monitoring thereof) of this plan. The representation in this working group should include DOE, DOFor, DOA, DOWW, DDI, SDLM and SEPU.
- c. The recommended guidelines should be incorporated into legislation as regulations for land use in the water catchment areas.

4. Soil erosion preventive measures should be imposed on any land development.
 - a. The DOE's siltation control guidelines should be incorporated into the Local Government Act (1976), the Street, Drainage and Building Act (1974) and the Land Conservation Act (1960, revised 1989) so that the land office and the local authority would be authorized to enforce the necessary measures.

- b. The local authority should utilize and consistently enforce the Land Conservation Act (1960, revised 1989) for all land use and development projects. Hill land should be identified and classified as hill land under the Act, which should also be reviewed with the objective of incorporating both the by-laws of the Ministry of Housing and Local Government (MHLG) and the siltation control guidelines of DOE.
- c. The review should also include provisions requiring land developers to have their projects inspected by relevant government agencies such as DDI, DOE and the local authorities to certify that the conditions for the issuance of permits for their proposals have been met. With these incorporations, the local authorities will be empowered to effectively control erosion arising from construction activities.



5. The National Pesticides Board should establish a coordinated national program of research on the presence of pesticides in water and the health risks this poses.

6. Strict water quality criteria and standards should be established.

- a. The proposed INWQS and the recommended revisions of DOE (1989), as outlined above, should be adopted.

The DOE-UM (1986) recommendation of the 200 mpn/100 ml FC level in freshwater or marine areas for recreational use should be adopted as a national water quality criterion under the Environmental Quality Act (1974).

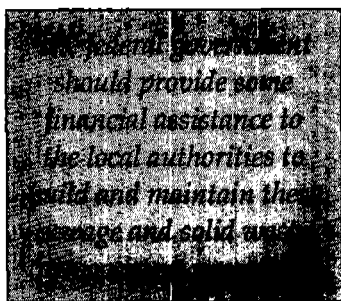
- b. The DOF, DOE and the Department of Health (DOH) should collaborate to set water quality criteria and standards for different types of aquaculture.

- c. The zonation system based on the beneficial uses of the area, as discussed earlier, should serve as a control mechanism for water quality.

- d. For the international waters of Johore Strait, a bilateral program with Singapore should be initiated to coordinate the efforts in improving the water quality of this waterway.

7. The local authority concerned should carry out its responsibilities to construct, maintain and monitor sewage treatment systems and solid waste disposal programs. This could be made possible by taking the following recommendations:

- a. The local laws should require housing developments and building complexes to install their own centralized sewage treatment systems.
- b. Local authorities should adopt the DOE effluent regulations in their own by-laws to clarify the standards for enforcement purposes.
- c. The local authority concerned should collect the maximum allowable fees from the residents for providing these services. Lack of funds is the main reason for the poor implementation and maintenance of sewage/waste treatment systems. The Local Government Act (1976) allows the local authority to collect fees up to 5% of the property value for sewage improvement. These fees need to be reviewed with the objective of raising them to meet present-day conditions.
- d. Local authorities should hire more trained personnel to carry out the water quality and effluent quality monitoring program.
- e. The federal government should provide some financial assistance to the local authorities to build and maintain these sewage and solid waste management programs. Helmi (1989) states that for the favorable consideration of FEPUs, projects undertaken by the public sector should show an internal rate of return of not less than 10%, or less, if it results in additional social benefits. But, "projects that contribute to the prevention and control of environmental pollution will certainly qualify for a waiver in this criterion ..." (Helmi 1989).



8. The Master Action Plan for a Beautiful and Clean Malaysia should be implemented. The MHLG has recently completed the national plan to manage solid wastes, which outlines the development of a master plan for all local authorities to follow. This master plan, which is to be completed by 1995, includes 12 strategic schemes that will provide guidance in dealing with significant solid waste problems and tackles the different types of wastes, e.g., domestic, commercial, institutional, street, garden, construction site, drain and watercourse, beach and industrial wastes.

The programs concern institution building, interagency and inter-ministerial coordination, formulation of master plans for all municipal councils, improvement in municipal solid waste management of district councils, and the improvement of the refuse collection system and sanitary landfills. These also include establishing permanent training programs for solid waste management staff, strengthening law enforcement, improving education programs and promoting applied research on solid waste management, upgrading equipment management, privatizing some services and monitoring the performance of the master plan.

Chapter 7. Management Plan for Water Quality and Land Use

9. The pig-rearing venture should be classified as an "agro-based industry" as opposed to its current classification as a "backyard agricultural activity." The Sewage and Industrial Effluent Regulations (1979) should be amended to include animal wastes as sewage.
 - a. Once the pig farms are reclassified as an "agro-based industry" and the wastes as "sewage," DOE should have specific jurisdiction over the monitoring of effluent quality and enforcement of standards.
 - b. A cooperative program to monitor pig farm activities should be established with the local authorities and DVS and coordinated by DOE. This concerted effort will help overcome the difficulty in keeping track of the farms due to their large number and their wide distances apart. The local authority and DVS personnel could undergo training by going on site visits, taking water samples and sending these to the Department of Chemistry through DOE, for analysis.
 - c. The new set of rules and regulations being drafted by DVS, which specifies the standards and treatment requirements, schedules for implementation and farm design, should be incorporated into legislation. These regulations will provide clear guidelines for controlling swine waste. The legislation should also give the responsibility of monitoring to DOE and DVS.

An interagency Memorandum of Understanding should then be agreed upon between the two agencies to clearly specify how these pig farms would be monitored.

- d. Regulations requiring pig farms above a certain size to provide monthly effluent monitoring data to DOE on a quarterly basis should be promulgated. This could probably be effected by an amendment to the Environmental Quality Act (1974).
- e. An interagency working group should be formed to deal with the issue of animal wastes, particularly the pig waste problem. This may be a subcommittee of CRC, which will include representatives from SEPU, DTCP, SDLM, DVS, DOF, DOA, the District Offices and DOE. The working group should first address the cultural, religious, legal and institutional issues before carrying out the site selection process for a centralized pig-rearing complex.

10. Detailed recommendations for sand mining are given in Chapter 5.

Regulations requiring pig farms above a certain size to provide monthly effluent monitoring data to the Department of Environment on a quarterly basis should be promulgated.

11. Recommendations for shipping are as follows:

- a. The maintenance and operations budget of DOE/MD for the oil spill response fleet should be increased to a minimum of M\$500,000 annually.
- b. The evaluation report on the 1984 Oil Spill Response Test should be released to the state and the necessary steps should be taken to address the shortcomings identified here.
- c. The necessary steps should be taken to expedite the adoption of the proposed rules for implementing Annexes I and II of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).

Any other prerequisites to signing the convention, such as the provision of an oil sludge disposal site for use at each port, should be fulfilled. At the Johore Port, necessary arrangements should be made with the private companies dealing with the transshipment of oil or oil sludges for the safe disposal of these sludges. The disposal site should be carefully selected and all the necessary EIA requirements fulfilled.

By signing and ratifying this convention and adopting its annexes, Malaysia would be able to exercise further enforcement authority over pollution matters. This is because the treaty and its annexes cover a variety of pollution concerns, such as the discharge of oil from vessels (Annex I), the disposal of chemicals transported in bulk (Annex II) and the dumping of garbage generated on board the ships (Annex V).

12. The DOE is being asked to increase its monitoring, enforcement and planning activities. All these require additional budget outlays for the department.

A new regulation under the Environmental Quality Act would be necessary to require relevant industries to have only one effluent discharge point, or more, if given written permission by DOE. They should also install their own weir and flow meter for gathering data on the rate of effluent discharges.

The Act should also have a new regulation that would require all monitoring data sent to DOE to be based on analysis done in a certified laboratory and supervised by a registered chemist. The certification and registration would be done by MIC.

All monitoring data sent to the Department of Environment should be based on analysis done in a certified laboratory and supervised by a registered chemist.

**AREA-SPECIFIC PLANS
FOR SOUTH JOHORE'S
RIVER BASINS**

As stated earlier, the forested areas in South Johore were confined to the eastern and upper portions of the Johore and Sedili Kechil basins, as of 1974. However, extensive clearings of forest for agriculture are evident.

Rivers in South Johore that require water quality improvement have earlier been identified based on a comparison between existing water quality and that required to maintain existing beneficial use (Table 7.2). For this section, the rivers will be dealt with by river basins, with the similar ones grouped together, based on geographical location and land use characteristics. The groupings will be the (1) southwest Johore river basins, including Sg. Benut, Sg. Air Baloi, Sg. Pontian Besar, Sg. Pontian Kechil and Sg. Pulai; (2) Sg. Skudai-Sg. Tebrau basin; (3) Sg. Johore basin; and (4) Sg. Sedili Besar and Sg. Sedili Kechil basins.

**Southwest Johore
River Basins**

Situational analysis

LAND USE

The river basins of Sg. Benut, Sg. Air Baloi, Sg. Pontian Besar, Sg. Pontian Kechil and Sg. Pulai are generally low-lying and flood-prone, requiring drainage and a protective coastal bund to prevent river and tidal inundation. The bunding has reduced the mangrove strip along the west coast. The most extensive mangrove area is the reserve at the Sg. Pulai estuary. The land use is predominantly agricultural, having small holdings of crops such as rubber, coconut, padi, pineapple and oil palm.

**PRESENT POLLUTION
SOURCES**

The pollution effects of agricultural activities in the rivers are seen in the high SS, DO, BOD and $\text{NH}_3\text{-N}$ levels, especially in Sg. Benut, Sg. Pontian Besar and Sg. Pontian Kechil. The main point pollution sources are rubber processing factories and pig farms (Fig. 7.2).

The land use pattern is essentially set and therefore, extensive land clearing of forest tracts is not expected. Agricultural holdings are small, and an occasional conversion from one crop type to another is not likely to have much of an impact on sediment yield from the basin as a whole.

**CURRENT PROBLEM
AREAS**

The proposed developments associated with the second linkage, particularly those in housing, tourism and agriculture, will affect the Sg. Pontian Kechil and Sg. Pulai basins. The Sg. Pontian Kechil basin will primarily experience

pressures from the agricultural activities. The Sg. Pulai basin will be surrounded by a housing project, a new town center and a government complex on the eastern side, and a road and a bridge through the lower portion of the mangrove reserve. It is predicted that conflicts between such developments and the use of land for aquaculture will arise.

Water quality problems beset the whole of Sg. Air Baloi, Sg. Pontian Besar, downstream of Sg. Benut (in order of security) and Sg. Pontian Kechil. These rivers have stretches where the existing water quality is lower than that required by their current beneficial uses, thus, needing water quality improvement (Table 7.2).

**Recommended
management actions**

1. A study should be carried out by the Pontian district office, in cooperation with DOE and DOH, to positively identify the main sources of the pollutant load in the current problem areas. The degraded stretches of river given in Table 7.2 may be used as a reference point for identifying the exact areas needing remedial measures.
2. Once the problem areas are identified, the enforcement of effluent standards should be carried out.
3. In addition to ensuring that all effluents meet the standards, the human waste systems in *kampung* should also be improved if their impact is found to be significant. Pour-flush toilets should replace those that discharge waste directly into the rivers.
4. In the meantime, any proposed development along these river basins should be very carefully evaluated to ensure that it will not add to the already unacceptable pollution load in the river. Basically, industries that discharge significant amounts of effluent should not be allowed.
5. For the Sg. Pontian Kechil basin, the proposed residential and agricultural development in association with the second linkage should be carefully planned. In the mangrove management plan, a 500-m setback from the mangroves for all housing estates is recommended (Fig. 7.10). This will help in reducing leaching, runoff and the direct discharge of wastes into the mangroves and rivers.
6. For the Pulai basin, several water quality monitoring stations are needed to provide baseline data on the area before it undergoes the planned development. Continuous monitoring during the development stage should be carried out.
7. The proposed construction of a road and a bridge through the downstream area of the Sg. Pulai Mangrove Forest Reserve should undergo an EIA. The road should be built entirely on pilings to maintain the water exchange in the mangrove ecosystem and to accommodate the 50-year flood.

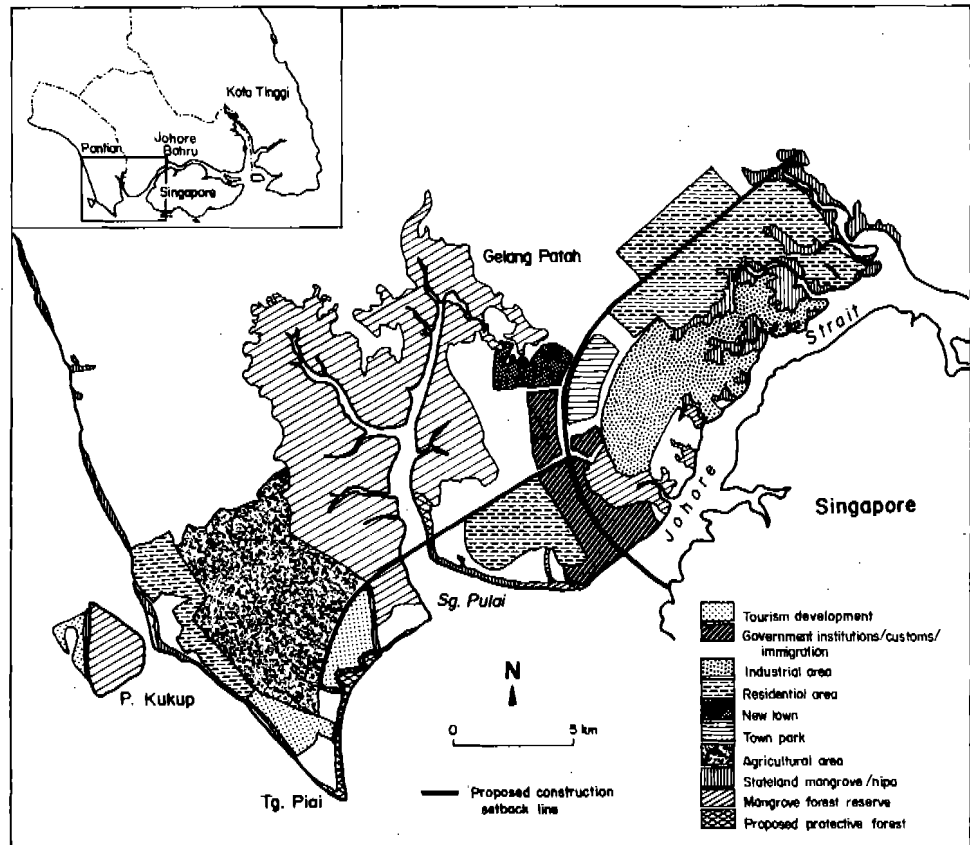


Fig. 7.10. Sites of developments associated with the second linkage project, with proposed construction setbacks, South Johore.

Skudai-Tebrau River Basins

Situational analysis

LAND USE

The Skudai-Tebrau river basins together cover an area of 72,164 ha. Although small in area, their combined coastal frontage is wide and has dense population centers that are undergoing rapid urbanization. The Kuala Lumpur-Johore Bahru trunk road, as well as the Malaysian railway, passes through the Skudai valley and towns such as Kulai, Senai, Skudai and Johore Bahru. The most obvious change in land use between 1974 and 1984 has been the expansion of industrial land along the Johore Bahru-Skudai axis.

Agricultural land use in the upper basin area is predominantly large-scale, with substantial conversion of rubber to oil palm estates. Because of the good transportation network in the Skudai valley, the small river basin has the largest concentration of processing factories for agricultural products.

The upper basin area is also important as a water catchment. The Singapore Public Utilities Board (PUB) operates water intake stations at both Sg. Skudai and Sg. Tebrau. The small pockets of mangrove forest along the river mouths have been identified as potential sites for small-scale aquaculture operations. The Bahan-Kemudi mangrove forest reserves, which have not been harvested in recent years, are identified as pristine and suitable for conservation.

CURRENT PROBLEM AREAS

Sg. Skudai's water quality, however, has been deteriorating steadily. The $\text{NH}_3\text{-N}$ concentration increased from 0.2 mg/l to more than 2.0 mg/l over a 6-year period at the water intake point (Helmi 1989). This required a high chlorine treatment, resulting in additional problems and costs at the drinking water treatment plant. Moreover, bloodworms were commonly found during dry spells. This deterioration in water quality has been shown to be directly related to the rapid development of the river basins and the increase in human activity (PUB 1987).

Moving from Sg. Skudai upstream towards Johore Strait, one of the critical problem areas is the Kulai-Central area, where pollution is extensive, thus requiring improvements in sanitation services. It is densely populated, and the septic tank and pour-flush systems are inadequate. The area has slack river channels and drain slopes. The problem is aggravated by coffee shop sullage wastes and refuse that clog drains, resulting in stagnant pools of water. The same condition also ails the Skudai-Central Area (Bumi-Watson 1982).

The downstream section of Sg. Skudai is identified in Table 7.2 as an area where the existing water quality is critically below that required by the existing beneficial uses of the area.

At Sg. Skudai Kiri at the mouth of Sg. Skudai, there is extensive waste discharge into the mangrove and estuary. The pollution is so severe that it is not feasible to attain a practical sanitation level there, and therefore, the residents should be relocated (Bumi-Watson 1982).

Recommended management actions

1. In Sg. Skudai, close monitoring of the quality of effluent discharged from the industrial estates, and the rubber and palm oil mills, should be done by DOE to ensure adherence to established standards.
2. No new palm oil or rubber mills should be allowed to operate on this river basin, even if these have met the effluent standards set by DOE. The river basin is already overstressed by the presence of too many factories.
3. The pig farms should be inspected and samples from them taken for analysis.
4. New industrial estates should include only light, nonpollutive industries.

Sg. Johore Basin

Situational analysis

LAND USE

Of all the rivers in South Johore, Sg. Johore has the most extensive basin, covering an area of about 309,000 ha. Its main tributaries are Sg. Sayong, Sg. Pengli, Sg. Linggiu, Sg. Semangar, Sg. Telor, Sg. Tiram, Sg. Layang and Sg. Lebam. The smaller upstream tributaries include Sg. Temon, Sg. Berangan, Sg. Remis and Sg. Sebol. The watershed of the upper tributaries, which is still forested, forms the biggest water catchment area in the region. Freshwater swamps are found along the stretches of Sg. Sayong, Sg. Pengli, Sg. Linggiu and Sg. Semangar, while the extensive estuary of Sg. Johore is lined with mangrove, parts of which are forest reserves, such as those along the Sg. Lebam and Sg. Santi tributaries.

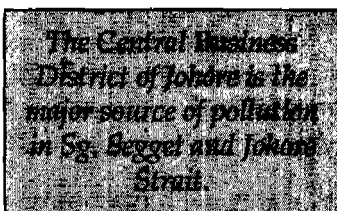
Forest areas within the Sayong-Pengli sub-basin have been converted into oil palm estates. In fact, most of the agricultural development within the basin is on an estate scale, with an increase in the oil palm area and a reduction in rubber land size within the 1974-1984 period. Other economic activities in the area are some residual mining and, in Ulu Tiram, animal husbandry. Water intake points are operated by both DPW and PUB at various parts along Sg. Johore and its streams. Tourism development, on the other hand, is being expanded along the east coast of the Sg. Johore basin, whose major town is Kota Tinggi. The water area is used extensively for aquaculture, fisheries and navigation.

Recommended management actions

With development pressures indicating the potential incompatibility of resource uses, there is a need for effective zoning of the Sg. Johore estuary to make these uses work together. However, in view of the fact that the issues concerning this river basin pertain not only to water quality, the management recommendations for this area is dealt with under the area-specific action plan for the Sg. Johore Basin (see Chapter 11).

Johore Bahru Municipality and Surrounding Area

Situational analysis



The Central Business District of Johore is the major source of pollution in Sg. Segget and Johore Strait. Due to inoperative or ineffective sewage treatment facilities, parts of the Business District have no sewage treatment systems at all. In many cases, the oxidation ponds, Imhoff tanks or other packaged sewage treatment systems are not adequately maintained. Neither DOE nor the municipal councils monitor and enforce the standards for effluents from sewage treatment plants due to the lack of manpower and funds. In addition to the sewage problem, there is also constant dumping of solid and human wastes into the open drains.

Chapter 7. Management Plan for Water Quality and Land Use

In a study conducted for FEPU and ADB called "Development of selected urban centers in Peninsular Malaysia" (BKH 1989), Johore Bahru was identified as one of the three areas with the highest economic growth potential. The main objectives of the project were to remove and redress the social imbalances and constraints to the growth of these cities. One of the constraints is the sewage problem.

In other towns outside Johore Bahru, the management problems with municipal sewage are similar, but no data are currently available to assess the significance of its impact on the water quality of the nearby waterways. In the smaller communities, there is often little, if any, treatment of domestic sewage disposed on the coast or rivers. Most of these settlements have sanitation systems that are either in poor condition or inadequate. Many *kampong* use pit toilets or discharge waste directly into the waterway.

In an effort to quantify this problem, the Johore Bahru Sewerage and Drainage Master Plan (Bumi-Watson 1982) categorized the smaller communities around Johore Bahru's metropolitan area, which are under stress from pollution, and outlined the causes and effects of the problem (see Bumi-Watson 1982, Appendix 7, Table AP7-2). Although the plan is outdated, it still can be used in setting priorities in the establishment of programs to improve the local areas.

According to this report, the most severely polluted locality is Kg. Bakar Batu. It recommends the relocation of residents since it is not feasible to improve the area's sanitation level. In Kg. Setinggi, the situation is almost as severe, but improving the sanitation services at this site may be adequate. In both villages, there are direct discharges into the mangroves and the inadequate local drainage causes stagnant pools of water.

In Kangkar Tebrau, the pollution, which is primarily from domestic sewage, is so widespread that sanitation services require immediate improvement. Both Sg. Tebrau and Kg. Ulu Pendar are priority areas where prompt action should be taken to reduce pollution levels. The situation is similarly critical in the central area of Masai.

The coastal villages are not spared from this problem. The water quality monitoring station assigned to the nearshore waters between Kukup Laut and P. Kukup indicated good water quality levels. Even the currents seemed to provide adequate flushing of human wastes discharged directly into the water. However, recent fish fry kills in large areas in that waterway (where their aquaculture cages had been set up) showed that the waters contained high pollution levels caused by sewage wastes.

**Recommended
management actions**

A scaled-down version of the 1982 Johore Bahru Sewerage and Drainage Master Plan (Bumi-Watson 1982), as proposed by ADB, should be implemented. This revised proposal suggests the construction of a major sewer trunk main and a sewage treatment plant. In addition to the Central Business District, a few other residential, commercial and industrial areas are included to spread out the cost of investment on the sewer trunk main. Areas already sewerred are to be connected to the main line, where possible.

This sewerage system, which is proposed along with a drainage improvement project, is to be implemented on a five-year scheme, starting in 1990. The costs for sewerage construction alone are estimated at M\$35.8 million¹, at a total cost of M\$57.17 million². The overall expenditures would increase gradually, enabling the MPJB Engineering Department to handle more design jobs and contracts. The MPJB would need only a few additional staff if the project is implemented by consultants. The new staff would probably include 1 more engineer and 3 additional members of the supporting staff. However, the existing staff would need more training. Phase I of the design would take one year, with the construction starting in 1991. The costs are itemized in Table 7.10.

FINANCING

It is projected that 35% of the costs will be recovered by four mechanisms: a property valuation increase of 5% on all direct residential, commercial and institutional properties; a general property rate assessment increase of 1-1.5% on the whole town; a water rate surcharge only on those properties connected to the proposed sewerage scheme equalling about M\$5/month for residential users and M\$10/month for commercial users; and an MPJB equity of M\$6.5 million to be spent over an 11-year period at M\$300,000-M\$350,000/year. The project financing from federal and state governments is proposed to include a federal government loan of M\$20.75 million and a grant of M\$10.98 million to MPJB.³

In addition, the drainage project is proposed to receive federal funds of M\$11.5 million from ADB, a direct federal budget allocation of M\$8 million and a direct Johore state budget allocation of M\$10.2 million, for a total of M\$29.7 million. The overall expenditure for the combined sewerage and drainage project is shown in Table 7.11.

It should be noted that the payback period for the ADB loan is 15 years, with a grace period of 3 years for the federal government and 4 years for MPJB.

¹1991: M\$43.0 million.

²1991: M\$68.7 million.

³July 1992: M\$2.49 = US\$1.00.

Chapter 7. Management Plan for Water Quality and Land Use

Table 7.10. Costs and phasing of the proposed Johore Bahru sewerage and drainage project at 1988 prices (in million M\$), 1990-1994.

Construction	1990	1991	1992	1993	1994	Total
Sewerage construction	0	3,387.9	6,963.5	9,708.8	8,585.0	28,645.2
Preliminary designs and contingencies	1,432.3	1,054.9	1,412.5	1,687.0	1,574.6	7,161.3
Subtotal	1,432.3	4,442.8	8,376.0	11,395.8	10,159.6	35,806.5
Drainage construction	2,278.5	2,990.0	4,126.6	4,639.8	3,771.2	17,806.1
Preliminary designs and contingencies	940.1	566.1	679.8	731.1	644.2	3,561.3
Subtotal	3,218.6	3,556.1	4,806.4	5,370.9	4,415.4	21,367.4
Total	4,650.9	8,000.9	13,182.4	16,766.7	14,575.0	57,175.9

Source: BKH (1989).

Table 7.11. Total expenditure for the proposed Johore Bahru sewerage and drainage project.

Financial sources	Expenditure	
	(M\$ millions)	(%)
Federal government	51.2	49.0
Johore state government	10.2	9.8
MPJB equity	6.5	6.2
Cost recovery from beneficiaries	36.5	35.0
Total	104.4	100.0

Source: BKH (1989).

FURTHER ACTIONS

1. With the implementation of the sewerage and drainage project, the Johore Bahru downtown area would achieve substantial benefits from increased attractiveness to investors, businessmen, tourists and residents. The user-fee system is viewed as a reasonable approach to pay for this scheme. The state, however, should strongly support increases in customer fees and charges, since the public does not appreciate the inadequacy of the current sewerage system and may not be ready to pay for the extra costs for its improvement. The project, thus, requires the strong political commitment of the federal, state and MPJB governments so that it will be given top priority. The public should also be educated about the benefits of this new system and the services it would get from the increased fees.

2. A thorough study should be done to evaluate the feasibility of the island on Sg. Skudai as the site of a proposed sewage treatment plant. The island is low-lying and close to town, which are both advantageous in reducing pumping costs. The sewage treatment plant would consist of a few buildings, several oxidation ponds and sludge drying areas to prevent leaching or the discharge of contaminants into the groundwater or river. Discharges will be required to meet the effluent quality standards.

However, this proposed site is currently a mangrove island that would have to be converted for the treatment plant's use. Thus, the very limited mangrove area in Johore Bahru will be further reduced. Another problem is the island's being in the direct view of the Istana Bukit Serene. The MPJB should meet with the Sultan to seek his approval before proceeding with the matter.

3. The merchants from the Central Market should be relocated to decentralize the area and thus minimize the problems of a large market facility. A related issue is the relocation of the Central Market. The MPJB and some private developers are planning to build smaller markets in new housing schemes, such as the one in Taman Johore.
4. The enforcement of rules on the monitoring of effluents from sewage treatment plants should be strictly undertaken.

Current monitoring is poor and the sampling procedures are not acceptable. Another problem is that many septic tanks are not maintained. There is no suitable trenching site for the septic tank sludge. Having the sewage treatment plant in Skudai or close by as part of ADB's proposed package will solve this problem.

5. The Kampong Atas Air project should be implemented. This project is being coordinated with the federal government to improve the conditions in existing coastal or riverine *kampong*. It is funded by ADB and coordinated by the Economic Planning Unit of PMD. It aims to develop a strategy for dealing with the extensive pollution and low living standards found in *kampong* that are built over intertidal areas. There are 50 pilot sites selected throughout the country. The focus is on sanitary facilities, erosion control and the improvement of the environment. The federal government is looking for an *in situ* solution instead of resettling the villagers. They hope the ADB study answers such questions as: How are we to deal with the problems of human and solid wastes? How can we improve the poor hygiene commonly practiced by people in these villages? Which institutions and resources should be mobilized to accomplish this?

The Kampong Atas Air project, which is coordinated by the Economic Planning Unit of the Prime Minister's Department, aims to develop a strategy for dealing with the extensive pollution and low living standards in kampong that are built over intertidal areas.

The *kampong* will be categorized according to the severity of their problems and the appropriate strategy for addressing them. Criteria for classification would include hygiene, current condition of related infrastructure, presence/adequacy of the garbage collection system and drinking water supply. Based on these, measures that will need to be taken, such as educational programs and infrastructural improvements (major or minor), are determined.

In South Johore, the *kampong* initially identified by the state for this project were Pontian Kechil and Sedili Besar. After further analysis, more sites are being recommended, including Kg. Tg. Pelepas (at the Sg. Pulai estuary), Kukup town and Air Masin (just north of Kukup).

This program will be useful in addressing the hygiene, sanitation and pollution problems in these villages.

Improvements on rural sanitation services in the state of Perak will also be undertaken. Here, the State Medical Health Services Department plans to convert 1,000 latrines into flush toilets along Sg. Perak and its tributaries from Grik to Kuala Kangsar. This will help reduce the river's pollution caused by the direct discharge of human wastes. This move came as a result of the concern over recent outbreaks of cholera in the area. The project will cost an estimated M\$100,000 or M\$100/toilet.

CHAPTER 8

MANAGEMENT PLAN FOR TOURISM DEVELOPMENT

INTRODUCTION

Tourists have been flocking to South Johore in increasing numbers over recent years, reaching 1.8 million in 1987. The widening market of the tourism industry has provided the impetus for the development of more facilities and programs for the visitors. Thus, the state government has been faced with the challenge of judging the suitability of each development proposal that comes its way.

Most of these projects are proposed on coastal areas, particularly along Desaru and the offshore islands. In many cases, however, these proposals lack consideration for their long-range impacts on the environment, the infrastructure and the local population. Numerous examples can show that this lack would lead to the degradation of resources, alienation of the local people and the eventual demise of the industry (Maragos et al. 1983; Clark 1985).

Therefore, tourism development should be carefully and sustainably managed to ensure consistent financial returns for the private developer, the regional authority and the state, while protecting the very resources that are being developed and utilized. This tourism management plan based on Kechik et al. (1991) provides general management guidelines and specific action plans for areas currently being developed for tourism (see Fig 8.1).

SITUATIONAL ANALYSIS

South Johore is endowed with several natural areas that have great tourism potential. Figs. 8.2 and 8.3 identify those that are under development at present. Figs. 8.4 and 8.5 present checklists of the demands on coastal resources in tourist areas of South Johore and the offshore islands.

Current Status

Between 1980 and 1984, the state's tourist rate increased at 9.5%/year, greater than the national annual rate of 6.7%. It was projected that the total number of tourists would reach 3.3 million in 1990 (SEPU 1988). This figure represents major earnings for the economy of Johore, with tourist expenditure roughly estimated at M\$500 million annually, increasing by 5% every year.

Chapter 8. Management Plan for Tourism Development

Resource Agency		Beaches (Desaru area)	Beaches (Outside Desaru)	Estuaries	Mangroves		Offshore islands
State	SSDTC	○	○				○
	SEPU	○	○○●				○
	State Tourism Office	○	○○●				
	SEDC	●					
	State DTCP		○				
	KEJORA	○○●	○	○○●	○○●		
	Johore Tourist Association	○	○	○○●			○○●
	MPJB			○			
	Pontian District Office				○		
	Kota Tinggi District Office		○				○
	Mersing District Office						○
	State DOFor	○	○	○	○		
	Harbour Master			○		○	○
	DOA	○	○				
	SDLM	○			○		
	DDI	○		○	○		
	Community Progress Section (Kemas)	●					
DPW			○				
Federal	TDC	○	○				
	Majlis Amanah Rakyat						●
	DOE			○		○	
	DOF	○○●		○	○	○	○○●
Others	Private sector	○○●	●	●	●	●	●
	Individuals	●	●	●	●	●	●

○Policies ○Plans ●Proposals

Fig. 8.1. A checklist of policies, plans and proposals for tourism development.

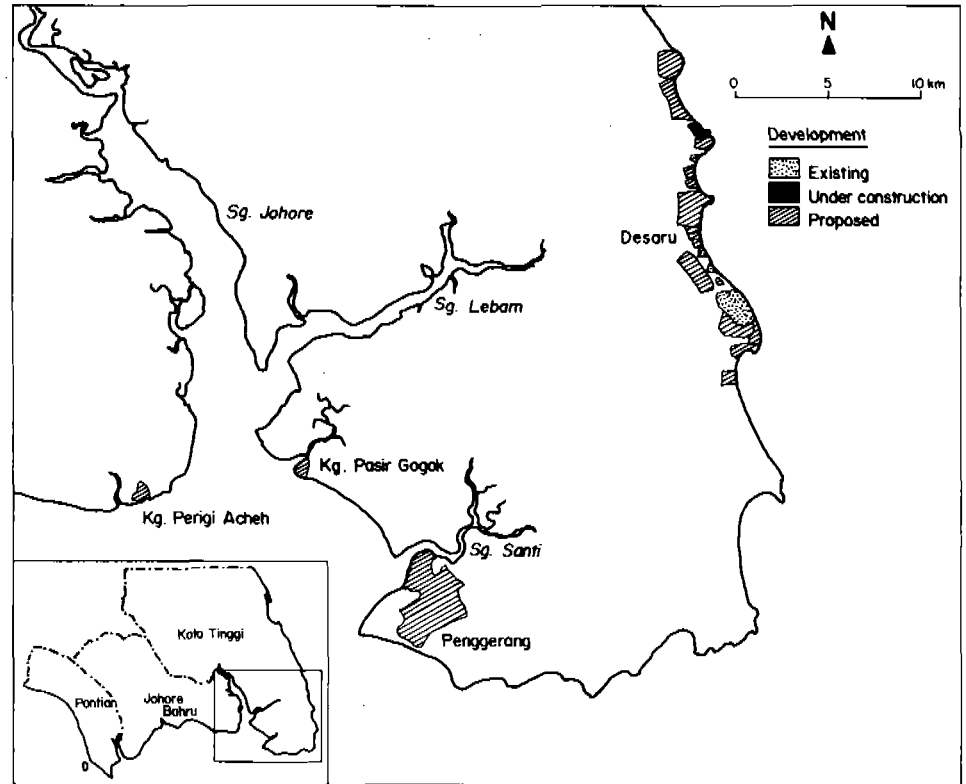


Fig. 8.2. Current and proposed tourist developments in Southeast Johore.

JICA (1985) reported that around 60% of the total number of tourists in Johore in 1987 visited the coastal area—38% in Desaru, 12% in Kota Tinggi and 10% on the offshore islands. The Desaru tourism area is expected to attract 73% of the total tourist arrivals to the southeast coast of Malaysia by 1995, when its expansion would have been completed. The projected number of tourist arrivals to the beaches is around 0.8 million guest nights and about 2 million day trippers. This represents a very high increase in tourist arrivals compared with the trend from 1978 to 1987, and is likely to create congestion and overcrowding along the beaches (Kechik et al. 1991).

The tourism industry in South Johore was providing employment for about 3,000 persons as of 1989 (Wong and Chang 1989b). There were 400 tour guides and drivers, 600 workers at food and shopping centers, 1,000 hotel (and catering) employees, 600 persons working at the Desaru complex and 400 more in the islands. These areas or industries that offer jobs to thousands may be found in Figs. 8.6-8.8, which are checklists of the basic amenities and attractions that tourists can avail of in South Johore and the offshore islands.

The bulk of the investments in tourism development for South Johore are in Desaru. In 1985, approximately M\$70 million was invested in the area. Other investments, such as those on the offshore islands and hotel developments outside Desaru, are estimated to have a maximum limit of about M\$35 million. Currently, the total investment is estimated at M\$100 million.

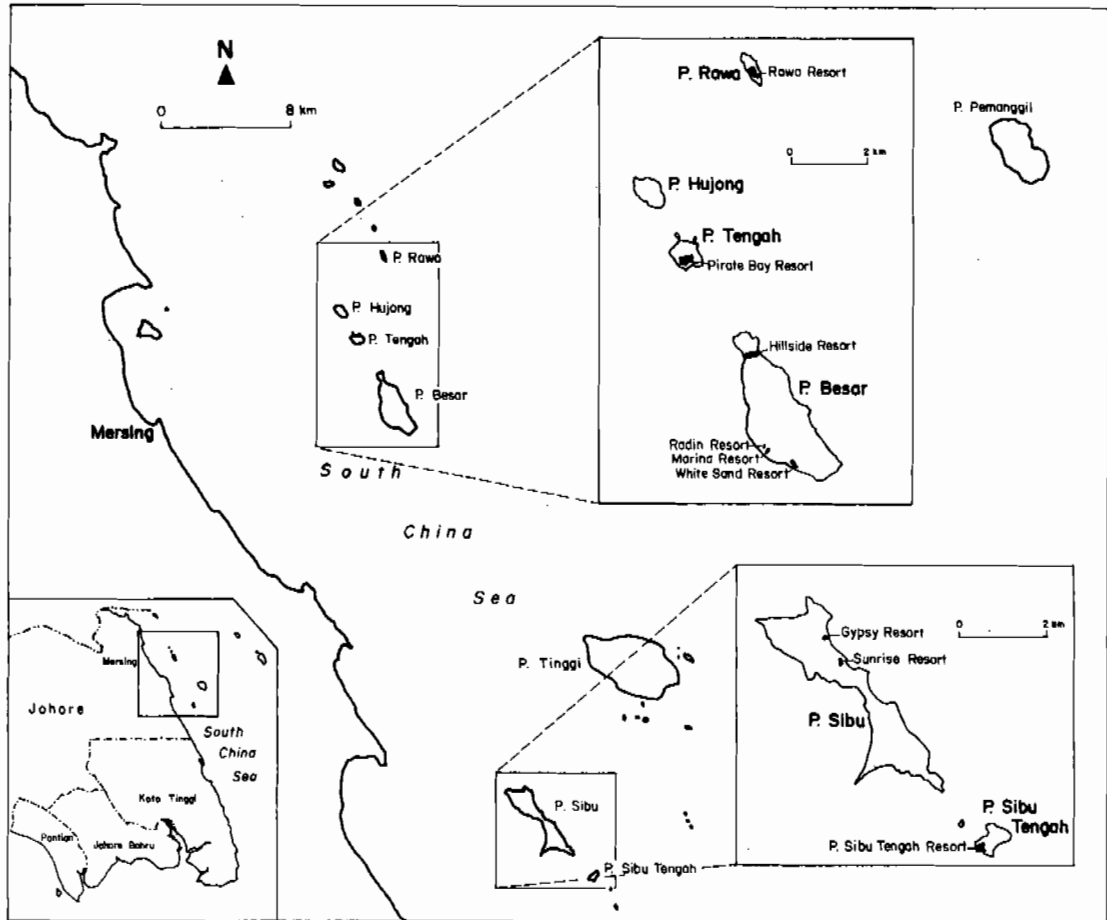


Fig. 8.3. Tourist development areas on the islands off Mersing.

Projections for the Industry

Looking to the future, projections for the number of tourists arriving on the southeast Johore coast are expected to increase from 161,570 to 450,000 in 1995, achieving a growth rate of about 13.7%/year. The total guest nights in Johore are estimated at 1.12 million in 1995 with 0.8 million guest nights in Desaru alone. Per capita expenditure by international tourists in southeast Johore's coastal area is approximately M\$250-330/guest night. The total estimated annual expenditure would be at M\$250-320 million. An additional 5,800 direct and 3,400 indirect job opportunities are expected as spin-offs of the development in the area (JICA 1985).

Demand Resource (By location)		Visitor		Local			Tour operators
		Domestic	Foreign	Local community	Authority	Entrepreneur	
Beaches	Tg. Logok	●					
	Tk. Temelah	●					
	Tk. Mahkota	●	●	●	●	●	●
	Tg. Gemoh						
	Tg. Kelesa						
	Tg. Siang	●		●			
	Tg. Balau	●			●	●	
	Tg. Lompat	●			●	●	
	Desaru	●	●			●	●
	Tk. Penawar	●		●	●	●	
Estuaries	Tk. Punggal	●	●	●	●		
	Sg. Pulai	●		●			
	Sg. Melayu	●		●		●	
	Sg. Skudai	●		●	●	●	
	Sg. Kim Kim	●		●			
	Sg. Serai	●		●			●
	Sg. Layang	●	●	●			
	Sg. Tiram	●	●	●	●	●	
	Sg. Johore	●	●	●	●	●	●
	Sg. Lebam	●		●	●		
Mangroves	Sg. Layau	●		●			
	Sg. Santi			●			
	Benut	●	●	●	●		
	Kukup	●	●	●	●	●	●
	Tg. Piai	●	●	●	●		
	Pendas	●	●			●	
	P. Juling	●		●	●		
Coast	Sg. Landas	●		●	●	●	
	Tg. Belungkor	●		●	●		
Islands	West	●	●	●	●	●	
	East	●	●	●	●	●	●
	P. Pisang	●	●			●	
	P. Rawa	●	●	●	●	●	●
	P. Hujung	●		●	●	●	●
	P. Tengah	●	●	●	●	●	●
	P. Besar	●	●	●	●	●	●
	P. Tinggi	●	●	●	●	●	●
	P. Mentinggi	●	●	●	●	●	●
	P. Sibn	●	●	●	●	●	●
	P. Aur	●	●	●	●	●	●
	P. Pemanggil	●	●	●	●	●	●
	P. Lima-Geruda		●		●		

Fig. 8.4. A checklist of the demands on coastal resources by various sectors of the tourism industry, South Johore.

Chapter 8. Management Plan for Tourism Development

Demand Resource	Beach					Mangrove					Coast			Estuary					Island										
	Color				Grain	Wood		Fishing	Aquaculture	Wildlife observation	Erosion control	Conservation	Fishing	Fish trap	Cruise	Fishing	Fish trap	Mussels	Cockles	Jetty	Transport	Corals	Fishing	Snorkeling	Diving	Cruise	Settlement	Water supply	Hiking
	Brown	Gold	White	Gray	Black	Coarse	Medium																						
Beaches	Tg. Logok			•			•							•		•													
	Tk. Temelah		•				•							•		•													
	Tk. Mahkota				•	•			•					•		•													
	Tg. Gemoh			•			•							•		•													
	Tg. Kelesa			•				•						•		•													
	Tg. Siang				•				•					•		•													
	Tg. Balau				•			•						•		•													
	Tg. Lompat													•															
	Desaru		•					•							•														
	Tk. Penawar		•						•						•														
	Tk. Punggal				•				•						•														
Estuaries	Sg. Pulau								•	•	•	•					•				•	•							
	Sg. Melayu									•	•	•					•				•	•							
	Sg. Skudai								•	•	•	•					•				•	•							
	Sg. Kim Kim								•	•	•	•					•				•	•							
	Sg. Serai								•	•	•	•					•				•	•							
	Sg. Layang									•	•	•					•				•	•							
	Sg. Tiram										•	•					•				•	•							
	Sg. Johore								•	•	•	•					•				•	•							
	Sg. Lebam									•	•	•					•				•	•							
	Sg. Layau									•	•	•					•				•	•							
Sg. Santi										•	•					•				•	•								
Mangroves	Benut				•			•			•	•									•	•							
	Kukup				•			•			•	•									•	•							
	Tg. Piai				•			•			•	•									•	•							
	Pendas				•			•			•	•									•	•							
	P. Juling				•			•		•	•	•									•	•							
	Sg. Landas				•			•			•	•									•	•							
	Tg. Belungkor				•			•			•	•									•	•							
Coast	West													•		•													
	East													•		•													
Islands	P. Pisang			•				•																			•		
	P. Rawa																												
	P. Hujung																												
	P. Tengah																												
	P. Besar			•				•							•		•					•	•		•	•	•	•	•
	P. Tinggi																												
	P. Mentinggi																												
	P. Sibul																												
	P. Aur																												
P. Pemanggil																													
P. Lima-Geruda																													

Fig. 8.5. A checklist of the demands on coastal resources, by activity/resource feature, in tourist resource areas in South Johore.

**MANAGEMENT ISSUES
AND PROBLEMS**

Coastal and Soil Erosion

Unmanaged land use for tourist facilities has caused numerous environmental problems. Extensive land clearing through the removal of large stands of mangroves and coastal forests has resulted in the loss of wildlife habitat and an increase in soil erosion. Some facilities have become affected by the erosion because they were built too close to the shore.

**Overuse of
Drinking Water Supply**

Groundwater is an essential source of drinking water. It is also important for the perpetuation of natural resources, as experienced on some islands such as P. Sibu Tengah. However, freshwater supply in some areas is being pumped and used at a nonsustainable rate. This results in the lowering of the groundwater table and may lead to saltwater intrusion. In such cases, groundwater quality becomes degraded, making it unfit for uses such as drinking and irrigation.

Water Pollution

Poor water quality also afflicts the beaches along Johore Strait, which is grossly polluted with domestic sewage (see Chapter 7). *Kelong* (which no longer function as fish traps) and certain aquaculture activities cause water pollution, too.

Since *kelong* are no longer economically viable as fish traps, some have been illegally converted into tourist accommodations and sportfishing platforms. The lack of adequate treatment of sewage from these structures has caused significantly elevated local levels of FC and other bacteria. Solid waste is also often dumped in the water. Similarly, concentrated cage aquaculture operations can give rise to localized pollution in the nearshore waters due to the accumulation of feed below the cages. Many chalets, especially the smaller ones, have also no proper sewage facilities.

Oil slicks from tanker spills can be a threat to recreational and fishing activities in beaches and other coastal waters. In recent years, collision between oil tankers and other vessels has resulted in oil spills near South Johore's waters.

Solid waste disposal poses a major problem in all tourist facilities. Many landfills are not well maintained, causing smelly and fly-infested surroundings. Improperly sited landfills lead to leaching into the ground and surface waters. This obvious lack of waste management presents potential health hazards to man and the environment.

The quality of some beaches on the east coast and the islands has been reduced because facilities were built too close to the shore. Consequently, the beaches have become prone to littering and indiscriminate dumping of

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Location	Settlement				Facility										Beach (Sand color)					Rock/stone (color)					
	Fishing	Agricultural	Aboriginal	Town	Jetty			Accessibility	Marques	Electricity	Water	Restaurants	Shops	Accommodations	Hotels (over water)	Others/recreation	1 (brown)	2 (golden)	3 (white)	4 (grey)	5 (black)	Black	White	Red	Mixture
					Wooden	Concrete	Others																		
Kg. Seribong	●				●			●	●								●								
Kg. Lunchu	●	●			●			●									●								
Kg. Teluk Jawa	●		●		●			●									●								
Kg. Rekoh	●																								
Kg. Pasir Putih	●				●			●	●	●	●	●				●									●
Batu Dawas		●			●																				●
Kg. Kabong		●	●																					●	
Kg. Perigi Acheh	●				●																				●
Kg. Tg. Langsung	●				●			●	●																
Kong Kong Laut	●					●		●			●	●	●												
P. Juling			●																						
Sg. Layang								●								●									
Kg. Sg. Tiram		●																							
Kg. Sri Medan	●	●																							
Kg. Ayer Puteh	●	●																							
Kg. Tengah	●	●			●			●	●																
Panchar	●					●		●	●																
Kg. Johore Lama	●	●			●																				●
Kg. Teluk Sengat	●			●	●			●	●	●	●	●	●	●	●										
Kg. Batu Burak	●				●												●								
Kg. Tg. Bual	●				●				●								●								
Kg. Mempung	●																●								
Kg. Sg. Layau	●		●		●			●	●							●									
Kg. Sg. Landac	●		●					●																	
Sg. Ambok		●			●																				
Kg. Bahru	●	●			●			●				●				●									
Kg. Pinang	●	●			●			●				●													
Kg. Tg. Serindi	●	●			●			●	●			●	●				●								
Kg. Linting	●				●												●								
Kg. Nor	●				●												●								
Tg. Surat	●				●			●	●							●	●								
Kg. Belungkor		●						●				●				●									●
Pasir Gogok	●				●						●	●	●	●											
Penebok						●																			
Tg. Pengelih					●			●				●				●				●		●	●	●	●
Kg. Sg. Buntu	●																								
Kg. Sg. Rengit	●			●				●	●	●	●	●	●												
Tg. Sepang	●	●						●						●			●								●
Kg. Gambur	●	●												●			●								
Tg. Punggal	●	●						●	●	●	●	●		●			●								●

Fig. 8.6. A checklist of the basic amenities/attractions offered by the tourist development area(s) in each community in South Johore.

Location	Settlement				Facility										Beach (Sand color)					Rock/stone (color)							
	Fishing	Agricultural	Aboriginal	Town	Jetty			Accessibility	Mosques	Electricity	Water	Restaurants	Shops	Accommodations	Hotels (over water)	Other/recreation	1 (brown)	2 (golden)	3 (white)	4 (grey)	5 (black)	Black	White	Red	Mixture		
					Wooden	Concrete	Others																				
Tg. Setajam	●	●						●																			
Tg. Penawar									●	●	●	●	●	●	●	●	●	●									
Tg. Balau	●							●						●													●
Tg. Siang								●						●													●
Tg. Kelesa								●																			●
Tg. Gemoh								●																			●
Sedili Kechil	●				●			●	●	●	●		●	●	●						●						●
Tk. Mahkota	●	●						●	●	●	●		●								●						●
Kuala Sedili	●	●		●		●		●	●	●	●	●	●		●							●					●
Tg. Tebal								●									●					●					●
Tg. Tenggara								●														●					●
Tg. Logok								●																			●
Kg. Sg. Danga	●	●	●		●			●								●											●
Kg. Sg. Melayu	●	●			●			●	●	●		●	●														●
Kg. Pendas Laut	●				●			●																			●
Kg. Pendas					●			●				●															●
Tg. Pelepas	●				●			●																			●
Kg. Sgg. Arang		●	●					●							●												●
Kg. Perpat Timbu	●	●			●			●							●												●
Kukup	●				●	●		●	●	●	●	●	●	●	●						●						●
Pantian	●			●				●	●	●	●	●	●	●	●												●
Ayer Baloi	●			●				●	●	●	●	●	●	●	●												●
Bonut	●			●				●	●	●	●	●	●	●	●												●
P. Pleang					●			●							●												●
Tg. Punggal								●																			●
Tg. Penawar								●	●		●																●
Sg. Punggal	●	●			●			●	●		●																●
Bkt. Karim								●																		●	●
Bkt. Sudin								●																		●	●
Bkt. Kering								●																		●	●
Bkt. Tinggi								●																		●	●
G. Panti		●						●														●	●	●	●	●	●

Fig. 8.6. (continued)

garbage. Cattle and goat grazing near or within the vicinity, on the other hand, has posed animal waste problems. All these encourage breeding of sand flies, which is not only unsightly but unhygienic as well.

Lack of Regulations for Scuba Diving

No safety measures are imposed on scuba diving activities, which are proliferating in connection with the boom in the tourism industry. While there have been minimal problems with established diving shops (such as those in Desaru) despite the lack of regulations, there have been numerous complaints against small-scale scuba diving operations regarding safety, e.g.,

Chapter 8. Management Plan for Tourism Development

Facility/ attraction	Lodging										Food				Shopping						Bank		Entertainment			Sports and Recreation										
	Hotel	Chalet	Rest. houses	Hostel/dorm	Hut	Village house	Camping ground	Restaurant	Starbs	Homebars	Fastfood	Supermarket	General store/minimarket	Souvenir/gift shop	Photo shop	Laundry/dryclean	Wet market	Night market	Pharmacy/medical hall	Bank	Money changer	Nightclub	Bar/pub	Cultural show	Cinema	Sports center	Gymnasium	Court game	Field game	Golf course	Indoor sport	Fishing lodge	Boating			
Beeches	Tg. Logok						•																													
	Tk. Temelah																																			
	Tk. Mahkota	•					•	•	•	•																										
	Tg. Gemah																																			
	Tg. Kelesa																																			
	Tg. Siang							•																												
	Tg. Balau	•						•																												
	Tg. Lompat							•																												
	Deazru	•	•	•	•	•	•	•	•	•				•									•	•	•			•	•	•	•	•	•	•	•	
	Tk. Penawar							•																												
Tk. Punggal	•			•			•						•																							
Estuaries	Sg. Pulau																																			
	Sg. Melayu							•					•																							
	Sg. Skudai																																			
	Sg. Kim Kim																																			
	Sg. Serai																																			
	Sg. Layang																																			
	Sg. Tiram																																			
	Sg. Johore	•	•					•	•	•			•		•		•		•	•			•					•			•	•	•	•		
	Sg. Lebarn									•				•																						
	Sg. Layau													•																						
Sg. Sandi																																				
Mangroves	Benut																																			
	Kukup						•	•	•			•	•																							
	Tg. Piai																																			
	Pendas							•					•																							
	P. Juling																																			
	Sg. Landaa																																			
Tg. Belungkor								•																												
Coast	West																																			
	East																																			
Islands	P. Pisang																																			
	P. Rawa	•				•		•					•									•	•								•			•		
	P. Hujung																																			
	P. Tengah																																			
	P. Besar	•				•		•	•	•																		•							•	
	P. Tinggi					•			•																											
	P. Mentinggi																																			
	P. Sibu								•																											•
	P. Aur	•																																		
	P. Pemanggil																																			
P. Lima-Geruda																																				

Fig. 8.7. A checklist of the basic amenities/attractions offered by various tourist resource areas in South Johore.

LEGAL AND INSTITUTIONAL ISSUES

The tourism industry in Malaysia is relatively new. However, it has become one of the priority areas for development that involve both the federal and state governments, resulting in its very rapid growth. The main problem with tourism development is the lack of environmental considerations in policy and program formulation, and also on all levels of implementation. This is because policy- and decisionmakers, as well as the implementing agencies, lack awareness of the environmental dimensions of development. This state of affairs is compounded by the fact that the various government

Chapter 8. Management Plan for Tourism Development

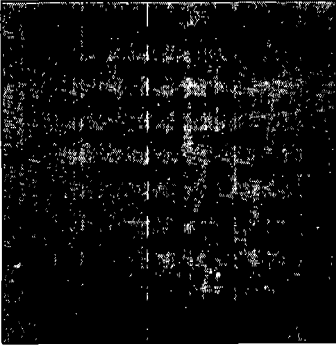
Technological feature	Resource	Access					Water			Telecommunications			Health				Electricity			Transportation									
		Highway	State road	Rural road	Estate road	Lateral road	Piped	Well	River	Telephone	Solar telecommunications	Wireless	Telex	Government clinic	Private clinic	Rural clinic	Hospital	Main	Generator	Kerosene	Bus	Taxi	Car hire	Bicycle hire	Boat hire	Cruise boat	Speedboat	Ferry	
Beaches	Tg. Logok																												
	Tk. Temelah																												
	Tk. Mahkota																												
	Tg. Gemoh																												
	Tg. Kelesa																												
	Tg. Siang																												
	Tg. Balau																												
	Tg. Lompat																												
	Desaru																												
	Tk. Penawar																												
	Tk. Punggai																												
Estuaries	Sg. Pulai																												
	Sg. Melayu																												
	Sg. Skudai																												
	Sg. Kim Kim																												
	Sg. Serai																												
	Sg. Layang																												
	Sg. Tiram																												
	Sg. Johore																												
	Sg. Lebam																												
	Sg. Layau																												
	Sg. Sant																												
Mangroves	Benut																												
	Kukup																												
	Tg. Piai																												
	Pendas																												
	P. Juling																												
	Sg. Landas																												
Coast	Tg. Belungkor																												
	West																												
Islands	East																												
	P. Pisang																												
	P. Rewa																												
	P. Hujung																												
	P. Tengah																												
	P. Besar																												
	P. Tinggi																												
	P. Mentinggi																												
	P. Sibn																												
	P. Aur																												
	P. Pemanggil																												
P. Lima-Geruda																													

Fig. 8.8. A checklist of the infrastructural/technological conveniences offered by the various tourist resource areas in South Johore.

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Impact / Resource	Mining		Fishing			Agriculture	Forestry		Sea transport	Urban			Social		Economic		Tourist		
	Sand	Mineral	Fishing	Aquaculture	Deep-sea	Oil palm	Logging	Mangrove	Pollution	Land clearing	Settlement	Resort development	Industry	"Yellow culture"	Displacement	Values	Income	Employment	
Beaches	Tg. Logok					•	•			•									
	Tk. Temelah																		
	Tk. Mahkota			•													•	•	•
	Tg. Gemoh							•											
	Tg. Kelesa			•		•	•												
	Tg. Siang	•																	•
	Tg. Balau			•		•											•	•	•
	Tg. Lompat											•							
	Desaru											•							•
	Tk. Penawar	•					•	•		•					•				•
	Tk. Punggal			•				•		•									•
Estuaries	Sg. Pulai			•				•									•	•	
	Sg. Melayu			•				•									•	•	
	Sg. Skudal			•				•	•			•					•	•	
	Sg. Klm Kim							•											
	Sg. Serai			•				•											
	Sg. Layang								•										•
	Sg. Tiram							•											
	Sg. Johore			•				•	•								•	•	•
	Sg. Lebam			•	•			•	•								•	•	
	Sg. Layau							•									•	•	
Sg. Santi		•											•						
Mangroves	Benut							•									•	•	•
	Kukup			•	•												•	•	•
	Tg. Piai																		•
	Pendas							•									•	•	•
	P. Juling							•											
	Sg. Landas				•												•	•	
	Tg. Belungkor		•							•									
Coast	West			•					•								•	•	•
	East			•					•								•	•	•
Islands	P. Pisang																		
	P. Rawa			•													•	•	•
	P. Hujung			•													•	•	•
	P. Tengah			•													•	•	•
	P. Besar			•											•		•	•	•
	P. Tinggi			•											•		•	•	•
	P. Mentinggi			•											•		•	•	•
	P. Sibu			•											•		•	•	•
	P. Aur			•											•		•	•	•
	P. Pamanggil			•											•		•	•	•
P. Lima-Geruda														•		•	•	•	

Fig. 8.9. A checklist of the various economic activities and their impacts on tourist resources at different sites in South Johore and on the offshore islands.



and private agencies involved in the planning and development of tourism act independently of each other. Planning and decisionmaking are also done without regard for development in other sectors even if they may spatially overlap. This has given rise to conflict in coastal resource uses.

The tourism industry touches on various aspects of everyday life. Therefore, it has laws that govern other sectors, e.g., facilities and amenities development, trade, transportation, health (especially that pertaining to water quality), sanitation and food.

This multidimensional nature of tourism is also reflected in the state's tourism policies (SEPU 1988):

1. Promote the tourism industry while ensuring pollution control, preservation of areas of natural beauty, infusion of local values and the safeguarding of the interests of the local community.
2. Implement tourism projects through privatization.
3. Create tourist attractions that promote local history, culture and recreation.
4. Improve existing tourist attractions regarding basic facilities, cleanliness and aesthetics.

For the state of Johore, the agencies below are involved in tourism planning, decisionmaking, evaluation or promotional activities:

1. The State Social Development and Tourism Committee (SSDTC) and the State Special Committee on Tourism (SSCT) are involved in policy and development decisions for tourism.
2. The SEPU coordinates the overall tourism planning for the state. The State Tourism Officer also undertakes activities related to tourism.
3. The SIDC evaluates large-scale tourist development proposals for approval purposes.
4. The federal Tourism Development Corporation (TDC), through its regional office in Johore Bahru, is in charge of promoting existing tourist attractions.

In addition, a new department that will be involved in promotional activities for tourism will be formed. Its scope of responsibilities will probably broaden as it becomes more established.

Out of the 11 beaches in the management area, the only ones that are covered by comprehensive policies, plans and proposals are those in the region under KEJORA. These include Tg. Siang, Tg. Balau, Tg. Lompat, Tg. Penawar, Tg. Punggai, Desaru and Telok Mahkota, Sedili. For instance, KEJORA has a standard requirement of a 60-m construction setback from the mean high water line, which establishes the limits of the beach reserve with regard to all development and construction activities. This setback is not a legal requirement in the by-laws for all other beaches since it is only a condition enforced by KEJORA. Another issue is the lack of clarity as to which agency has the legal or administrative jurisdiction over these beach reserves.

Policies on the management of estuarine areas are limited to development restrictions for erosion control. The DDI restricts the development of river reserves to prevent erosion and silting. However, because of poor enforcement of these restrictions in many parts of the estuarine areas, the river reserves are illegally occupied by squatters, and small-scale businesses and service shops. These areas are also being used for waste disposal. On the other hand, current policies on the management of mangroves are primarily in terms of their potential economic contribution as sources of forestry products. Their economic value as nature tourism areas is yet to be evaluated or appreciated.

One tourist potential of the area that has just been tapped is its historical value. The Johor Heritage Trust Corporation is currently undertaking a project to identify resources in Sg. Johore that may have some historical significance. This project is a necessary step in the development of this type of tourism in the state.

MANAGEMENT GOAL AND OBJECTIVES

The overall goal of this plan is to aid in the management of tourism as an environmentally sustainable industry. Its objectives are to:

- minimize the adverse impacts of tourist development on coastal ecosystems;
- preserve areas of outstanding natural beauty as well as sensitive coastal, marine or estuarine habitats and areas of significant scientific interest;
- lessen current development pressure on the beaches and islands by developing alternative tourist resources, such as estuarine and mangrove areas; and
- ensure that all development proposals are evaluated so that they do not adversely affect the environment.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

Tourism resource zones

The "tourism resource zones" are broadly categorized, based on the existing demand for and supply of these resources for tourism purposes (Kechik et al. 1991). These are the southern gateway, mangrove estuarine, historical estuarine, beach, coastal/nearshore water (Fig. 8.10) and offshore island zones.

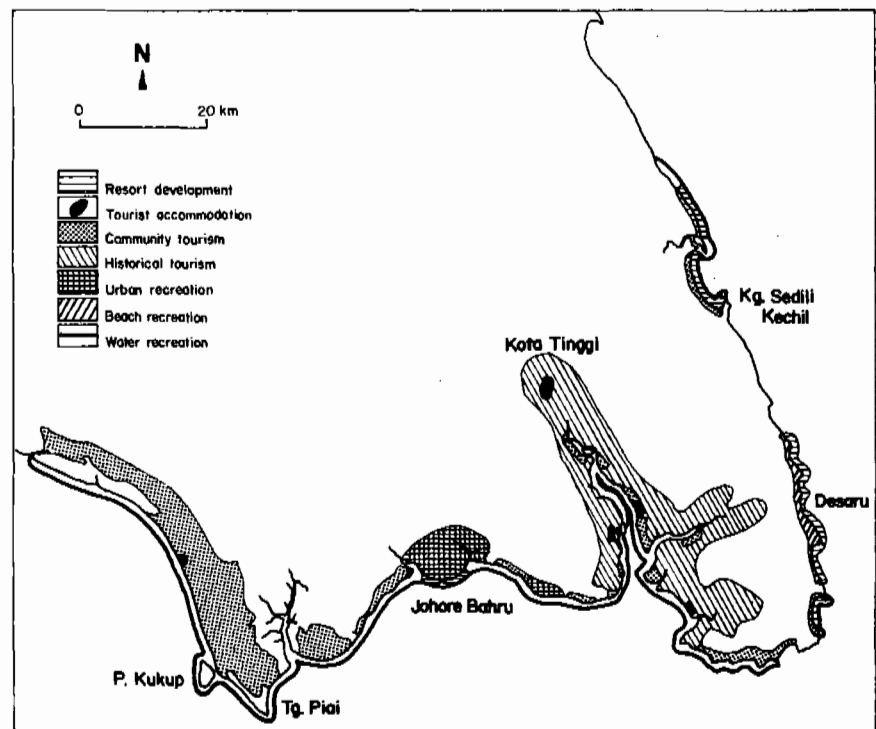


Fig. 8.10. Management zones for tourism and recreation in South Johore.

Tourism development (limitation) zones

Within each tourism resource zone, an area is identified according to its appropriateness for any of the different scales of development, namely those of: large-scale resorts, medium-scale tourist accommodations and small-scale community tourist accommodations. This zonation is based on environmental considerations, management objectives and existing facilities.

Proposed protected areas where tourism can be a compatible activity

In the coastal forest and mangrove management plans (Chapters 2 and 3, respectively), several areas of significant natural forest have been recommended to be established as protected areas. These are suitable for tourist activities that are compatible with sustainable management and the conservation of the natural environment. Management plans for each protected area should be developed to regulate these activities.

MANGROVES

1. The coastal fringe of mangrove outside the bunds, including the large forest at Benut, has been proposed as a Protective Forest. Because it is a nesting ground for migratory seabirds and shorebirds, the Benut forest could be a venue for nature tourism activities such as boat tours and bird/wildlife watching (see Chapter 3).
2. P. Kukup and Tg. Piai are proposed as State Parks (see Chapter 3). P. Kukup is a unique mangrove island where a short, interpretive nature trail could be built. Boat tours and bird watching could also be encouraged. On the other hand, Tg. Piai has only a narrow strip of coastal mangrove forest remaining. Being at the southernmost tip of the Asian continent, it could easily be promoted as a tourist attraction. A boardwalk interpretive trail to this southern point could provide access for visitors.

COASTAL FOREST

The inland freshwater swamp forest and the downstream mangroves in the Sg. Sedili Kechil basin have been proposed as State Parks in the coastal forest management plan (Chapter 2).

The forest does not only lessen the impact of floodwaters on the lowlands and protect water quality, which may affect downstream aquaculture developments and estuarine fisheries, but it is also an important nature tourism resource. It is the only transitional forest from mangrove to freshwater swamp woodland in Peninsular Malaysia. This proposed protected area extends along the coast going south to Tg. Siang, where the last stands of coastal *kapur* forest in the peninsula remain.

ISLANDS AND SURROUNDING WATERS

The waters up to 3 nautical miles from the islands of P. Rawa, P. Hujung, P. Tengah, P. Besar, P. Tinggi and P. Sibu are gazetted as protected areas (Fig. 8.11). Tourism, if strictly regulated, is considered a compatible activity as stated in the objectives of island-marine park management (see Chapter 9).

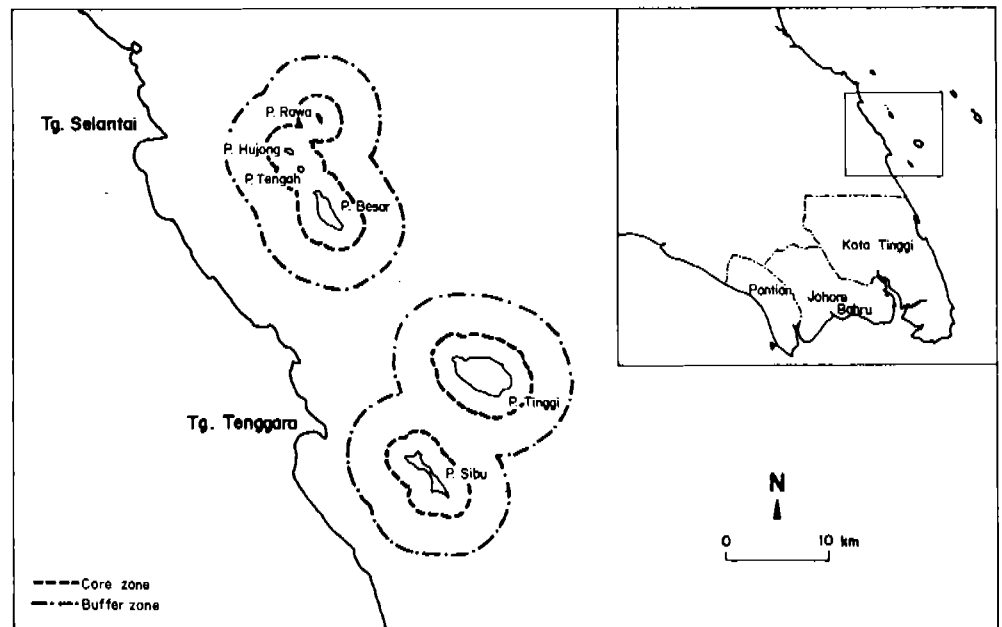


Fig. 8.11. Marine park zones on the offshore islands.

General Guidelines

Tourism resource zones

SOUTHERN GATEWAY

1. Water quality standards for recreation and tourism use should be established and enforced in areas such as Johore Strait and the Sg. Skudai estuary, as stated in Chapter 7.
2. Large-scale and high-intensity tourist and recreational development should be restricted and monitored along the mangroves, such as those along the Sg. Skudai estuary, and between Stulang Laut and Pasir Gudang.

MANGROVE ESTUARINE ZONES

1. Selected mangroves such as those in Benut, P. Kukup, Tg. Piai and those along Sg. Skudai near Johore Bahru town should be designated for protection as wildlife sanctuaries for nature tourism, as stated in Chapter 3.
2. Mangroves should be promoted and regulated as tourist and recreational areas for activities such as birdwatching, river cruises and recreational fishing.

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3. Local economic activities that can be compatible with tourism, such as cage culture, aquaculture, and orchard, rubber and oil palm farming should be integrated with the tourism industry.
4. Industrial and residential development (e.g., the Tg. Langsat Petrochemical Industrial Estate and the second linkage development with Singapore) should be strictly regulated and water quality standards stringently enforced to ensure that development does not adversely affect the tourism industry.

HISTORICAL ESTUARINE ZONES

1. Historical artifacts, relics and locations should be identified, restored and promoted.
2. Oral and written traditions should also be recorded and presented in interpretive exhibits.
3. Industrial development should be carefully managed to minimize its impacts on the environment and therefore on the tourism industry.

BEACHES

1. The construction setback of 60 m from the high water mark for buildings and other construction should be required to avoid erosion and to protect the beaches.
2. Marina development should be carefully regulated to avoid erosion and sedimentation.
3. The coastal forest should be protected as a wildlife habitat and a valuable tourist resource.
4. Areas should be zoned to protect natural watersheds (e.g., swamp forests).
5. Sand mining of beaches should be prohibited and a prohibition zone in the nearshore waters where sea-based sand mining is allowed should be established (see Chapter 5).

OFFSHORE ISLANDS

Detailed recommendations for offshore islands are given in Chapter 10.

Tourism development (limitations) zones

The following are recommended:

RESORT DEVELOPMENT

1. Offshore islands should be designated as prohibition areas for resort development.

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2. Requirements for permitted building development should be as follows:
 - a. By type: hotels, motels, restaurants, shopping arcades, sports complex, theaters, museums, aquariums, holiday homes and marina parks.
 - b. Minimum site area: 10 acres.
 - c. Maximum density: a plot ratio of 1:1.
 - d. Maximum building height: up to 6 stories, depending on the development's relationship to surrounding natural or man-made features.
 - e. Maximum land coverage: 60%.
 - f. Minimum shoreline setback: 60 m. No development or construction will be allowed within this limit to protect beaches, avoid erosion and thus prevent the administrative closure of beaches. Where the beach width exceeds 60 m, the whole beach is to be preserved.
3. Sewage disposal
 - a. Resorts should possess stabilization ponds, aerated lagoon systems, systems such as activated sludge, contact stabilization and extended aeration, or a rotating biological contactor appropriate to the scale of the development. For resorts of the scale of the Desaru complex, the oxidation pond system is recommended.
 - b. Oxidation pond standards
 - 1) Siting: flood-free lowland area to prevent the leaching of the ground - or surface water and to facilitate gravity flow.
 - 2) Discharge points: far enough offshore, away from coral reef areas and rich fishing grounds, to maintain water quality standards.
 - 3) Water quality standards: Class II B for freshwater or Type II for marine water (DOE 1988).
 - c. Sewage outfalls should be located far enough from the shore and in such a location that the effluent does not affect the recreational area or any sensitive habitat, such as coral reefs and seagrass beds. This sewage effluent should meet the standards stipulated in the Environmental Quality Act.

TOURIST ACCOMMODATION

1. Requirements for permitted building development are as follows:
 - a. By type: Tourist accommodations are low-profile and *kampong*-style, e.g., longhouses, chalets, huts with attached or shared bathing facilities and with meals or eating facilities provided. Recreational facilities and services are optional.
 - b. Maximum site area: 10 acres.
 - c. Maximum density: a plot ratio of 2:5.

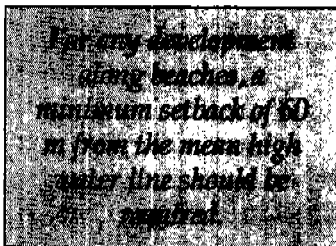
The maximum number of people per room is set by the local authority, based on the room size. This is a standard limitation stipulated in the license and should be strictly enforced.
 - d. Maximum building height: 1 story.
 - e. Maximum land coverage: 40%.
 - f. Minimum shoreline setback: 60 m. Where the beach exceeds 60 m, the whole beach is to be preserved.
2. Sewage disposal
 - a. A centralized sewage treatment system or septic tanks with filter beds should be installed.
 - b. Water quality: Class IIB for freshwater or Type II for marine water (DOE 1988).

**COMMUNITY TOURIST
ACCOMMODATION**

1. Requirements for permitted building development are as follows:
 - a. By type: Community or *kampong* tourist accommodations include huts and longhouses, with bed and breakfast provisions. Meals or eating services are optional.
 - b. Sewage disposal: individual septic tank or pit latrine. A centralized community treatment system is recommended.
2. Water supply should be adequate for the maximum number of visitors.
3. The owners of homes to be opened to visitors should get a certificate from DOH confirming that their houses are suitable, clean and have adequate facilities for resident visitors.

Tourism area development

1. Siting, design and construction of facilities
 - a. Soil erosion control measures should be implemented to reduce the loss of topsoil and runoff in waterways during construction. Phased development, cover cropping, silt fences and other erosion control measures should be incorporated into the construction plan.
 - b. Proposed erosion control measures should be approved by DDI.
 - c. No mangrove forests should be converted for tourist development.
 - d. The design of facilities adjacent to mangrove forest areas should have minimal impact on these forests. Buildings adjacent to mangroves (with a buffer area of less than 400 m) can still affect the mangrove environment through changes in drainage patterns, soil erosion and pollution runoff. Measures to prevent such impacts should be required.
 - e. The design of facilities in or adjacent to coastal forest areas should have minimal impact on these forests. Every effort should be made to protect the forest environment as a valuable tourist resource. Detailed management guidelines for development in coastal forests in the Desaru and Sg. Sedili Kechil areas are given in Chapter 2.
 - f. *Kelong* should not be used for tourist accommodations. Any such activity is unlawful under the Innkeepers Act.
2. Setback
 - a. For any development along beaches, a minimum setback of 60 m from the mean high water line should be required.
 - b. For any development next to mangroves, a construction setback of 400 m from the mangrove's edge is recommended. This will help reduce the impact of soil erosion and pollution runoff on mangroves and water quality.
3. Sewage waste disposal - There should be adequate measures for sewage waste disposal in all tourist developments. This is a very important issue that should be carefully addressed. Maintenance of high water quality in particular is essential to the success of an area as a tourist attraction.
4. Construction of marinas
 - a. Construction of marinas and any dredging of the seabed should only be done if there are accompanying measures to reduce the resulting water turbidity.



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- b. Silt fences should be required so that adjacent rivers or nearshore habitats (e.g., coral reefs) will not suffer from the increased turbidity.
 - c. Each marina should have pump-out facilities for emptying the human waste tanks on the boats and removing used oil from the engines to avoid dumping these at sea.
 - d. Solid waste receptacles should also be provided at each marina.
 - e. The specific design of the marina should be evaluated in terms of its effect on sediment transport and coastal erosion.
5. Water quality - All developments adjacent to recreational areas should be evaluated on the basis of their cumulative impacts on the water quality. (See water quality standards for resort development, under "Tourism Development Zones," in this chapter.)
6. Solid waste management
- a. Each tourist facility should provide adequate garbage containers and have a regular collection system.
 - b. The tourism operation should either have its own landfill or arrange with a nearby local authority that has one.
 - c. There should be sanitary landfills that are lined to prevent the leachate from going into the groundwater.
 - d. This leachate should be pumped out and undergo sewage treatment.
 - e. Open burning of trash should be discouraged, especially in urban areas.
7. Groundwater supply
- a. Evaluation of groundwater supply should be undertaken prior to development, especially in rural areas and on islands. Water supply is evaluated to make sure that it is adequate for the local community and for the total projected future population. The island's or rural population's water requirement is 40 g/capita/day.
 - b. Tapping of groundwater for tourist development may be allowed, but only when carefully monitored. Tourist resort/accommodation development should take into account the recommended level of demand with respect to the availability of water supply. The quantity of water supply would determine the threshold tourist capacity and the resort size.

Evaluation of groundwater supply, to check the adequacy of this resource for the local community and the total projected future population, should be undertaken prior to development, especially in rural areas and on the islands.

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8. Involvement of local population - Tourism development should always benefit the local population. This can either be through direct or indirect employment. Indirect employment involves jobs in associated transportation services, acting as tour guides, producing arts and crafts (excluding seashell craft) for sale, charter fishing, or highlighting traditional activities in tours of villages or agricultural operations (e.g., local orchards, rubber or oil palm plantations and aquaculture farms).
9. Carrying capacity - The carrying capacity of isolated discrete areas, such as islands or sites adjacent to any protected area, should be assessed as part of the evaluation exercise for any development proposal.

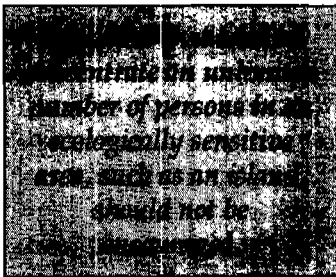
For the islands, specific management plans that include basic carrying capacity recommendations should be developed. Studies in this report will need to evaluate the amount of available water, sewage system limitations, types of preferred experience (i.e., isolated or social) and the effects on the flora and fauna.

Activities that tend to concentrate an unlimited number of people in an ecologically sensitive area, such as an island, should not be encouraged. Therefore, island beach festivals are not advisable unless these are carefully planned, so that the numbers are limited to what the environment can take in short inputs.

10. Protected areas - Tourist operations should not have adverse impacts on the nearby protected area's environment and only compatible tourist activities should be allowed.
11. Education and interpretation - All tourist developments should be required to present educational exercises geared toward the decisionmakers, the local population and the visitors.

Some examples are interpretive trails, exhibits and visitor centers. This can also include brochures and posters, presentations and tours that highlight the area's resources, cultural activities, industry and historical significance.

Educational efforts may also focus on the area and its management -- why the area and its resources are protected, how waste and sewage are managed and how water quality is maintained. Even the local schools may have art contests or other activities with environmental themes. Moreover, the general public may be educated through advertisements on print and television.



**RECOMMENDATIONS FOR
LEGAL AND INSTITUTIONAL
ARRANGEMENTS**

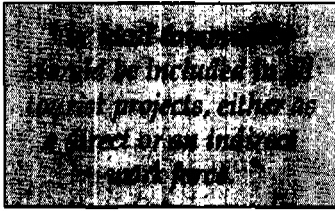
Legal Aspect

Areas outside local authority To ensure that all areas are subjected to the local planning authority, the state authority should declare via Section 5(3) of the Town and Country Planning Act (1976) areas not under the local authority (such as the islands) to be areas within the provisions of this Act.

Siting, design, construction, and erosion and siltation control The recommended guidelines outlined earlier in this chapter should be incorporated into the structure plan of the local planning authority and in the rules of the Town and Country Planning Act (1976) to enable their enforcement in areas where tourist development is being planned. There is also a need to review the Local Government Act (1976) and its By-laws, and the Street, Drainage and Building Act (1974) and its Uniform Building By-laws (1986), to ensure that these guidelines will be incorporated as requirements for any tourist development. With respect to erosion and siltation control, there is a need to enforce the Land Conservation Act (1960, revised 1989).

**Planning, Implementation
and monitoring**

1. The requirement of EIAs for all large-scale coastal tourism projects (above 80 rooms) should be enforced, as legislated in the 1987 Environmental Quality (Prescribed Activities) (EIA) Order.
2. An EIA should be carefully reviewed by DOE and other relevant agencies (depending on the type of tourist facility) to identify mitigating measures that should be undertaken by the developer at his cost. Factors to be considered in the evaluation should include the: design of sewage and solid waste systems; availability of groundwater supply for local community and tourist activities; ecological, economic and social impacts of the development; and the area's and ecosystem's carrying capacities.
3. The mitigating measures to be undertaken by the developers should be enforced, based on the evaluation of the EIA, to ensure environmentally sustainable development. The developers will have to work closely with DOE, DTCP, SEPU, DOF, DDI and other state agencies to ensure that their concept design and development scheme meet all the general and specific guidelines recommended in this plan.
4. Based on the EIA, DOE should develop a monitoring program to be implemented by the developer at his own cost.



5. During project implementation, there should be spot checks by the relevant government agencies earlier mentioned to ensure that the conditions agreed on are adhered to.
6. The Certificate of Fitness should be issued only upon successful implementation of all the recommended environmental mitigating measures in this plan.
7. The local community should be included in all local tourist projects, either as a direct or an indirect work force.

Construction setback along beaches

The designation of a beach reserve where construction would be prohibited (but public access would be allowed) will satisfy the recommendation for establishing a construction setback. This could be accomplished as an amendment to the Local Government Act (1976) and the Uniform Building By-laws (1986).

The beach reserve is recommended to be 60 m in width from the mean high tide mark shoreward. Where the beach is wider than 60 m, the whole beach is to be designated as a reserve.

The specific guidelines recommended in this plan, which include pollution control measures and the effects on sediment transport, should be incorporated into the Local Government Act (1976) and the Land Conservation Act (1960, revised 1989) in areas where marinas are proposed.

Management of community tourism

Houses where tourists are allowed to stay with families should be required to obtain a certificate of approval from the Department of Tourism (DOT) and DOH.

As part of the permit application, a DOH certification for all toilet facilities and water supply should be required. Upon approval, these community tourism homes would be given certificates and then registered with DOT. These homes would be included in the visitors' guide issued by DOT, which gives the locations of approved accommodations and contact person(s). Establishing this program would require new legislation.

Regulation of the scuba industry

The scuba diving operators should first be legally allowed to conduct charter operations. The Fisheries Act (1985) should be appropriately amended to provide for the licensing and the enforcement of conditions attached to these licenses.

To maintain acceptable safety levels in scuba diving, it is necessary to establish some legal requirements, such as periodic hydrostatic and visual inspections of air tanks and compressors. The government should officially require and endorse professional training for diving instructors and leaders with the Professional Association of Diving Instructors, National Association of Underwater Instructors, British Sub Aqua Club and other internationally recognized scuba diving organizations. As a requirement of the license, diving operators should show proof of certification by any of such organizations. Without this, the diving operator would not be able to conduct diving tours in the marine parks. If the operator is found to have violated any of the organization's rules, then the license should be revoked.

These diving operators would also need to be registered with DOF to be permitted to operate within the marine park areas.

Institutional Aspect

Review and coordination of development proposals

1. The committees established by the state authority of Johore should submit to CRC all tourist and other development proposals in the coastal zone that may have detrimental effects on the tourism industry. The CRC should review and present specific recommendations to the state government regarding these proposals. The proposed Environmental Section of SEPU should provide the necessary technical support to CRC.
2. There is obviously a need to review the functions of the newly formed state tourism department and the two main state committees dealing with tourism (SSDTC and SSCT), in relation to SEPU, which has an overall role in planning. This will help eliminate duplication of their functions, and will also ensure proper coordination in planning and implementing tourist development proposals. It is recommended that there should be only one state committee dealing with tourism.
3. There should be a link between the state committee dealing with tourism and the Malaysian Tourism Development Corporation/Singapore Tourism Promotion Board Joint Committee on Tourism by way of representation from either of the committees.

State Tourism Department

It is recommended that the newly formed state tourism department be given these additional responsibilities:

1. to act as the secretariat of the state committee dealing with tourism, so that it would be active in planning for tourism development in the state;
2. to regulate and manage the development of tourism in the state;

3. to work with the Mersing District Council to see to it that the islands' development is in accordance with the required construction and development control guidelines (e.g., carrying capacity of rooms); and
4. to carry out periodically a training program throughout the year to assist both the private and public sectors in preparing brochures, exhibits, signs, public tours and presentations.

**National Parks-
Johor Corporation**

The proposed NPJC should continue to seek the advice of experts in park management from federal departments, and national or international organizations. It should begin the tasks of establishing land parks under the National Parks-Johor Enactment and developing the required management plans. The Johor Parks Department should build up its own staff and expertise as the number of parks expand to implement these management plans effectively.

**Development of
historical tourism**

1. The state government should support the Johore Heritage Trust project in identifying and restoring the historical sites on Sg. Johore and other parts of the state.
2. The state should subsidize the restoration of the historical sites identified in the project and establish a policy that will encourage private participation in these projects.

AREA-SPECIFIC PLANS

Desaru

The proposed plans for tourism development at Desaru are extensive. Large- and medium-scale projects are proposed from Tg. Siang to Tg. Punggai (Fig. 2.4 and A.3). The Desaru International Resort project presents a major opportunity for KEJORA to coordinate the participation of experts from relevant government departments, universities and nongovernmental organizations (NGOs) with the project's planners in coming up with a plan that meets the needs of an international class tourist resort, yet at the same time protecting the environment and minimizing the socioeconomic impacts on the local population. Specific guidelines for managing the Desaru development with regard to coastal forests and coastal erosion are included in Chapter 2. Relevant guidelines for resort development given in this plan should be applied to this project.

Offshore Islands

Since the offshore islands have such a wide range of specific issues relating to managing development, the marine parks and the state park land, this volume includes a specific management plan on Islands and Marine Protected Areas (see Chapter 10). Meanwhile, the area-specific guidelines are given below:

Lido Beach and Stulang Laut In Johore Bahru

1. The recommendations given in the water quality plan for improving the water quality of Johore Strait (Chapter 7) should be implemented. These include measures in reducing the discharge of sewage effluent into the water, stricter monitoring of the area and providing for increased circulation in the strait.
2. As the agency responsible for maintaining these beaches, MPJB should address the litter problem on both beaches by taking these measures:
 - a. A person (or contractor) should be assigned by the agency to clean the beach and empty the trash cans on a daily basis.
 - b. This person can also be given authority to issue a ticket penalizing anyone who is seen littering. This ticket would require the offender to pay a small fine, an inconvenience that should deter potential litterers.
 - c. The clean-up and enforcement program may be complemented by an education program. One of its activities should be the erection of a large sign with pictures and text describing the resources of the area (including Johore Strait), water sports, fishing and shellfish collecting, and also emphasizing litter control and everyone's responsibility in keeping the beach environment clean.

Alternative Tourist Sites

1. Mangroves, estuaries, historical sites, coastal forest and nearshore coastal water areas for boating should be developed as alternative sites for compatible tourist development.
2. Educational nature tourism should also be developed as an alternative tourist activity. The number of tourists in South Johore is projected to increase each year, thus intensifying the pressure on the resources and environment in the above areas. Developing alternative tourist sites will distribute this increased pressure in more areas, thereby reducing the impact on the environment.

Mangroves and estuaries

1. The recommendations in the mangrove management plan (see Chapter 3) that certain mangrove areas and estuaries be established as protected areas should be followed.
2. A management plan for the park should include provisions for interpretive boardwalk trails, exhibits and resting shelters. This could be done by NPJC, in cooperation with the tourism department, DOF, FRIM, DOFor and NGOs such as the Malayan Nature Society and Worldwide Fund for Nature - Malaysia.

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3. Ocean access to mangroves and estuaries via river cruises should be promoted and limited land access through boardwalks should be provided. This would help overcome the difficulties of reaching these mangroves by land. The NPJC, in cooperation with the tourism department, is responsible for this.
4. Local people should be employed as guides for boat trips into the mangrove forests.

Coastal forests

1. The NPJC should gazette the coastal forests in the Sg. Sedili Kechil area as a National Park-Johor. These coastal forests have beautiful landscapes, flora and fauna that would be attractive to adventurous visitors. Watching birds and other wildlife, botanical tours and wilderness camping may all be incorporated into the management of protected coastal forests.
2. For nonconsumptive, low-impact tourism, NPJC should develop a management plan that includes provisions for a trail system and educational materials promoting coastal forests, which are currently underutilized as tourist destinations. The NPJC may be guided by experts from the various agencies and institutions enumerated previously.
3. Persons hired to act as guides for hiking trips in the forests should come from the local population.

Historical sites

1. A survey of historical sites, as outlined by this plan, should be carried out.
2. A coordinated program of restoration should be established and interpretive guides for the whole area should be developed.
3. The state could then publish a guide of historical sites and TDC could conduct a promotional campaign for tourists, tour operators, promoters and tour book writers.

Educational nature tourism

1. Tourism programs should be established to highlight the commercial development of coastal activities such as aquaculture, fishing, agriculture and cage culture; charcoal kilns or orchards; and traditional or fishing villages.

This would minimize the impacts and wastage of such resources and the conflicts from their uses. This would also provide for community participation in development and management efforts. For instance, integrating aquaculture and mangrove charcoal kilns for tourism use has already been accomplished on a very small scale.

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2. A brochure identifying the locations of estates, farms and mills that could be visited, and describing the products and the processing systems, should be prepared.

To carry this out, the tourism department staff should interview the farmers and estate owners, and encourage them to establish a program to explain to the tourists how their farms operate. If they are willing to do this, their farms or estates shall be included in the brochure. This brochure can be an important promotional and educational tool for highlighting the agricultural sector of Johore.

3. To carry out this project, it would be necessary for the tourism department to work with development- or management-oriented agencies such as DOF, DOFor, SEDC, KEJORA, FELDA and others to determine the best examples of these cultural and educational resources that should be highlighted and promoted.
4. An educational program promoting mangroves, estuaries and coastal forests as tourist sites where one can indulge in nature-tripping activities such as bird-watching, river cruising and fishing should be developed and established. This will be helpful especially to tour operators (who will need to know these things), relevant federal or state agencies (which make policies and decisions regarding these resources) and tour book writers (for promotional purposes). This program should be undertaken by NPJC, with the help of the different agencies and organizations previously mentioned.

Coastal and riverine waters

1. An index of fishing and diving charter operations should be developed and published in tour guide books. This would help promote the coastal and riverine waters as recreational fishing and diving areas.
2. This plan's recommendations for regulating the scuba diving industry should be implemented, so that the safety of visitors is ensured.

MANAGEMENT PLAN FOR FISHERIES

INTRODUCTION

Coastal fishing activities in South Johore, both commercial and traditional, are significant because they provide food, income and employment for the growing local population.

There are many issues facing fisheries management, the most critical of which is overfishing of the inshore areas by both licensed and illegal fishermen. Other issues include: competition between traditional and commercial fisheries for fishing grounds; competition for the use of the coastal zone for incompatible purposes; greater fishing effort because of more efficient technology; use of destructive fishing methods and gear; impact of pollution; and destruction of mangroves. To ensure that a healthy fisheries industry is maintained, it will be necessary to reduce the fishing effort in the inshore areas through licensing and proper management, as well as through the protection and rehabilitation of the marine environment.

This plan presents guidelines to help resolve some of the resource use conflicts for the coastal zone that are related to fisheries. It also presents general recommendations concerning research needs and institutional arrangements for addressing current problems.

SITUATIONAL ANALYSIS

This management plan is based on Audrey et al. (1989), Lui (1989) and Said (1989) for mangrove, marine fin and shrimp fisheries, respectively.

Current Status

The coastal marine fisheries of Johore, which are multispecies and multigear, consist of both finfish and shrimp, and are dominated by the trawl and drift net fisheries on the west coast and the trawl and purse seine fisheries on the east, where the bulk of the landings comes from. The pelagic fisheries had been the mainstay of the marine fisheries production on the east coast for most of the years from 1977 until 1986, when the demersal fisheries production overtook it. This is probably due to the expansion of trawl fishing toward the deep-sea areas off the eastern coast of Peninsular Malaysia. On the west coast, the demersal fishery catch consistently forms the major part of the total harvest.

Chapter 9. Management Plan for Fisheries

On Johore's west coast, marine fish landings increased from 11,000 t in 1970 to 18,000 t in 1979, but appeared to have stabilized after 1980 as landings fluctuated between 15,000 and 20,000 t annually (Fig. 9.1).

The marine fish landings on the east coast fluctuated between 28,000 t and 36,000 t from 1970 to 1987, although these exceeded 40,000 t in 1978 and 1979 (Fig. 9.2).

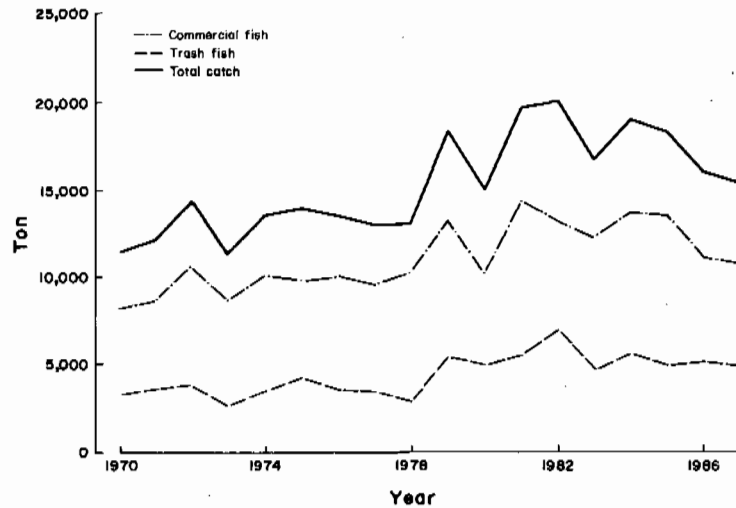


Fig. 9.1. Marine fish landings in West Johore, 1970-1987.

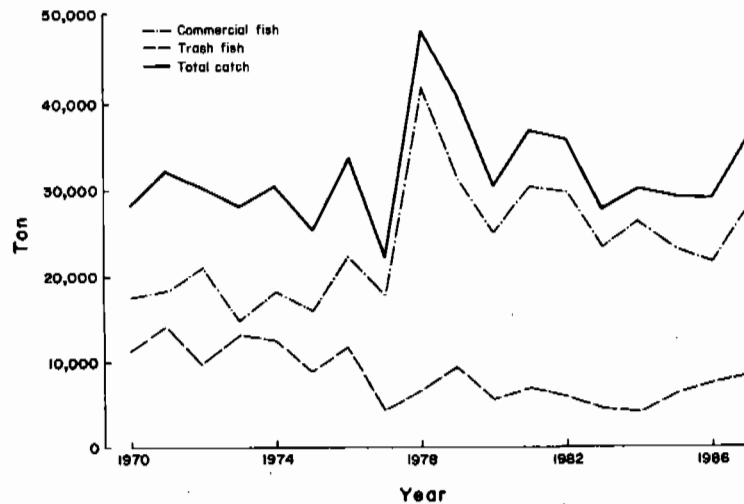


Fig. 9.2. Marine fish landings in East Johore, 1970-1987.

Demersal fisheries

WEST JOHORE

The demersal shrimp and finfish landings for West Johore are shown in Fig. 9.3. The estimated maximum sustainable yield (MSY) for demersal fish and shrimp combined, as derived from the Gulland-Fox model, is around 13,100 t (Fig. 9.4). The demersal fish and shrimp landings were combined as they were both caught by trawlers, who exploit these resources. However, based on the mean proportion of shrimp (26%) in the total demersal landings recorded between 1977 and 1987 on the west coast, the MSY of shrimp would probably be about 3,400 t, with the demersal finfish accounting for the rest.

The demersal fish and shrimp resources of the west coast appear to be currently exploited to the limit. The fish stocks are being overfished, as evidenced by the decreasing size of the fish, the increasing proportion of trash fish in the catch, the decreasing value of the catch, and the increasing size of nets and engines needed to catch the same amount of fish.

Fig. 9.3. Landings, by species group, in West Johore, 1977-1987.

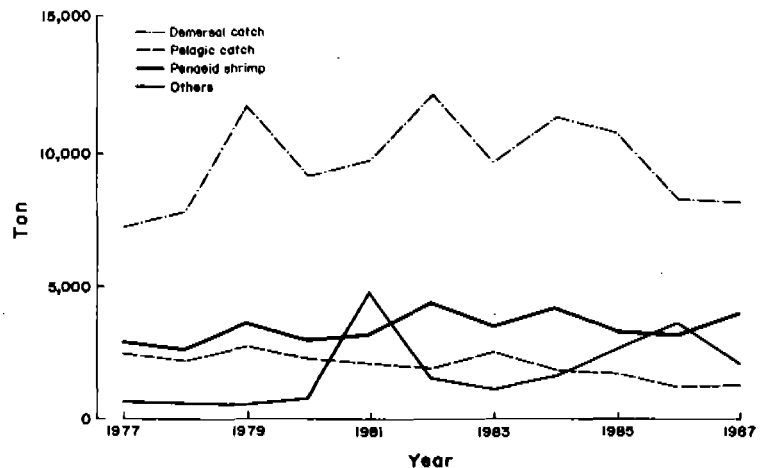
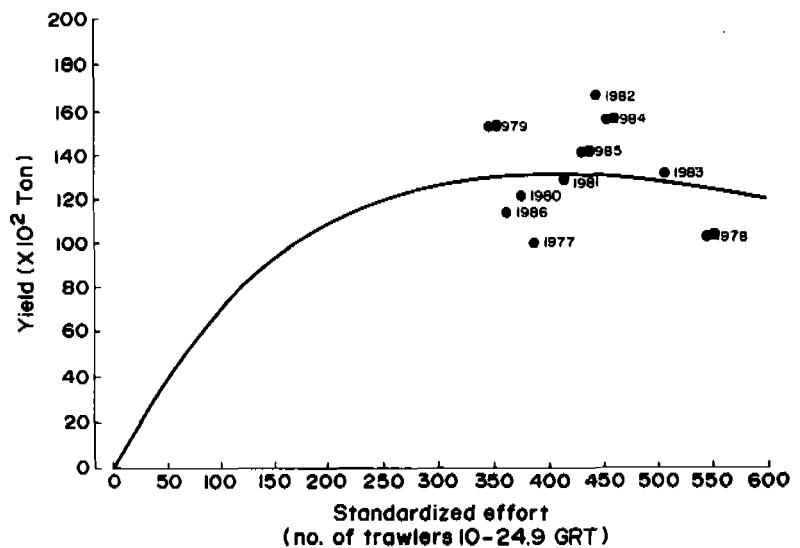


Fig. 9.4. Yield curve for demersal fish and shrimp (combined) in West Johore, 1977-1986.



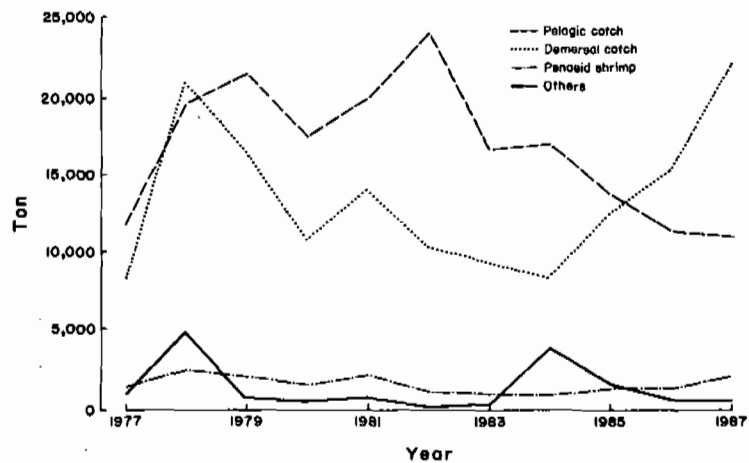


Fig. 9.5. Landings, by species group, in East Johore, 1977-1987.

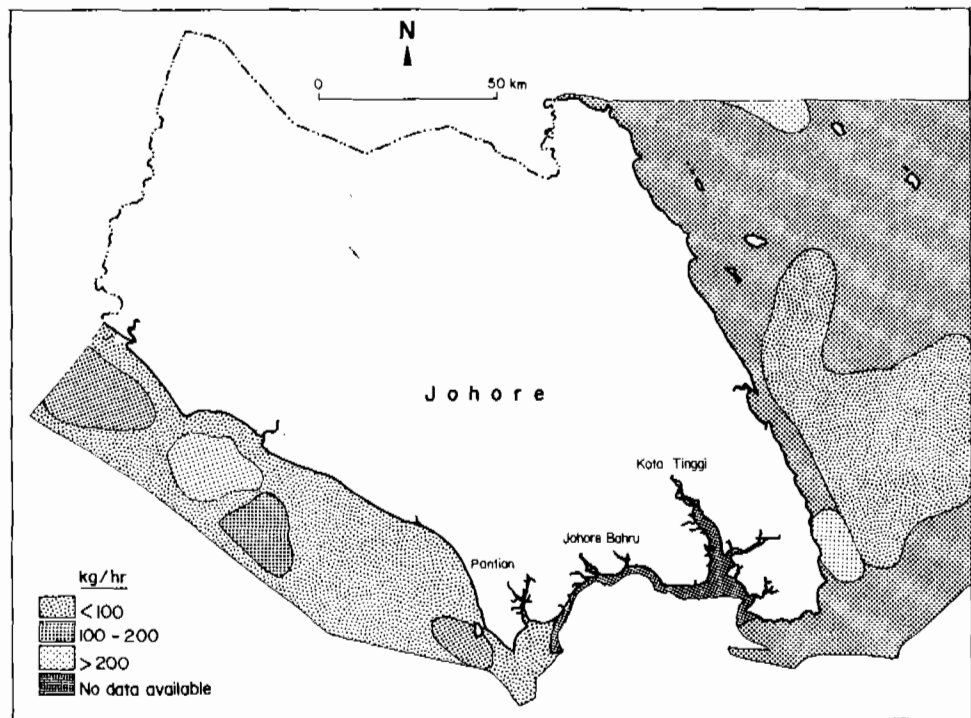


Fig. 9.6. Density distribution of demersal fish in Johore's waters, 1987.

EAST JOHORE

The demersal fish (including shrimp) landings on the east coast of Johore fluctuated between 8,100 t and 22,200 t from 1977 to 1987 (Fig. 9.5). Landings increased from 8,100 t in 1977 to 21,000 t in 1978, subsequently declining to 8,300 t in 1984. However, these landings appeared to have steadily increased again after that year. This increase could be attributed to the growth in the number of trawlers and the exploitation of fish resources farther offshore. The penaeid shrimp landings component in the east coast demersal fisheries ranged between 800 t and 2,200 t from 1977 to 1987 (Fig. 9.5). Demersal fish density in Johore is shown in Fig. 9.6.

The estimated MSY for demersal finfish and shrimp combined for the east coast is around 14,300 t. This estimate was derived from commercial catch-effort statistics, using the Gulland-Fox model (Fig. 9.7). As the commercial fishing vessels were only exploiting the inshore waters until the last two years or so, this estimated MSY would be from the inshore demersal fish and shrimp resources. Of this figure, the shrimp yield is probably around 1,400 t (based on a mean of 9.8% it comprised in the total demersal landings recorded on the east coast between 1977 and 1987), with demersal finfish accounting for the balance of 12,900 t.

With active government encouragement, larger trawlers have begun exploiting the offshore resources in the last two years, contributing to a substantial increase in demersal fish landings on the east coast. While the deep-sea areas off this coast still offer scope for development of an offshore fishery, the exploitation of the inshore demersal fish and shrimp resources has certainly reached the level of MSY, and possibly exceeded it. Thus, there is significant evidence of economic overfishing.

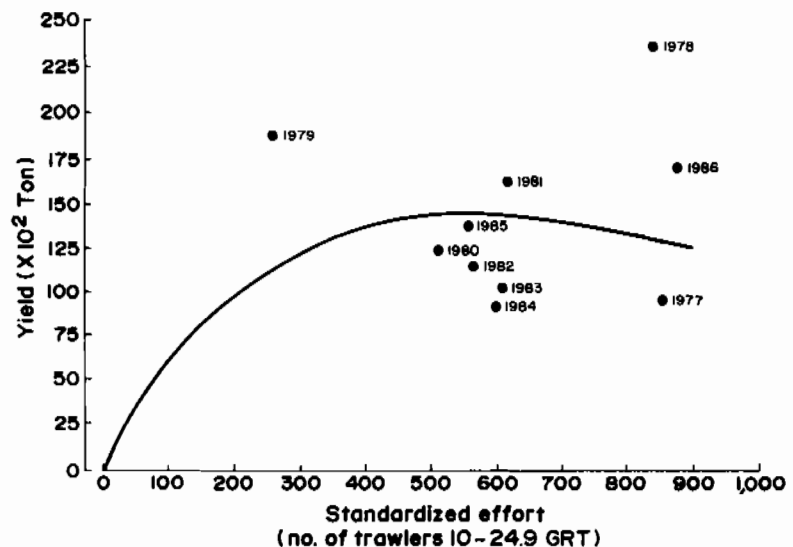


Fig. 9.7. Yield curve for demersal fish and shrimp (combined) in East Johore, 1977-1986.

Pelagic fisheries

WEST JOHORE

Landings of pelagic fish (including shrimp) on the west coast of Johore ranged between 1,163 t and 2,655 t from 1977 to 1987 (Fig. 9.3). The drift net, the major fishing gear used, is still operated on a subsistence level. The number of drift nets estimated to be in operation from 1977 to 1987 was between 1,275 and 2,525 units (Fig. 9.8). The various types of gear that are used include the trammel net (*pukat tiga lapis*), which targets shrimp, and the drift

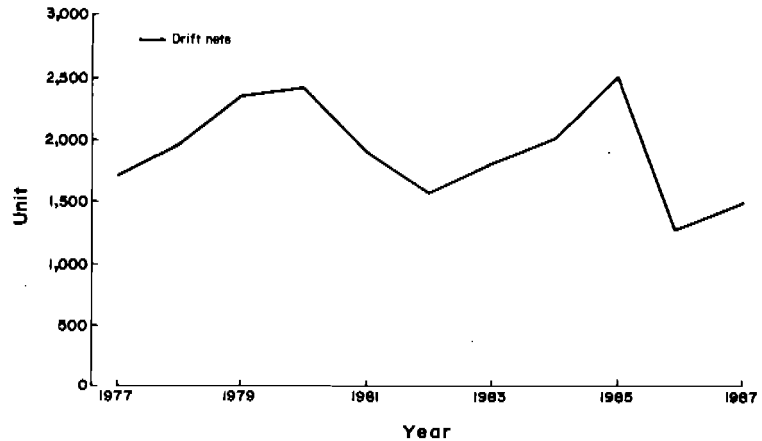


Fig. 9.8. Estimated number of drift nets in operation in West Johore, 1977-1987.

net (*pukat hanyut ikan*), which targets fish and comes in varying mesh sizes, length and material. Thus, there is no standardization of fishing effort. However, the trend in pelagic fish landings between 1977 and 1987 indicates that the MSY for pelagic fish from West Johore's waters is around 2,000, which has already been exceeded by current fishing efforts. (Pelagic fish density distribution for Johore is shown in Fig. 9.9.) Thus, pelagic fisheries in West Johore's coast do not offer further room for development due to current overfishing.

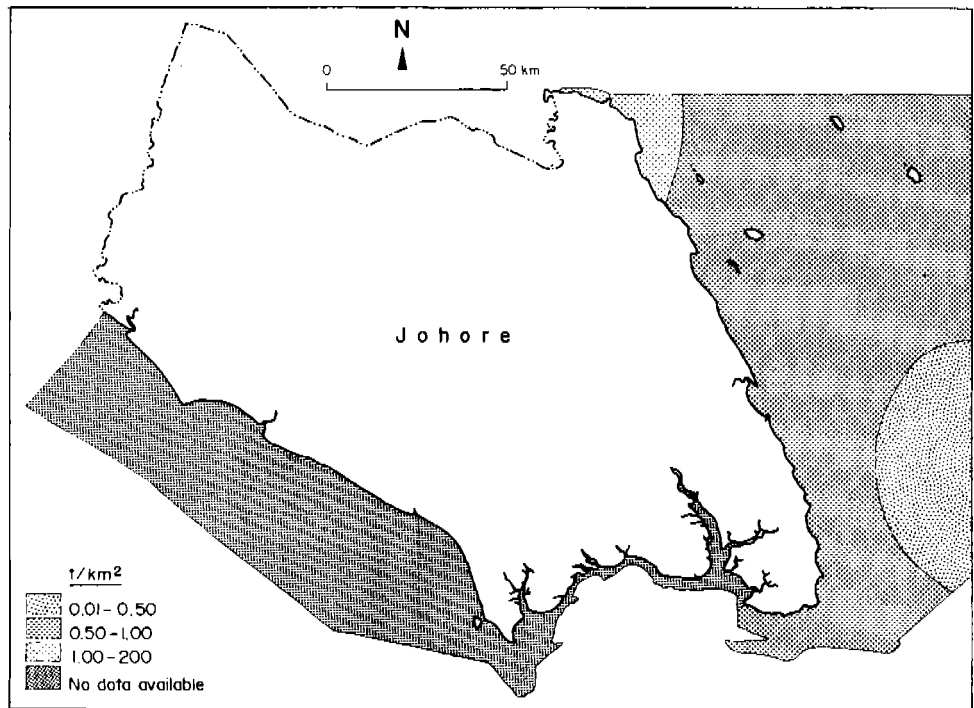


Fig. 9.9. Density distribution of pelagic fish in Johore's waters, 1987.

EAST JOHORE

On the east coast of Johore, pelagic fish landings fluctuated between 11,111 t and 24,015 t between 1977 and 1982 (Fig. 9.5). Since then, a decline has been observed. The major commercial fishing gear that is used to catch pelagic fish in this area is the purse seine (Fig. 9.10).

From the trends in landings, the MSY of pelagic fish from East Johore is approximately 17,000 t. Obviously, the MSY has been reached and, at times, possibly exceeded.

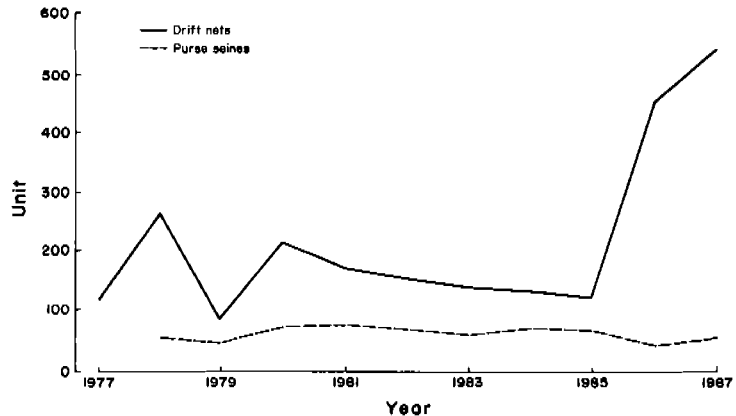


Fig. 9.10. Estimated number of purse seines and drift nets in operation in East Johore, 1977-1987.

The shrimp fishing Industry

Shrimp constituted an average of 9% of the total marine landings in Malaysia over the last five years, but accounted for 27% of the revenue from marine landings. Most of it was landed in the west coast and estimated at about 60,000 t annually (Chong 1984). In Johore, the landings increased rapidly from approximately 3,000 t in 1968 to 6,000 t in 1974, to 10,000 t in 1981 (Fig. 9.11).

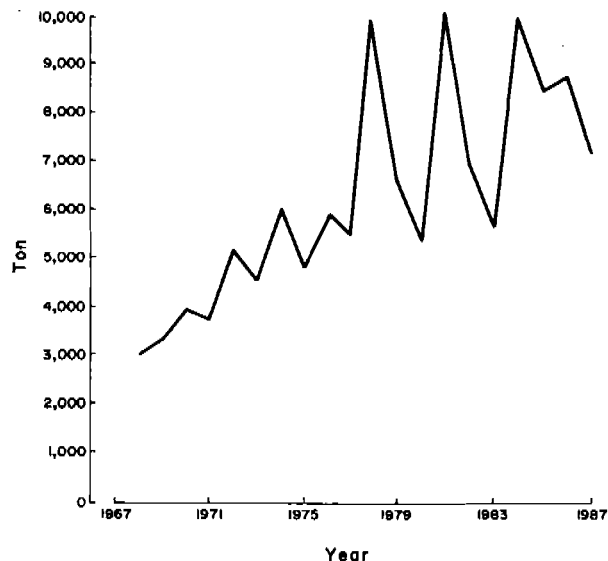


Fig. 9.11. Annual shrimp landings in Johore, 1968-1987.

There are two categories of shrimp fishing: offshore or commercial, and inshore or traditional.

Shrimp has been intensively exploited since the 1960s with the introduction of the otter board trawl. There are two categories of shrimp fishing: offshore or commercial, and inshore or traditional. Offshore shrimp fishing, one of the most valuable commercial fisheries, is carried out mainly by large trawlers that operate beyond 12 miles. Although finfish is the main target species, these trawlers catch all demersal resources. Shrimp, which is only a by-catch, adds a fairly substantial amount to the income of the fishers. The constantly high composition of shrimp in the trawl and the lucrative price it fetches provide additional motivation for offshore trawlers. In fact, at certain times of the year, when finfish catches are low, the fishers aim at catching shrimp. However, fishing for this resource, either as a main or by-catch, occurs throughout the year beyond the 12-mile limit.

In the inshore areas, traditional fishers employ a variety of fishing gear to catch shrimp. The gear, which are inexpensive, include both the passive (fixed) and active (moving) appliances. Fig. 9.12 shows the fishing operation areas by gear type, while Fig. 9.13 shows the percentage of fishers using traditional gear, by area, licensed in 1987. In commercial shrimp fishing, the otter trawl, bag net and drift net (in order of importance) are used in both East and West Johore, with the latter also employing the purse seine, and the scoop and barrier net.

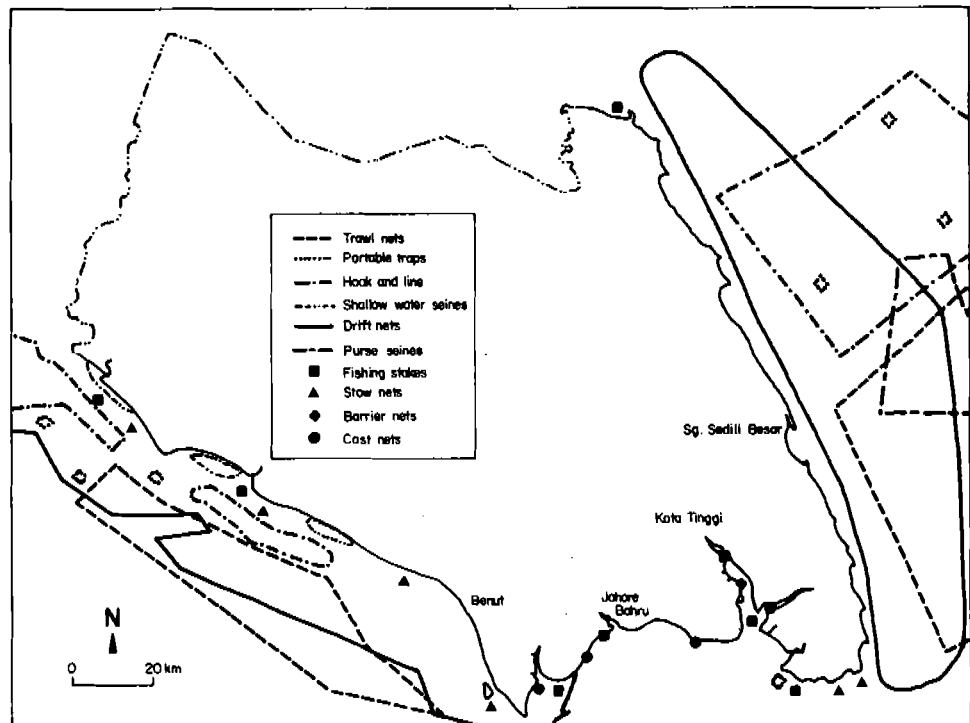


Fig. 9.12. Fishing operation areas, by gear type, in Johore's coastal waters, 1985.

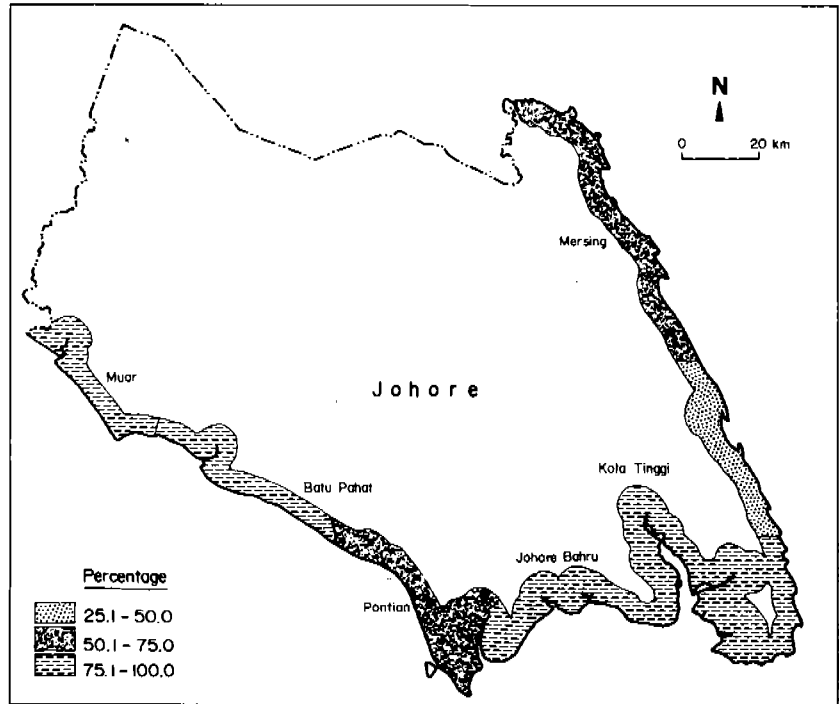


Fig. 9.13. Percentage of fishers using licensed passive traditional fishing gear in 1987, Johore.

Based on the existing methods of exploiting shrimp, trawling provides 52% of the total catch in West Johore and 39% in East Johore, while catch by bag net contributes 37% and 58% in West and East Johore, respectively (Fig. 9.14). The catch from otter trawls forms the major part of the landings ever since trawling was introduced in the 1960s. The effectiveness of trawlers in catching not only shrimp but other demersal resources has partially contributed to their high production.

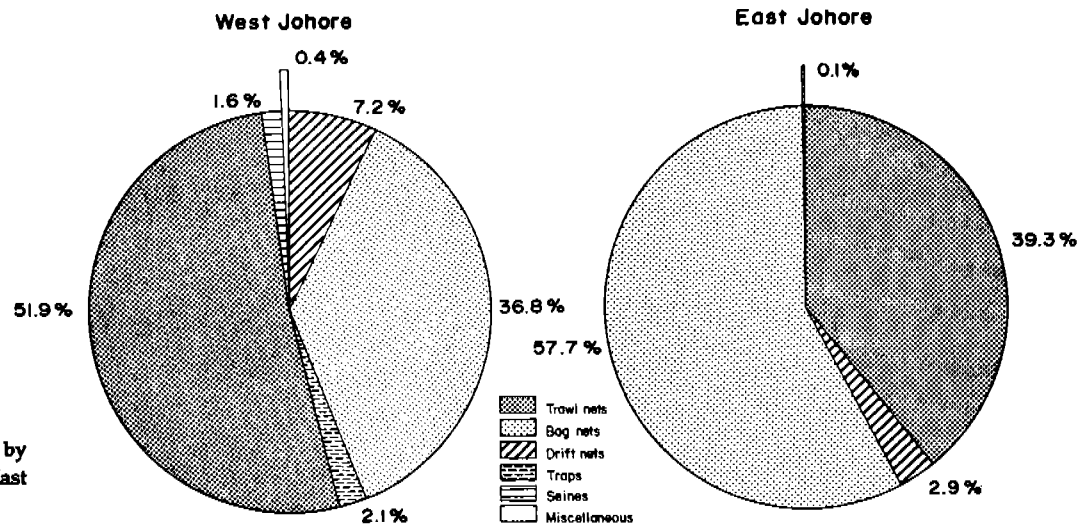


Fig. 9.14. Shrimp landings, by gear type, in West and East Johore, 1984-1987.

Chapter 9. Management Plan for Fisheries

In terms of total production, West Johore contributes 65% while East Johore landed 35%. Figs. 9.3 and 9.5 show the trend of shrimp landings for the years 1977 through 1987. Yield curves for West and East Johore shown in Figs. 9.4 and 9.7, respectively, indicate that shrimp fishery on both coasts has reached the MSY, and possibly exceeded it. There is, therefore, strong evidence of economic overfishing, as discussed earlier.

Current Fisheries Management Regime

Current fisheries management is based on the 1981 FCLP, which stipulates clear guidelines for the management of fishing effort via an LLS. The FCLP was based on research data and formulated using economic, biological and socioeconomic criteria. As such, the FCLP shall be taken as the foundation for this fisheries management plan. The following overview of the FCLP is based on Bakar and Ch'ng (1987).

The objectives of the FCLP are the:

1. elimination of conflict between traditional and commercial fishers, particularly trawlers;
2. prevention of overexploitation of fishery resources in the inshore waters;
3. promotion of a more equitable distribution of resources;
4. restructuring of the ownership pattern of fishing units in accordance with the New Economic Policy; and
5. promotion of the development of offshore industrial fisheries.

To achieve these objectives, fishing effort would be regulated by the LLS at a level of MSY. The FCLP divides Malaysian fishing waters into four zones:

Zone A: 0-5 miles from shore, reserved for traditional fisheries;

Zone B: 5-12 miles from shore, for commercial fisheries that use gear such as trawls and purse seines below 40 GRT (gross registered ton);

Zone C1: 12-30 miles from shore, for commercial fisheries that use boats above 40 GRT;

Zone C2: 30 miles from the shore and beyond, for commercial fisheries that use boats 70 GRT and above; and

Zone D: 30 miles from the baseline, reserved for joint ventures with foreign fishing boats above 70 GRT.

Zones A, B and C are shown in Fig. 9.15.

One objective of the Fisheries Comprehensive Licensing Policy is the elimination of conflict between traditional and commercial fishers, particularly trawlers.

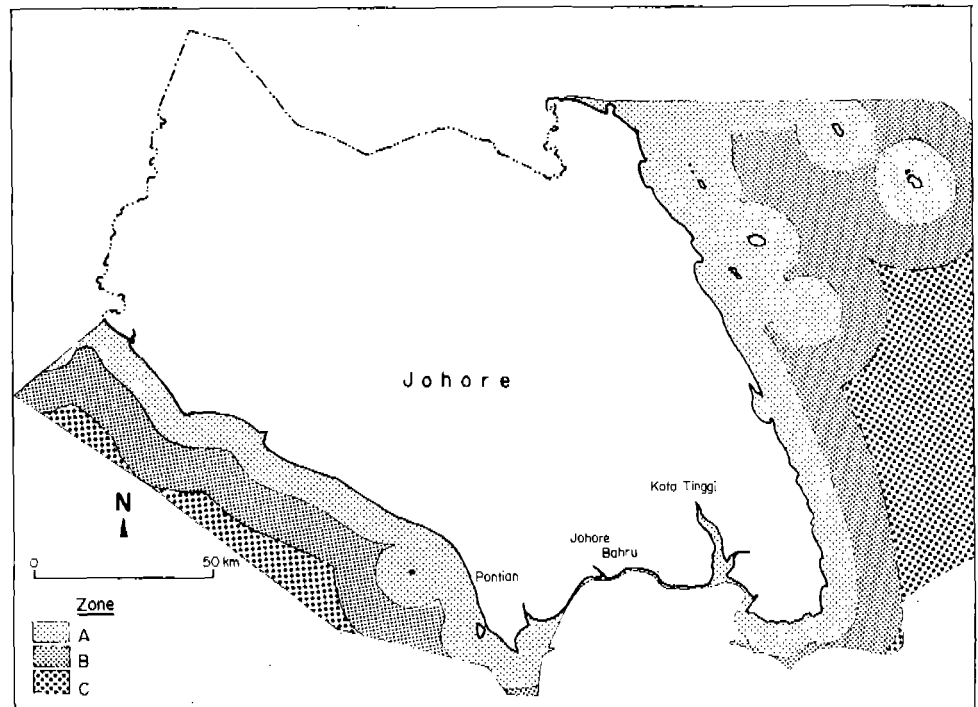


Fig. 9.15. FCLP zones in the coastal waters of South Johore.

An analysis of gear use in Johore's coastal waters shows that passive gear is being operated most widely in areas where there are limited fishing grounds, i.e., along the west coast and Johore Strait (Fig. 9.16). The FCLP is based on the MSY calculated for the Malaysian fishery waters as a whole, not only for discrete areas such as South Johore's waters. Therefore, the current FCLP zones do not reflect the density distribution of either the demersal or pelagic fish (Figs. 9.17 and 9.18).

This management plan thus seeks to improve the FCLP's management scheme for a sustainable fisheries industry in South Johore.

MANAGEMENT ISSUES AND PROBLEMS

Overfishing

A serious issue in coastal fisheries management is the problem of biological overfishing in inshore coastal areas along the west and east coasts. In the cases of both demersal and pelagic fisheries (including shrimp), the current levels of catch have exceeded the MSY levels. The current number of fishers and fishing boats exceeds that which can be sustained by current resources. Because fish is an open access resource, there is always the tendency for the

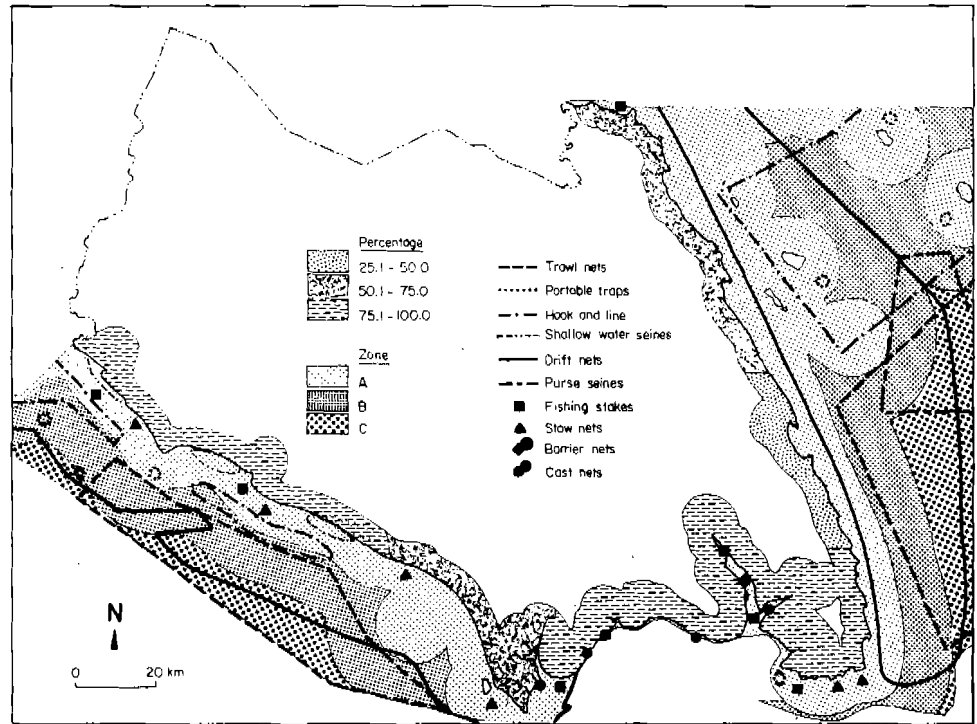


Fig. 9.16. Fishing operation areas (by gear type) in 1985, FCLP zones and percentage of passive traditional gear that were licensed in 1987.

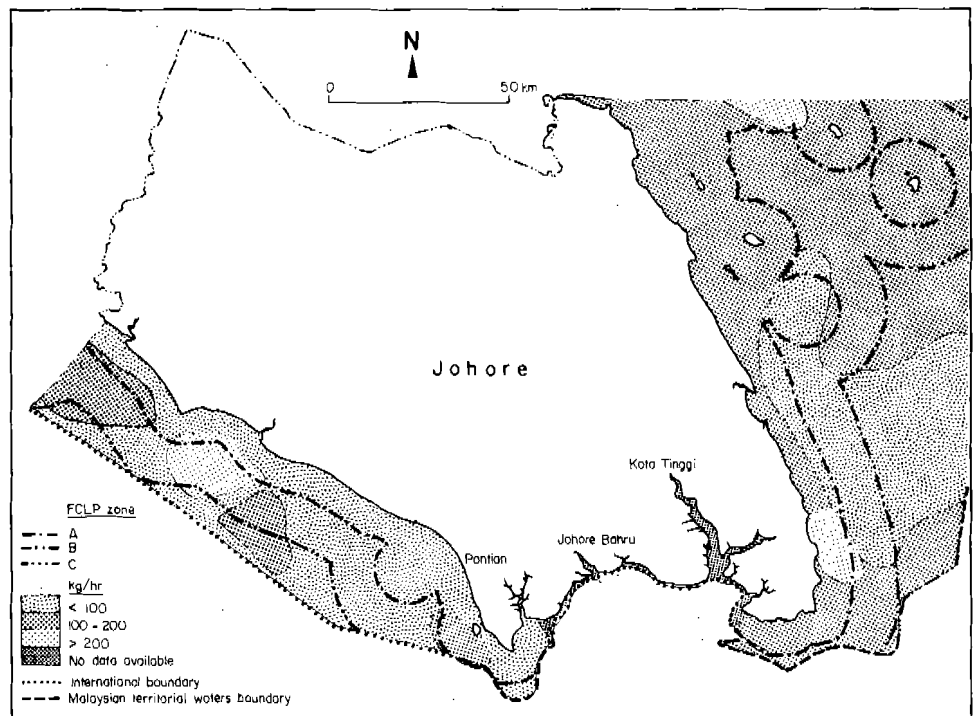


Fig. 9.17. Density distribution of demersal fish within FCLP zones, Johore, 1987.

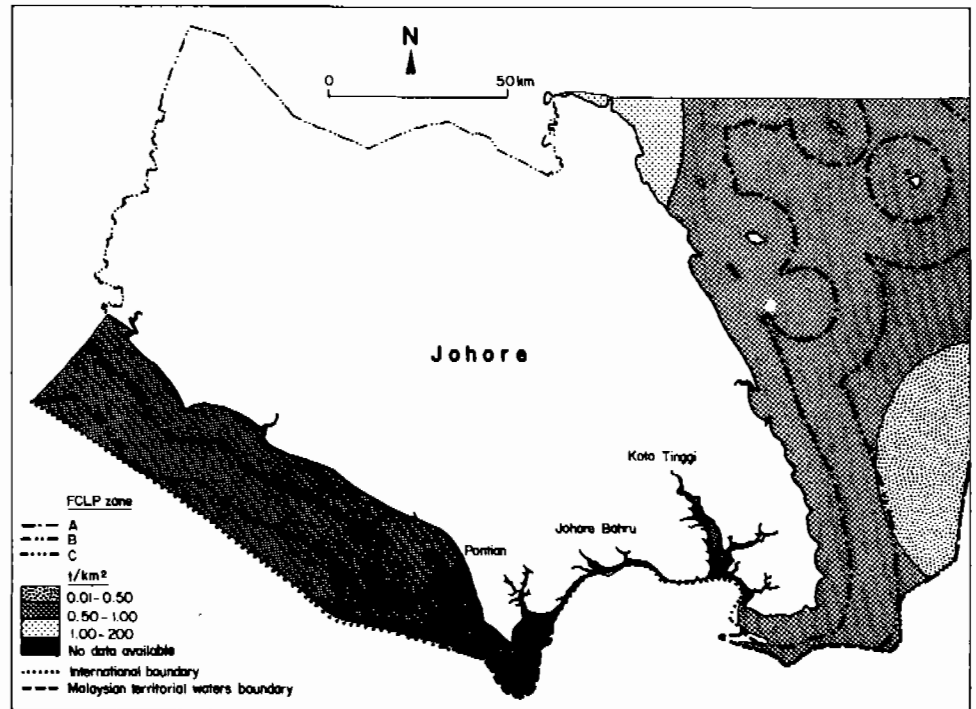


Fig. 9.18. Density distribution of pelagic fish within FCLP zones, Johore, 1987.

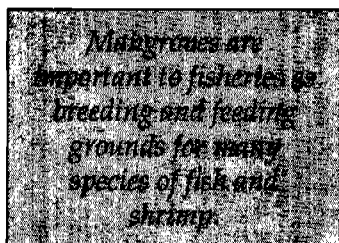
industry to absorb more fishers in times of a downturn of the national economy. Even during an upturn, resident fishers do not leave the industry. Moreover, biological overfishing is a difficult problem to resolve because, as the nation prospers, there is an increased demand for fish and shrimp, resulting in their high and continually rising prices.

In addition to the problem brought about by the "open access" nature of fisheries, the fishing community in Malaysia forms a substantial electoral role with the result that political exigencies often override management prerogatives. Moreover, although the FLCP calls for a phased decrease in fishing effort in the coastal zone, this is not always possible, as in the case of Johore.

Conversion of Mangrove Areas

Another critical issue is the extensive conversion of mangrove forest areas for agriculture, aquaculture, industrial and tourism uses. West Johore's mangrove area has already been extensively reclaimed for the West Johore Integrated Agricultural Development Project, while Southeast Johore's mangroves along Sg. Lebam, Sg. Belungkor and Sg. Buah Besar have been identified and, in some cases, already alienated for aquaculture purposes (Fig. 3.2). The proposed site of the Tg. Langsat Industrial Estate will necessitate the clearing of some mangrove areas along Sg. Johore (Fig. 3.3). Tourism development is also encroaching into mangrove areas (Fig. 8.2). The proposal for a second linkage with Singapore, the associate new township of

Bandar Baru Piai and the industrial estate adjacent to these resources at Sg. Pendas, Sg. Bahan, Sg. Perepat, Sg. Melayu and Sg. Skudai will obviously present problems such as pollution and the inflow of freshwater to the mangroves in the Sg. Pulai estuary and in Southwest Johore.



Mangroves are important to fisheries as breeding and feeding grounds for many species of fish and shrimp. A study by Audrey et al. (1989) shows that several species of commercially important shrimp and finfish use the Sg. Pulai mangrove estuary as a nursery. Commercially valuable juvenile fish caught here included the sea perch, anchovies (*Stolephorus* spp. and *Thryssa hamiltoni*), snapper and catfish/eel (*Plotosus canius*), while the juvenile shrimp included *Penaeus indicus*, *P. merguensis*, *P. semisulcatus*, *Metapenaeus brevicornis*, *M. ensis* and *P. monodon*.

Recently, the Prime Minister announced plans to reclaim large amounts of land on the west coast of Peninsular Malaysia, where most of the mangroves are found. This large-scale loss of this resource may have a significant impact on the finfish and shrimp stocks in the area, and therefore, on the livelihood of the coastal community (see Chapter 3).

Damage to Fringing Coral Reefs

Coral reefs are essential breeding and nursery areas for many types of fish. In recent years, the fringing reefs around the islands of Johore have been damaged by trawl fishing, the anchorage of tourist and fishing boats, sewage effluent, sedimentation from land developments, sand mining, illegal collection of corals and water pollution.

Impact of Pollution

With the increasing number of development activities and proposals along the coasts, pollution from runoff and the direct discharge of wastes is fast becoming a real threat to the ecological functions of mangroves and coral reefs as nursery and breeding areas for both offshore and inshore fisheries. Reclamation and indiscriminate land clearing can also have downstream effects on mangroves and coral reefs from the resulting siltation.

Sand mining, which is licensed in the Sg. Johore estuary and along the nearshore waters of Southeast Johore's coast (Fig. 5.1), has the potential of significantly affecting the water quality of the area through increased turbidity. In fact, in two small rivers of South Johore, Sg. Pelentong and Sg. Lebam, increased turbidity caused by sand mining upstream is suspected to have been directly linked to reductions in fish stocks downstream.

The use of fishing stakes (*kelong*), which are no longer viable for fishing, as cheap accommodations for recreational and other purposes has resulted in the pollution of the surrounding waters since there are no sewage facilities on these structures and all discharges flow directly into the sea. The resulting

high nutrient levels, besides posing a health problem for swimmers, have an adverse impact on the corals. This effect has also been observed in the Great Barrier Reef of Australia.

Degraded water quality has been identified in some fishing areas. In Johore Strait by the causeway in Johore Bahru, high FC levels are a problem for shellfish. In the Sg. Johore estuary, fishers from Sg. Rengit and Tg. Surat complain that ships cleaning their tanks, bilges and hulls merely dump the wastes into the water. This is also a major concern at Kg. Senibong, across the Sembawang shipyard. At Pasir Puteh, fishers complain about the industrial wastes from Pasir Gudang that are affecting their catches. Fishers from Sg. Melayu and Kong Kong also claim that industrial pollution is severely affecting fish yield in their areas (Wong and Chang 1989a).

Destructive Fishing Techniques

Destructive fishing techniques, such as use of fish traps (*bubu*), trawls, muro-ami and *kelong* in and around coral reef areas, and also small fishing stakes (*togok*) and stationary gear in the estuary and mangrove areas, have adverse impacts on the coastal fisheries due to the use of small-sized mesh fishing nets. In the case of muro-ami, the actual breaking of the corals themselves occur during fishing operations.

Lack of Information on Fish and Shrimp Stocks

There is a lack of detailed information on the fish stocks in the coastal waters for the establishment of individual fisheries management plans for coastal areas. There is a need to know, for example, the biology and migration patterns of the commercial species of fish and shrimp that breed or spend their juvenile phases in the mangroves.

Socioeconomic Problems

The fishing communities, particularly the traditional fishers, have the potential to be adversely affected most by all these developments along the coastal area. These fishers are bound to the inshore areas due to lack of bigger boats and engines. Figs. 9.19 to 9.21 identify the fishing villages that are most likely to be affected by the major development proposals in South Johore, namely the second linkage with Singapore, the Tg. Langsat industrial estate and sand mining leases.

LEGAL AND INSTITUTIONAL ISSUES

Legal Aspect

The Fisheries Act (1985) is a comprehensive law that provides for the conservation, management and development of marine and estuarine fisheries in Malaysian fishing waters, and also of turtles and riverine fisheries. Marine

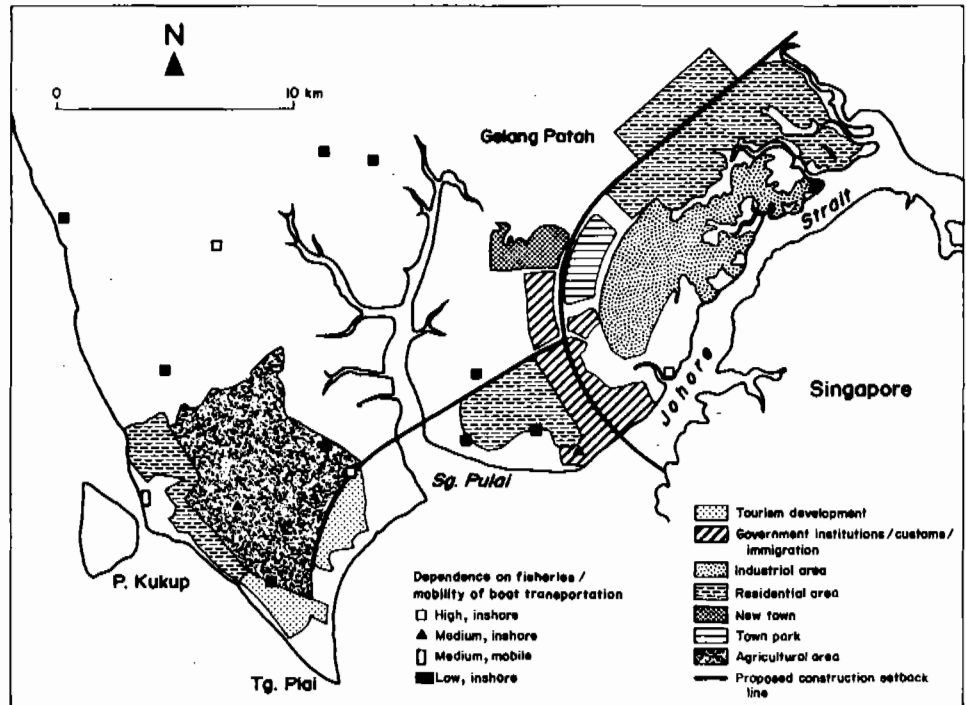


Fig. 9.19. Fishing villages affected by the proposed second linkage development, their dependence on fisheries and the mobility of the boat transportation system.

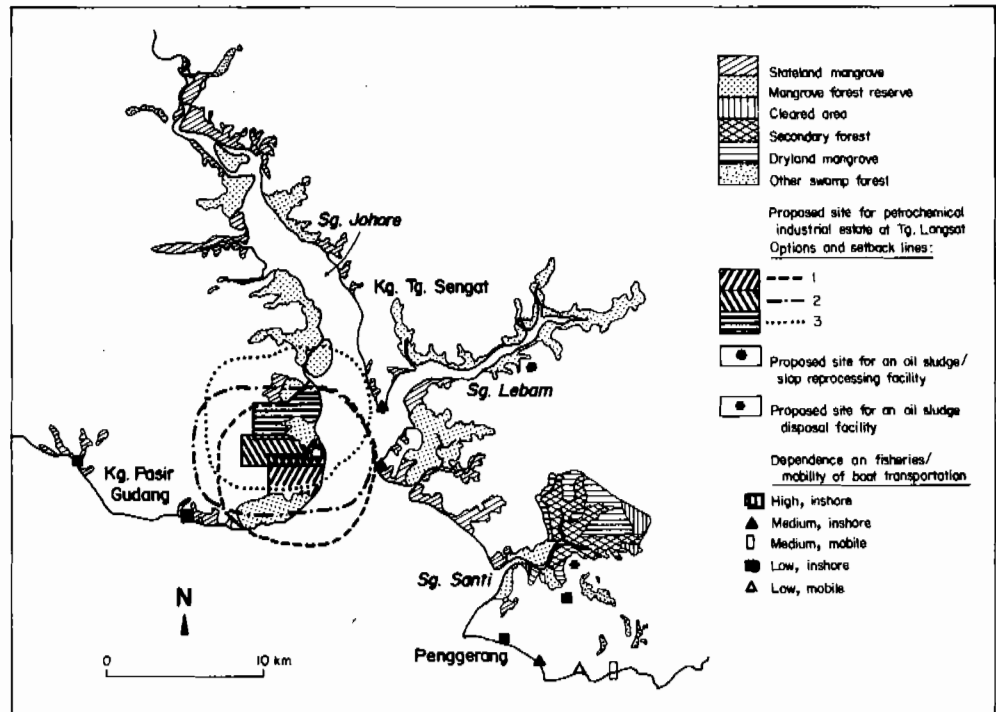


Fig. 9.20. Fishing villages along the Sg. Johore estuary, their dependence on fisheries and the mobility of the existing boat transportation system, with respect to industrial development pressures.

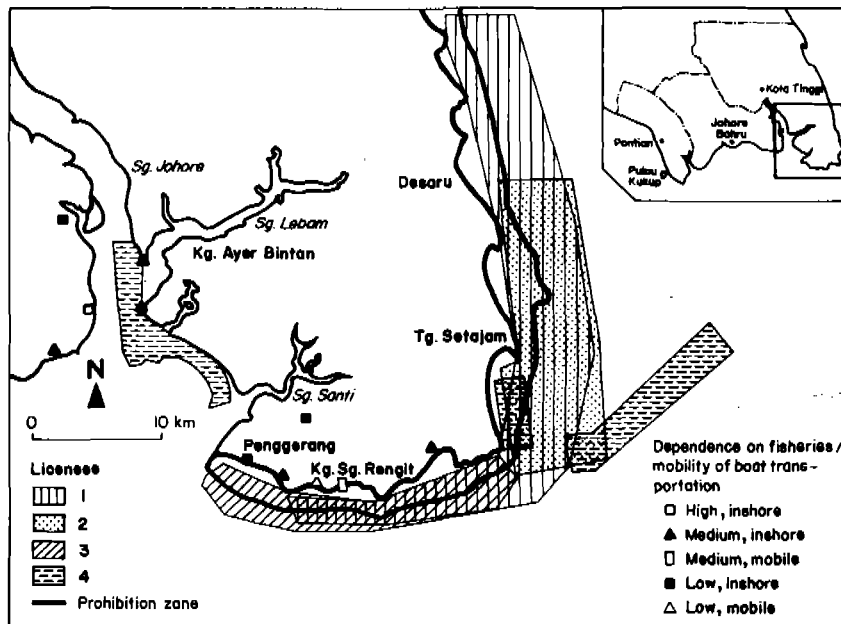


Fig. 9.21. Fishing villages, their dependence on fisheries, the mobility of the existing boat transportation system and their proximity to licensed areas for sand mining.

and estuarine fisheries are federal matters, with DOF empowered to undertake their management via this Act. Turtles and riverine fisheries on the other hand, are state matters, although training and research conducted for these resources come under federal purview.

The FCLP is a management scheme based on the limitation of fishing effort. However, besides overfishing, the other main problem in fisheries is the destruction of fish and shrimp habitats by coastal development and pollution of the riverine, estuarine and marine waters from land sources and ships. The laws pertaining to pollution, coastal development and shipping are varied and come under the purview of several state and federal agencies. This creates a problem of overlapping jurisdiction in the same spatial dimension and presents a conflict of interests in the same area. Similarly, there is a gray area over the jurisdiction of marine and estuarine fishery resources in mangrove and estuarine forest swamp areas since mangrove and swamp forests come under the jurisdiction of the National Forestry Act (1984) and under the purview of the State DOFor. The main legal instruments to address the problem of pollution caused by land sources and coastal development in fisheries would be the Environmental Quality Act (1974), the Town and Country Planning Act (1976), the Land Conservation Act (1960, revised 1989) and the Local Government Act (1976). However, these laws, as stated in Chapter 7, would have to be reviewed to make them more effective in combating pollution and indiscriminate coastal development.

Fisheries in waters surrounding islands also face similar problems, and are discussed separately in Chapter 10.

Institutional Aspect

Presently, there is no coordinated effort among the various state and federal agencies, particularly between the local authority and DOF, with respect to the destruction of fishery habitats by pollution from land sources and ships. In this respect, DOF would need to be strongly represented in the proposed CRC.

The relevant agencies involved with the control and monitoring of land use and development would need to be given adequately trained manpower to consistently enforce the various laws listed above.

There is also a need for a national and ministerial policy that will provide for the protection of mangrove for the maintenance of fish breeding and nursery grounds.

A serious problem of Johore's coastal fisheries is the lack of strict enforcement of relevant regulations on fishing operations, thus leading to rampant illegal fishing. This includes the establishment of illegal fishing stakes (e.g., *kelong* and *togok*) in the nearshore areas and around the islands.

MANAGEMENT GOAL AND OBJECTIVES

The goal of coastal fisheries management is to achieve a sustainable coastal fisheries industry with particular attention to the finfish and shrimp resources.

Its objectives are to:

- review the effectiveness of the FCLP;
- identify areas that should be protected and managed as nursery areas to ensure the survival of juveniles;
- identify ways in which development has potentially detrimental impacts on fisheries and fishing communities, so that mitigating measures can be undertaken;
- facilitate cooperative research efforts between the government and the academe to provide data essential for the formulation of area management plans in Johore; and
- establish strict enforcement of regulations that address the problem of illegal fishing operations.

RECOMMENDATIONS FOR MANAGEMENT

The fisheries management plan aims at: helping management in controlling overfishing in the inshore areas; establishing habitat protection and rehabilitation measures; ensuring that the other development activities do not adversely impact coastal habitats; and initiating cooperative research for obtaining detailed data on the fisheries in the coastal areas of South Johore.

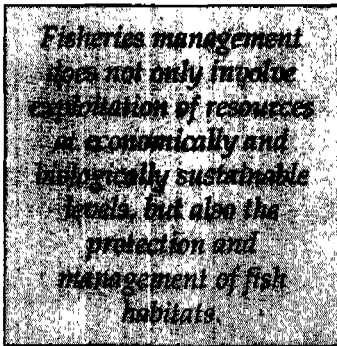
Fisheries

The FCLP seeks to decrease fishing effort in a phased program to reduce the number of excess fishers and boats over a period of time. This effort should be monitored seriously and the freeze on licenses should be maintained, despite political exigencies. These actions should be complemented with intensive enforcement of measures against illegal entry into the inshore fishing industry. Other recommendations are as follows:

1. The FCLP should be reviewed every two years, based on statistical research data.
2. Detailed data on nearshore coastal habitats, including mangrove areas and estuaries, should be obtained, and fisheries management plans for these areas should be established.
3. Monitoring, surveillance and strict law enforcement in the coastal waters of Johore should be established to deter and stop illegal fishing operations.

Habitat Protection

Fisheries management does not only involve exploitation of resources at economically and biologically sustainable levels, as recommended above, but also the protection and management of fish habitats. Recommendations for the latter are as follows:



Fisheries management does not only involve exploitation of resources at economically and biologically sustainable levels, but also the protection and management of fish habitats.

1. All fisheries in breeding and nursery grounds, such as mangroves, estuaries and coral reefs, should be protected.
2. EIAs should be required for all proposed development projects within and adjacent fishery breeding and nursery grounds.
3. Strict pollution and coastal development control measures should be required.
4. Sand mining in estuaries, such as the Sg. Pulai estuary, should be prohibited. The recommended prohibition zone for sand mining (see Chapter 5) should be adhered to strictly.
5. Marine parks should be gazetted and managed, following strict enforcement of pertinent regulations and laws. The proposed marine park around the islands off Mersing offers the necessary mechanism to protect the coral reefs in that area. The reefs have already been severely damaged by illegal trawling, anchorage, illegal collection of corals and pollution. The island and marine protected area management plan in Chapter 10 discusses the marine park management scheme.

6. Management plans, which incorporate the development controls (guidelines), as outlined in Ch'ng (1988), should be developed for the islands adjacent to the marine parks. The proposal to establish a land park, designate a local authority and impose the development guidelines for the islands (including alienated land) should be implemented immediately.

Educational Program

An education and outreach program should be developed and established for decisionmakers in the state government, the various relevant agencies and the public.

This would address the misconceptions or insufficient understanding of political decisionmakers, fishers and the general public regarding fishery issues. The program should include information on fishery resources and activities, locations, and the functions and management of protected areas. Such a program could include:

- presentations to the state assembly, SEC, local governments and other relevant federal and state agencies;
- touring exhibits and programs for rural fishing villages and urban areas;
- an outreach program to keep in close contact with the fishers in their communities;
- permanent exhibits at tourist destinations along the coast such as Mersing, Desaru, the offshore islands, Johore Bahru and possibly the newly proposed boardwalk in Lido Beach.
- brochures, posters, video and film for broadcast on television and in schools; and
- the participation of seafood restaurants in the education effort.

RECOMMENDATIONS FOR LEGAL AND INSTITUTIONAL ARRANGEMENTS

Legal Aspect

The various laws listed in this chapter should be reviewed to make them more effective in addressing the problem of pollution and the indiscriminate development of the coastal areas. For the recommendations for review, see the Water Quality and Land Use Management Plan (Chapter 7).

Institutional Aspect

An open and regular dialogue should be instituted between DOF and the academic research community so that research is streamlined to provide data for the establishment of area management plans for fisheries. This cooperative effort will make efficient use of the limited manpower and resources available at DOF.

To ensure fisheries input on decisions taken with respect to project proposals in the coastal areas that may have an impact on fishery habitats, a representative from the resource branch of the Fisheries Research Institute (FRI) would be required to be a member of the proposed CRC of Johore. For projects approved by the committee, there is a need for DOF to initiate a monitoring program in Johore to provide feedback to FRI.

The state authority should direct the various agencies involved in land use and development to establish official channels with DOF with the objective of minimizing the conflict of interests in the coastal areas.

The requirements for adequate trained manpower for the various agencies involved in the management of land use and development are already given in Chapter 7.

A national and ministerial policy for the conservation of mangroves as fishery breeding and nursery habitats should be initiated.

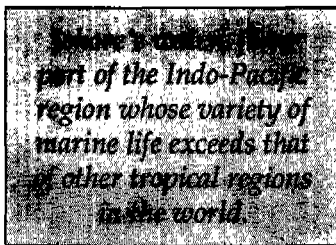
RECOMMENDATIONS FOR FURTHER RESEARCH

Research should be done intensively on the:

1. correlation between the species of finfish and shrimp found within mangrove systems and in nearshore waters;
2. the correlation between the loss of mangroves and the change in the population densities of fishery and shrimp stocks, especially in commercially valuable species such as *Penaeus indicus*, *P. merguensis*, *P. semisulcatus*, *Metapenaeus brevicornis*, *M. ensis* and *P. monodon*, which are known to depend on the mangroves;
3. the effects of different fishing gear on the fish population within the mangrove ecosystem; and
4. the usefulness of TEDs or turtle exclusion devices in management.

MANAGEMENT PLAN FOR ISLANDS AND MARINE PROTECTED AREAS

INTRODUCTION



The islands off the east coast of Mersing (Fig. A.2) are not only scenically attractive, but also very rich in foliage and marine life. Their tropical forests and coral reefs provide unique and diverse land and underwater ecosystems, which make them valuable as genetic, cultural, educational, scientific and aesthetic resources. Coral reefs have an edge over the islands' rainforests in terms of diversity and productivity of the ecosystems they support. Johore's waters, in fact, form part of the Indo-Pacific region whose variety of marine life exceeds that of other tropical regions in the world.

These continental east coast islands were once connected to the mainland during the major recessions of the sea that occurred at intervals in the Pleistocene period. When the continental ice caps melted, the islands separated. Their biota probably comprises species that arrived after isolation by rafting or by the intervention of man, and the remaining life and relicts of the ancient Sunda. The fauna, which is impoverished when compared with that of the mainland, has a tendency toward species extinction. However, thousands of years of isolation in unique island conditions have resulted in size, shape and color variations seen today among some of the island plants and animals. There is also a tendency toward evolutionary divergence with the emergence of species endemic to the islands. The introduction of nonnative plants and animals can therefore devastate indigenous species. Since the fauna has evolved without the presence of carnivorous predators from the mainland, it is vulnerable to introduced predatory or herbivorous species.

The growing number of tourist accommodations and the lack of development control on these east coast islands have put much stress on the resources and related ecosystems. The coral reefs surrounding these islands are also undergoing pressures from the use of destructive fishing gear, coral and shell collection, anchor damage, siltation and pollution.

Effective management is possible only when undertaken within the framework of an island ecosystem concept in which both the terrestrial and marine resources are managed as a single ecological unit. It is essential that the linkages between land and sea are recognized and treated as one integrated unit where the activities in one area affect the other.

The federal government, which has jurisdiction over the marine resources, and the Johore state government, which has jurisdiction over the islands and the foreshore 3 nautical miles from the low-water mark (including the super-adjacent waters), should coordinate closely in the management of both the islands and the surrounding marine waters.

SITUATIONAL ANALYSIS

Current Status

The islands are also known for their very attractive sandy beaches, clean waters and coral reefs. Development is primarily for tourism and tends to be small-scale, such as chalets and long houses. The tourist facilities are concentrated on the islands closer to shore, such as at P. Besar, P. Sibu and P. Rawa, since those farther offshore, e.g., P. Aur and P. Pemanggil, receive fewer tourists (Fig. 8.3). Recently, however, a tourism project has been developed on a fairly large-scale basis on P. Tinggi without prior approval of the authorities concerned. There are a number of chalet resort developments on P. Sibu, P. Sibu Tengah, P. Besar, P. Tengah and P. Rawa. Another chalet resort is being proposed on P. Sibu Tengah as a joint venture with Johore's SEDC.

The west coast islands of P. Kukup and P. Pisang have virtually no tourism development. P. Kukup is a mangrove island, while P. Pisang has pebble beaches and a mud coast. There is currently a proposal by a private developer to construct a resort complex, with hotel and residential areas, on P. Pisang.

JICA (1985) estimated that 10% of the total number of tourists in Johore in 1987 visited the islands off the east coast. By 1995, it is projected that about 24,400 domestic and foreign visitors, or 5% of the total tourist arrivals, will go to the islands, spending about 81,400 guest nights there. About 60% of these go to P. Tioman in Pahang, and about 40% to the Johore islands.

Government Action

In 1983, the Prime Minister, aware of the strategic importance of these islands and the value of their natural resources, directed DOF and MOA to designate the waters surrounding all offshore islands in Malaysia as marine parks. For this purpose, a National Marine Park Trust Fund, with an initial grant of US\$3.7 million, was established in 1986.

The federal government, anticipating the management problem of dual jurisdiction over the land and surrounding waters, ordered the formation of two committees at the onset of the marine park program. One committee, which would operate on the national level, would advise the Minister of Agriculture on the policies and programs to be adopted for marine parks.

The other committee would work on the state level, co-chaired by representatives from both the federal and Johore state governments. The former committee would have representatives from the central agencies of the federal and state governments, universities and private sectors, and NGOs with interest in conservation. The latter committee would act as a liaison in the actual planning and implementing stages of the parks.

Both governments, recognizing the paramount importance of joint management, have agreed in principle to gazette the unalienated land on the islands as National Parks-Johor and the surrounding marine waters as Marine Parks-Malaysia, respectively. They have also agreed to take steps to ensure that all development efforts on the islands, including those on alienated and privately owned land, be in line with the overall goal of Marine Parks-Malaysia, which is "to protect, conserve and manage in perpetuity marine environments of significance and to encourage public understanding, appreciation and enjoyment of Malaysia's natural marine heritage by present and future generations of Malaysians" (Ch'ng 1988).

The state government of Johore would also delegate the day-to-day administration of the islands to DOF. This is most logical as the department would have a visitors' center and a full complement of rangers and researchers on the islands. This arrangement would minimize cost and conflict in the management of both the islands and the surrounding waters, which would occur if different agencies would manage them.

The DOF would carry out a survey of the islands and their water resources, and formulate management plans for the islands and the state parks, to be adopted by the state government.

In view of the above, the Johore state government has promulgated the National Parks-Johor Enactment (1989) to enable it to establish parks on these islands, and to delegate to DOF the administration of the land parks that are adjacent to the national marine parks.

MANAGEMENT ISSUES AND PROBLEMS

The main problem with all the islands in Peninsular Malaysia is that they are not gazetted under any local authority area whereby the Town and Country Planning Act (1976), the Local Authority Act (1976), the Street, Drainage and Building Act (1976) and the relevant by-laws can apply with respect to development here. Neither is the Land Conservation Act (1960, revised 1989) applied with respect to the control of erosion and siltation on these areas. Therefore, there are currently no controls or guidelines that are imposed on land use and development on these islands, resulting in haphazard development without any regard for the environment's safety. Many of the issues discussed in the tourism management plan concerning the environmental impacts of tourism development are also experienced on the islands.

Sewage and Solid Waste Management

Sewage and solid waste disposal on the islands is a major problem especially since chalets are built without adequate toilet facilities or solid waste disposal sites. In some cases, untreated sewage is reportedly discharged directly into the sea. There is currently no solid waste disposal system for the islands as no established local authority is assigned to administer one. Thus, dumping of solid waste into the waters is unregulated. This problem is more serious at P. Sibiu, which has the largest population.

Beach Degradation and Coastal Erosion

Due to the lack of development control and absence of beach setback requirements, developments have encroached on the beaches in P. Sibiu, P. Besar and P. Aur. These present problems of erosion, public access and hygiene.

Limited Drinking Water Supply

Water supply is limited on all islands, especially P. Sibiu Tengah, due to the lack of watershed, the result of deforestation. Thus, the freshwater demand of the growing tourism industry would be in conflict with the needs of the local people and the natural vegetation. This scenario also means an increased tapping of groundwater supplies, which will result in saltwater intrusion into the underground aquifer. Therefore, any rate of groundwater depletion that exceeds the rate of replenishment will endanger the freshwater supply of the island. This will ultimately lead to the demise of the natural vegetation, which depends solely on groundwater supply during the dry season. The island ecology and the fauna of the islands will likewise be adversely affected.

Overcrowding on Some Islands

Carrying capacity studies to establish the sustainable levels of development have not yet been carried out. Therefore, there is currently no fact-based limit on the number of individuals or developments on the islands. For instance, the state authority regularly organizes water sports festivals on the islands where thousands of enthusiasts converge for a couple of days, causing much ecological damage. One can understand the state authority's noble objective of trying to encourage tourism on the islands by such methods, but the end result should be taken into consideration. Development that exceeds the carrying capacity may result in the deterioration of natural resources, destruction of the environment, harm to human health and financial losses due to the foreseen failure of the tourism industry.

Introduction of Exotic Animals

The introduction of exotic animals into the islands has created both aesthetic and hygienic problems. Goats and cows, which were introduced into the islands for food, could be seen grazing anywhere because of the lack of fenced-in pastures. This is especially true at P. Aur, P. Besar and P. Sibiu. The dung of these animals spoils the beaches and trails, making these unattractive. Sand fly infestation is also suspected to be a result

of the presence of dung. Moreover, uncontrolled grazing by these cattle removes "ground cover" plants, giving rise to erosion, and the runoff and siltation of surrounding waters. The introduction of cats has some adverse impacts on the natural bird population, which includes migrants on their way to their wintering grounds.

**Poorly Maintained
Coconut Plantations**

The lack of management of the coconut plantations on some islands, such as P. Sibu, has resulted in their poor maintenance. Thus, large amounts of unharvested fruits litter and rot on the ground without being disposed of. This reduces the island's attractiveness to visitors.

Coral Reef Damage

Tourist developments on the islands have wreaked havoc on the coral reef structures, primarily due to pollutive discharges; sedimentation from runoff caused by uncontrolled earth work; use of destructive fishing gear, traps and stakes; and anchor damage from boats. These have also led to the loss of corals and shells, which are collected by souvenir hunters or sold by the local population. Most of the supply is depleted around the islands and even on P. Rawa, whose owners are known for protecting the island's corals.

Presence of *Kelong*

In the surrounding waters of some of the islands, fishing stakes or *kelong* had been erected to serve as fish traps. Since these are no longer economically viable for this purpose, some are being used today as tourist accommodations and recreational fishing platforms. These *kelong* have even been reported to be used for illegal activities, such as smuggling and vice. These new functions have made *kelong* a source of localized pollution and a cause of elevated nutrient levels due to direct discharge of human solid wastes into the sea. These pollutants have an adverse effect on the island's sensitive coral reef environment. The physical structure of the *kelong* is also subject to storm waves during the monsoon season, making them unsafe as accommodations for tourists.

It has been reported that many of these *kelong* belong to Singaporeans whose local partners handle the operations. The local islanders do not derive any benefit from them. Some proponents of the *kelong* have used the excuse that these structures are examples of a traditional fishing gear, making them tourist attractions. There is no logic to this argument as the regular local and foreign tourists (mainly from Singapore) come to the islands solely for the isolated environment, their clear waters, the beautiful coral reefs and the inexpensive, fairly clean accommodations. The *kelong* are very cheap to rent because of the provision of only the basic amenities.

Pen Rearing of Fish Around Islands

In the marine protected areas around the islands, a number of pen-rearing aquaculture projects are causing problems. A combination of the excess fish food and fecal matter has caused elevated nutrient and pollutant levels within the vicinity of the operations, adversely affecting the surrounding coral reef ecology. Contrary to the objective of the proposed marine parks, these pens are also used to grow coral reef fishes for the local and overseas aquarium fish markets. Pen culture is permitted by DOF in Johore, perhaps in ignorance of the park objectives and the adverse impacts of the activity on the reef ecosystem. Culture of species that do not need artificial feeding, such as the giant clam (*Tridacna* sp.) and the sea cucumber, may be used as a substitute for fish pen culture.

Socioeconomic Impacts

The many socioeconomic impacts generally associated with tourism development in South Johore that are discussed in the tourism management plan also apply to the islands. In addition, many of the island tourism projects and *kelong* operations are developed through a partnership with Singaporean investors. The local islanders do not derive any socioeconomic gains from such developments, and are even exposed to, and possibly negatively influenced by, an alien culture.

Poor Sea Transport System

Many islanders are employed to operate boats that ply between the islands and the mainland (Mersing). They are also hired for fishing and diving trips. However, these boat operators are not organized, thus, the lack of publicity and information dissemination on the types of services available. There is also a limited number of disembarkation points for the islands.

Marketing of Island Resorts

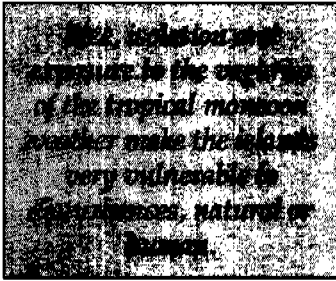
Since most of these island resorts are run on a small-scale basis, their operations cannot afford a large budget for advertising. They depend primarily on "word-of-mouth" referrals from their past guests. The state government has made some effort, though insufficient, to publicize these resorts.

Unregulated Scuba Diving Industry

One type of commercial operation in marine parks that needs stricter control and closer monitoring is the scuba diving industry. Inadequate training, poorly maintained gear and many potential safety hazards are the current problems that need to be addressed in the numerous small-scale scuba operations. Furthermore, those privately operated on the islands are not adequately monitored. There is also an absence of a contingency plan for emergency evacuation of divers in difficulty. The limited availability of decompression chambers in Malaysia has compounded the problem.

LEGAL AND INSTITUTIONAL ISSUES

Problems of Multiple Administrative and Legal Jurisdictions



The islands off Johore are very small, with a high ratio of land-sea interface as compared to the total island area. Size, isolation and exposure to the vagaries of the tropical monsoon weather make these islands very vulnerable to disturbances, natural or human.

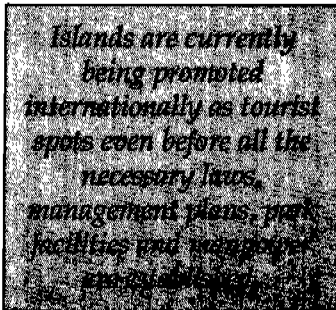
Proper management of the islands depends very much on the ability to minimize the impacts of development activities on land and water. However, the multiple jurisdictions over the islands and the surrounding waters have presented a problem to management. The legal jurisdiction over the islands, for instance, is with the state government of Johore, and that over the waters is with the federal government, namely, DOF. Although the state government has agreed to delegate the administration of the island parks to DOF, decisions on development proposals for the islands are currently made by the various state executive committees established, without prior consultation with DOF or the state/federal committee on marine parks management. This committee was established by MOA so that there will be joint decision-making on the plan and program proposals for marine parks.

A similar situation exists in Terengganu, another state. Here, although similar agreements were reached between the state government and DOF, a road was built on P. Redang by the army on the directive of the State Executive Committee on Welfare without any consultation with DOF and without carrying out an EIA as required by law. In the process of building the road, hill slopes were cleared, resulting in severe runoff. Earth cut from the hills was dumped on the only mangrove strand along the Sg. Redang estuary, damaging a fairly big portion of this strand at the river mouth. The fringing coral reefs have also been adversely affected.

Recently, the state government of Terengganu agreed in principle to alienate 700 acres of land, including hill forest reserve and mangroves, to a subsidiary company of Sports Toto Sdn. Bhd. This would be used for a massive tourist resort development of 350-room hotels, an 18-hole golf course, a horse range, 57 holiday villas, 80 holiday bungalows, 2 sports complexes, associated farmland, staff quarters and a 100-room condominium. The approval was given despite the recommendations of a DOF-sponsored study of the island (carried out by the Malaysian Nature Society) to allow only very minimal and well-controlled development in selected sites because of the fragility of the island ecosystem. The report also recommended that there should be no further alienation of land and that all unalienated and government land be turned into a state park.

Thus, this proposed massive development in Terengganu conflicts with the park's objectives. Such a situation can be envisaged for the Johore islands unless the state government concerned assumes greater responsibility in its role as custodian of these islands.

To add to the problem of multiplicity of jurisdiction, the National Parks-Johor Enactment (1989) provides for the establishment of management committees for land parks on the islands. Therefore, there will be two separate committees--a state committee to manage the land parks and a federal committee to manage the marine parks. The existence of many agencies or committees that have both legal and administrative control over the islands and surrounding waters is a management issue that needs to be resolved.



The other main institutional problem with respect to the management of the islands is that they are already being promoted internationally as tourist spots even before all the necessary laws, management plans, park facilities and manpower are established. These islands have been identified as having special significance in the national tourism policy of TDC, which is taking care of the publicity, together with the national airlines.

In trying to promote these islands, TDC has also initiated a loan scheme for the building of chalets where standard designs are made available. However, no proper guidelines with respect to water supply, carrying capacity and environmental safeguards, such as beach setbacks and appropriate sewage, garbage and solid waste disposal systems, were provided for each island. This resulted in the haphazard building of chalets without environmental considerations. On P. Tioman in Pahang, chalets under this easy loan scheme were built right on the beachfronts with no setbacks at Kg. Teket. This has aggravated the erosion problem faced by the existing houses. Moreover, the sewage effluent from these chalets flows into the sea in front, merely adding to the pollution already caused by the human settlements. If this current situation continues, there will eventually be a proliferation of cheap unsanitary chalets bringing in more people than can be sustained by the islands and further polluting the surrounding seas. It is obvious that TDC's poorly planned loan scheme clashes with the conservation objectives of both island (state) and marine parks.

An offshoot of TDC's promotional activities is the unnecessary publicity given the endangered marine turtle, which has even been adopted as the company logo. Focusing special public attention on an animal that is threatened with extinction makes it more vulnerable. This animal does not really need such attention until and unless management issues critical to its survival are addressed and resolved.

Lack of Legal Authority over Development on the East Coast Islands

The islands that make up the three island groups of Tinggi, Babi and Sibiu, and also P. Aur and P. Pemanggil, are not under the control of any local authority. Therefore, there is a lack of clear jurisdiction and regulation over island development.

Moreover, while the Mersing District Land Office (MDLO) has control over land conversions, neither this nor the Mersing District Council (MDC) has clear authority over approval of building plans and issuance of certificates of fitness on the island. This hinders any comprehensive island management and also gives rise to unregulated developments. Many chalets were developed without proper approval. It is only recently that several operators have started applying for land conversion to build commercial resorts.

This ambiguity in the application of law accounts for the lack of appropriate authority in charge of such functions as establishing and maintaining proper supply of water, electricity, and garbage and sewage disposal systems.

Gazettelement of the Island State Parks

Although in principle, the state government of Johore has agreed to establish the unalienated land on the islands as land parks under the National Parks-Johor Enactment (1989), it has yet to take steps to organize and draw up the machinery, including funds, for the establishment of NPJC, which is ultimately responsible for the administration of the enactment.

The DOF still has to carry out the survey of the fauna and flora of the islands, thus, management plans cannot yet be established. The DOF is faced with a manpower problem to implement this part of the agreement with the state government. It is also not able to obtain the assistance of the various in-country universities or NGOs as they are fully occupied with their own research projects.

With these problems, gazettelement of the unalienated land on the islands as state parks would only remain on paper and effective management would not be possible. There is also the hazard of further alienation of land by the state government, as in the case of Terengganu.

Gazettelement of the Marine Parks and Adoption of Regulations

The waters up to 3 nautical miles from P. Rawa, P. Hujung, P. Tengah, P. Besar, P. Tinggi and P. Sibiu are gazetted as fishery protected areas, and as marine parks in the near future, under the Fisheries Act (1985). Management plans for these marine parks have already been decided on and action is being undertaken to build marine park visitors' centers at P. Besar, P. Tinggi and Mersing, the jumping-off point of most visitors to the islands. Under the sponsorship of a UNEP-Coordinating Body of the East Asian Seas project, EAS 19, training courses have been developed and conducted for the staff who will administer and manage these islands and the surrounding marine park waters. Specific guidelines for use of these areas have been developed

by DOF. Those for park waters will be incorporated into law under regulations to be formulated in the Fisheries Act (1985), whereas those for the islands need to be incorporated into the management plans for land parks and the by-laws still to be developed.

**Lack of Scuba
Diving Regulations**

There are currently no legal requirements for basic safety precautions in scuba diving operations, such as periodic hydrostatic and visual inspections of air tanks and compressors. There is also no government-sanctioned enforcement of professional training requirements for diving instructors and leaders.

**Use of *Kelong* as
Tourist Accommodations**

The use of *kelong* as tourist accommodations is illegal under the Innkeeper's Act (1952, revised 1981). The MDLO is in favor of demolishing them as accommodations because these are considered unsafe and unsanitary dwelling places. A decision has to be made to classify the *kelong* as dwelling places, in which case their fishing licenses should be cancelled, thus putting them under the jurisdiction of MDLO. From here, several factors have to be considered. First, the state government of Johore has already agreed in principle to the establishment of marine parks and to ensure that the management of the islands (including the foreshore and super-adjacent waters up to 3 nautical miles from the water mark) will be in line with the conservation objectives of the park. In addition to being found unfit as dwelling places, these structures cause pollution that is adversely affecting the coral reefs. Based on these facts, the Johore state authorities should decide to demolish the existing *kelong* and prohibit the establishment of new ones.

**MANAGEMENT GOAL
AND OBJECTIVES**

This plan aims to guide management in its goal to regulate the development and activities on the islands and the surrounding marine waters, so that the resources are protected, conserved and managed in perpetuity for the enjoyment of present and future Malaysian generations.

The objectives are to:

- afford special protection to the unique biological and natural resources of the islands and the surrounding marine waters by preserving and managing the natural breeding grounds and habitats of aquatic (freshwater and marine), avian and terrestrial life, particularly species of rare, endemic or endangered flora and fauna;
- allow for the natural regeneration of island and marine resources where these have been depleted or damaged;
- promote scientific study and research;
- ensure that the forests, particularly the watershed areas, are maintained to conserve the water resources;

- preserve and enhance the undamaged and pristine state and productivity of the terrestrial and marine environments;
- develop and implement management plans that allow for the multiple use of each park without compromising their overall goals and objectives, and that regulate recreational and other activities on land and in the waters to avoid irreversible damage;
- safeguard the natural resources and life support systems of the islands and surrounding marine waters by considering all development and resource exploitation proposals to be potentially damaging to the terrestrial and marine environments, until and unless an EIA of each proposal has proven otherwise;
- maintain and enhance the socioeconomic and environmental benefits derived from the park, and particularly by the islanders;
- establish appropriate and effective legal and institutional arrangements to administer the islands effectively.

RECOMMENDATIONS FOR MANAGEMENT

Management Zones

The terrestrial and marine interface is delicate and interdependent on one another. Hence, the terrestrial and marine resources have to be managed as one whole ecological unit if economic exploitation of the islands and the surrounding waters is to be sustained in the long term.

The recreational (tourism), scientific and educational potentials of the islands, their surrounding waters, and the associated resources need to be developed. To contain and control the various activities such that the objectives of the marine and land parks are not compromised, both areas should be zoned according to sustainable, compatible activities.

The management plans will zone areas so that sensitive habitats are protected from damaging activities; intensive use is confined to sites that can sustain it; and incompatible activities are separated to avoid conflicts.

The management zonation is based on a multi-use concept. The island and marine park waters include a variety of habitats that may be more suited to one type of activity than another. The management plans will zone areas so that sensitive habitats are protected from damaging activities; intensive use is confined to sites that can sustain it; and incompatible activities are separated to avoid conflicts. Zoning will also be used to limit a certain number of people in a particular area so that adverse impacts from their activities are minimized or avoided.

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The management zones for marine park areas are as follows:

1. **Core zone** - This is the zone from the low-water mark to 1 nautical mile from the shore and covers all coral reef areas. All exploitative activities within this zone such as collecting of marine organisms and fishing of all sorts, including sportfishing, are prohibited. Access is limited to the carrying capacity level of the area. Only activities such as snorkeling, diving, wind surfing and sailing are permitted.
2. **Buffer zone** - This is the area from the outermost boundary of the core zone to 3 nautical miles from the low-water mark of the islands, established around the core zones. Only traditional fishing activities that are nondestructive, and controlled sportfishing are allowed. Fishing activities that are damaging to the resources, such as trawling and laying of traps (*bubu*), are prohibited.
3. **Reserve zone** - This covers areas whose undamaged wilderness is retained as a gene pool. No research activities are allowed.
4. **Scientific or research zone** - This covers relatively pristine areas where only ecologically sound research is allowed.
5. **Preservation zone** - This includes damaged reef areas that are closed to all forms of activity to allow for regeneration of the resources.
6. **Recreational zone** - This area allows recreational activities that are consistent with its carrying capacity and with the park's objectives.

It is proposed that the main islands be divided into three zones, namely:

Managed nature reserve zone A

This zone would be incorporated into the state park by a state enactment. Management plans would be established for the administration of the park. Within this zone, controlled recreational activities, such as those involving nature trails, jungle trekking and camping, would be allowed on a permit basis from the park authority. All other islands, except those whose wilderness needs to be preserved in its pristine form, should be included in this zone.

Protected nature reserve zone B

This zone would be incorporated into the state park just like zone A. Management plans would also be developed for its administration. The zone would include extremely sensitive areas that are adversely affected by disturbances in the environment. Such areas include marine turtle nesting beaches and breeding sites of other animals that should be accorded total protection from visitors during the breeding season.

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The nesting beaches should be established as turtle sanctuaries, and beach operators that allow the collection of eggs should have their licenses terminated by the state government. The DOF marine park rangers, with the assistance of interested NGOs, should patrol the beaches during the nesting season to collect eggs for the hatcheries.

Within this zone, the mangrove forest lining P. Sibutu should be established as a sanctuary, with boardwalks and interpretive signs established for visitors' use. The mangroves are important to the reef ecology and to the islands, as these serve as a buffer to storm waves, thus preventing erosion. They also act as a trap for sediments and toxic wastes, thereby enhancing the clarity of the waters, which is essential to the survival of the reefs. The mangroves serve as breeding and nursery grounds for fish and shrimp. The leaves provide nutrition to marine organisms.

Extensive economic use zone C

These are the currently alienated lands. Here, all forms of socioeconomic activities and facilities, including those for park administration, would be restricted. Environmental guidelines to ensure sustainable development with minimal environmental impacts would be developed and enforced on all current and future projects. EIAs would be a prerequisite for every development. The 1987 Environmental Quality (Prescribed Activities) (EIA) Order under the Environmental Quality Act (1974) requires EIAs for the following activities in zone C:

- clearing of mangrove swamps on islands adjacent to national marine parks;
- agricultural programs necessitating the resettlement of 100 families or more;
- housing development covering 50 ha;
- construction of coastal resort facilities or hotels with more than 80 rooms;
- hill hotel/resort development covering 50 ha or more;
- development of tourist or recreational facilities in national parks or on islands surrounded by waters gazetted as National Marine Parks;
- construction of airports;
- drainage of wetland, wildlife habitat or virgin forest covering an area of 100 ha or more;
- construction of harbors;

Chapter 10. Management Plan for Islands and Marine Protected Areas

- logging or conversion of forest into other land uses within the catchment area or in areas adjacent to state and national marine parks;
- waste treatment and disposal; and
- provision of water supply.

General Guidelines for Island Management

Management concepts

1. Islands and their surrounding marine waters should be managed as an integrated island ecosystem. The links between land and sea as well as their carrying capacities should be taken into account to ensure sustainable development.
2. Management plans should be developed based on site-specific studies.
3. Management plans should include the delineation of and specific guidelines for management zones. The legal and institutional framework for implementation purposes should also be provided.
4. No state land on the islands should be alienated. All state land should be gazetted as state island parks.

Habitat protection

1. Wetlands, such as tidal mudflats, and mangroves should be totally protected.
2. No reclamation, siting of landfills or conversion of mangroves should be allowed in wetlands.
3. Inflow of freshwater and sediments into the wetland areas should not be impeded by barraging rivers and building coastal bunds.
4. All breeding, nesting, roosting, feeding and nursery areas of birds, turtles and other animals should be gazetted as protected areas.
5. The collection of flora and fauna from all submerged and coastal upland areas should be regulated or prohibited through legislation. Programs to reintroduce native species should be properly studied before being implemented to avoid an imbalance in the ecology, which may have unpredictable effects. All exotics such as cows, goats and cats should be removed from the islands.

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6. Specified pathways, e.g., boardwalks through mangroves, should be established on the islands to avoid damage to sensitive habitats.
7. Some islands or parts of these should be closed to human visitation at certain times of the year, when they are used as nesting areas for different animals, such as seabirds and turtles.
8. Every effort should be made to educate visitors about the animals and to prevent the latter from being disturbed.
9. Specific measures should be taken to prevent the importation of alien species of flora and fauna into the islands. Goats, dogs and rats have already caused significant problems here.

Regulation of construction

1. Chalet resort development on the islands, including land acquisition for this purpose, should be monitored and controlled.
2. Tourist development should be limited to small- and medium-scale developments, such as chalets.
3. No pollutive industries should be allowed on the islands.
4. Coastal construction should be conducted in a manner that will protect, enhance and be sensitive to the qualities, values and processes of existing natural habitats within the islands and marine parks.
5. Facilities within or adjacent to important coastal habitats such as turtle nesting grounds or coral reefs should be constructed with minimum impact on these habitats and other shoreline features.
6. A construction setback having a standard minimum of 60 m from the mean high tide line should be strictly enforced. If the beach width is greater than 60 m, the whole beach should be preserved and construction prohibited.
7. A setback of 100 m from mangroves for tourist developments should be strictly enforced.
8. The other specific guidelines given in the tourism management plan (see Chapter 8) should also be followed.

Regulation of mining, excavation and earth moving

1. All terrestrial excavation and earth moving should be strictly regulated and prohibited, if possible. Mining should not be allowed. This is because these activities can deface the landscape and ruin its scenic value. Worse, these can lead to continuous erosion and chronic deterioration of coastal water quality through siltation, which damages nearshore habitats (e.g., coral reefs).

2. Silt fences and curtains should be required for all coastal construction to prevent siltation on the reefs.
3. Any construction should not be allowed to adversely affect the natural flow and quality of water, i.e., rivers or streams should not be diverted, silted or barraged.
4. Sand mining on beaches or inland ridges should be prohibited because of the risk of erosion and the destruction of biologically active areas such as turtle nesting areas and reefs.

Regulation of marinas and other shore constructions

1. Siting of marinas, which requires dredging or blasting, should avoid the use of shoreline areas adjacent to coral reefs and shallow areas.
2. All development should blend with the natural and visual qualities of the island and marine parks.
3. Specific guidelines on marina construction given in the tourism management plan (Chapter 8) should be strictly followed.
4. The construction of groins and seawalls should be discouraged to allow for natural beach processes to continue. These structures often give rise to more adverse impacts, such as increased erosion, in an adjacent area.

Proper sewage and solid waste disposal

1. Chalets should have a centralized sewage treatment system or at least a well-maintained septic tank system.
2. Septic tanks should be located in areas where there is no threat of overflow or contamination of groundwater.
3. Discharge of untreated or partially treated effluent into the sea should be prohibited.
4. Solid waste should be gathered and disposed in a sanitary landfill that is located well above the water table, with proper impermeable lining to eliminate any chance of contamination.
5. Only domestic, nontoxic and nonpathogenic wastes should be deposited at new solid waste landfill sites. Disposal of other materials would have to be approved by DOE on a case-to-case basis.
6. Continuous groundwater monitoring programs should be carried out in the area of the landfill sites.
7. Used oil from boats or other engines should be collected for shipment to the mainland to be recycled, and not merely dumped on the ground or in the sea.

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8. No littering should be allowed. Adequate trash receptacles should be provided in all visitor activity areas. Sand flies are known to abound in beach areas where rotten logs and garbage lie around.
9. "No littering" signs should be posted in several places.
10. Visitors to uninhabited islands should be required to take their own rubbish with them when they leave.
11. Visitors should be discouraged from bringing glass containers and cans with tear-off tops.
12. Use of biodegradable materials should be encouraged.
13. Regular cleanup campaigns should be carried out on the islands by local volunteer groups. These programs should be properly planned and implemented, using clear guidelines so that only minimal impacts would occur on the island environment. Slashing of plant undergrowth and clearing of hills to make them more visually pleasant, and burning of rubbish and undergrowth as well, should be discouraged. The cleanup programs should be sensitive to the fragile nature of the island ecosystem and confined to the removal of foreign objects.

Maintenance of freshwater supply

1. Studies to assess the drinking water resources should be done as part of the island management plans, since water is an important limiting factor in development. It is also a factor that should be incorporated into the carrying capacity studies of the islands, because the quantity of its supply would determine the threshold tourist capacity of any island.
2. As recommended in the tourism management plan, a maximum of 40 g/capita/day of drinking water should be used.
3. Tapping of groundwater for any tourist development should be allowed but carefully monitored. Any proposal to establish desalination plants needs to be considered in its proper perspective, since their use could be a means of justifying an increase in the number of visitors in the area that is beyond the island's carrying capacity. Moreover, the problem of the disposal of salt waste would have to be addressed because it would increase the salinity of the local waters, thus creating negative impacts on the coral reef ecology.

Settlement of conflicts between tourism and cattle- and goat-raising

1. On P. Aur, P. Besar and P. Sibiu, a study should be done to determine if raising cattle and goats is sustainable and compatible with the objectives of the marine and island parks. Otherwise, the practice should be phased out by the State Veterinary Department in coordination with NPJC.

2. Any heated water should not be discharged into the sea as it may cause stress on the nearshore ecosystem. Any large amounts of heated water should be allowed to reach ambient temperature before discharge.

Prohibition of dredging

1. Dredging should be prohibited in the vicinity of coral reefs. Unless planned and controlled with extreme care, dredging can result not only in direct physical damage to productive marine communities such as coral reefs, but also in indirect harmful effects over a far wider area by causing turbidity, silting and interference with water flow and natural sedimentation.
2. Whenever dredging is allowed, it should be strictly regulated to minimize turbidity, such as through the use of silt curtains.

Installation of mooring buoys

1. Mooring buoys should be installed throughout the islands to prevent anchor damage to coral reefs.
2. Within the marine park core zone, all boats should be required to use the mooring buoys and should not be allowed to drop anchors on the coral reef.

Regulations of recreational boating

1. Boats should be prohibited on shallow coral reef areas to prevent damage to coral reef communities.
2. Derelict vessels should be removed quickly. An agreement needs to be established with the Marine Department (MD) on this issue.
3. The Johore-Federal Marine Park Management Committee (J-F MPMC) should appoint a task force to study use conflicts and safety hazards, and then make recommendations regarding recreational boating activities in the marine protected areas.
4. Several issues on recreational boating should be addressed in the management plan for marine parks, including the following:
 - navigational and recreational safety regulations;
 - coordination of enforcement and emergency services;
 - measures to minimize accidents in recreational boating, boat sailing, swimming, diving and skiing;
 - minimum requirements for boat operators (e.g., age, licensing and insurance);

Chapter 10. Management Plan for Islands and Marine Protected Areas

- training opportunities for boaters;
- penalties for violation of safety and navigation regulations;
- marking of navigational hazards;
- prohibition of water skiing, swimming and diving in navigational channels; and
- maintenance of certain boat speed levels in restricted waterways.

Regulation of commercial operations

1. All commercial operations in the marine park should obtain a permit from the Marine Park Division of DOF.
2. All scuba diving charter operators should be registered with this division to ensure compliance with established safety measures within marine parks.
3. These scuba diving charter operators should have a current certification from an internationally recognized group. Otherwise, they would not be allowed to conduct diving tours in the marine parks.

Proper location of campgrounds

Campgrounds should be provided with appropriate toilet and shower facilities, and properly supervised cleaning services. Campsites should be located and marked to prevent illegal clearing of undergrowth outside these areas. Building of camp fire or cutting of trees and undergrowth should not be allowed. Campers, however, may use portable gas stoves or established barbecue pits.

Improvement of ferry services

1. The rates and schedules of ferry service to the islands should be standardized to facilitate tourist travel.
2. Alternative staging points should be established to the islands, such as from Tg. Murau, Sedili or Desaru.
3. The tour boat operators should be registered with the marine park once it is established. Their registration could help standardize the ferry system.

Phaseout of *kelong*

1. The state DOF should ensure strict enforcement of its policy on *kelong*, that is, to gradually phase them out as legitimate fishing gear. To that end, no new licenses should be issued and no existing licenses should be renewed.

2. *Kelong* should not be operated in marine parks, whether as fishing gear or as tourist accommodations. Both DOF and MDO should cooperate fully on this matter. If there is any need to retain the *kelong* for its historical value, then one may be retained (without being operated) on exhibit in a museum fashion. A single authority (state or federal) should be given the responsibility to maintain it as a safe structure, especially during the stormy monsoon season.

Implementation of the education program

A comprehensive education program is essential to a successful marine park management. For instance, boat operators should be trained to use mooring buoys instead of anchoring on coral heads. Fishermen should be educated on the allowable fishing activities in the park, and local residents and visitors alike should be taught why they are not permitted to collect shells or corals.

RECOMMENDATIONS FOR LEGAL AND INSTITUTIONAL ARRANGEMENTS

Legal Aspect

1. Regulations for the marine and state island parks should be established soon. Those for the marine park of P. Payar in Kedah have already been drafted by DOF and only await the final vetting by the Attorney General's Chambers. These regulations may serve as a model (with necessary revisions) for the draft regulations of Johore, which should address the problems and incorporate the recommendations made with respect to scuba diving, boating, etc.
2. All legislation pertaining to development of land, namely, the Land Conservation Act (1960, revised 1989), the National Land Code (1965), the Continental Shelf Act (1966, revised 1972), the Street, Drainage and Building Act (1974), the Local Government Act (1976) and the Uniform Building By-Laws (1986), should be reviewed and revised to include the recommendations in this management plan with respect to islands.

Most of these laws were formulated without considering the environment and the fragility and sensitivity of the island ecosystem. Development controls that are adequate for mainland development may be inadequate for the islands.

3. All state land on the island should be gazetted as state parks under the new National Parks-Johor Enactment (1989).
4. No more state land should be further alienated for any purpose whatsoever.

5. The island waters, which are already gazetted as Marine Protected Areas, should also be gazetted as Marine Parks under the Fisheries Act (1985).

Institutional Aspect

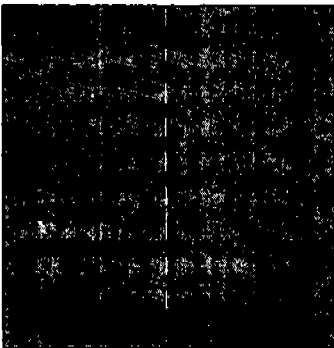
1. The multiplicity of both administrative and legal jurisdictions over the islands should be resolved. The DOF should be retained as the main administrator for the day-to-day management of both the island state park and the surrounding marine park. This is cost-effective as well as more efficient in terms of time and manpower. However, it does not rule out the roles of other relevant authorities, such as the Wildlife and Game Department and DOFor, among others, in the management of the respective resources.

There is a need for the Johore state government to recognize the existence of the J-F MPMC established by MOA and co-chaired by both the Secretary General of the ministry and the Johore State Secretary for joint decisionmaking on plans and programs for the marine parks established.

To address the problem of multiple legal and administrative jurisdictions over the islands and the surrounding waters, it is recommended that J-F MPMC be made the main committee, preferably solely responsible for coordination of the management of all the marine and island parks in Johore since both the islands and their surrounding waters are to be managed as one ecological system. All development proposals for the islands submitted to the local authority would need to be passed on to this committee for comments before a decision is made on the local level, or before they are given to the proposed Johore CRC and subsequently, to SEC for a decision. Additional members, such as the district officers and senior representatives of the local authority in charge of the islands, should be included in the J-F MPMC. All other state executive committees established for various functions (e.g., welfare, tourism, agriculture, etc.) could still receive proposals and programs for the islands but should follow this process.

Therefore, all development proposals for the islands would eventually have the views of the proposed CRC and J-F MPMC before a final decision is made by the state government. This is crucial because the fragility of the resource base on the islands requires that all development proposals be subjected to special scrutiny by experts and resource managers before being allowed to be carried out.

Therefore, the National Parks-Johor Enactment (1989) should be revised to provide for the above recommendations by legalizing J-F MPMC in the enactment. The name of the committee, however, should be changed to include the island (state) parks, which should also be under its jurisdiction. This step would legalize it as a Johore state committee rather than one established administratively by MOA, thus giving special



recognition to the state government, which has legal jurisdiction over the islands, and yet, recognizing the essential roles of MOA and DOF. These agencies would provide the technical expertise and the financial support required in the day-to-day running of the island (state) parks, since both the marine and island parks will be administered by DOF.

2. With respect to the other main institutional problem posed by the national tourism policy of TDC, it is recommended that a representative each from the J-F MPMC and DOF be included in both the federal as well as state tourism committees.
3. The state should either extend the jurisdiction of the Mersing local authority over all the islands, or establish a separate local authority. In the former case, the by-laws need to be revised to take into consideration the recommendations made in the management plans and guidelines for the islands. In the latter case, new by-laws need to be promulgated incorporating these recommendations.

The advantage of designating MDC as the local authority primarily lies in the fact that the institutional structure already exists and the necessary laws, though inadequate, would provide a framework to begin enforcement of existing development regulations. The disadvantage is that this council is set up to deal with land matters on the mainland. Therefore, both MDC and the legislations are not equipped to deal with the special requirements of a fragile and sensitive island ecosystem.

The advantage of creating a new specialized local authority is that the TOR for its operation as well as the accompanying legislations can be tailored to the requirements of managing the island ecosystem.

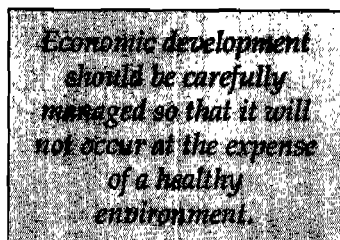
AREA-SPECIFIC ACTION PLANS

INTRODUCTION: FUTURE DEVELOPMENT

The economic development of South Johore should be conducted in such a manner that future generations can continue to rely on the productive use of the resource base. This is the concept of sustainability.

South Johore's industries are primarily based on both renewable and nonrenewable natural resources. Sustainable development of renewable resources, such as forests, fish, arable land and clean water, requires that their exploitation be at levels where the resource base can still continue to replenish itself. With the growing demand for these resources, the pressure to increase their exploitation is great. If the resource base is utilized above the sustainable level, the amount of these replenishable resources for future development will decline.

Nonrenewable resources, such as sand and minerals, are limited. Sustainable development of these resources means prolonging their productive existence through efficient use, thus reducing the rate of demand for them.



The main purpose of economic development is to improve the quality of life of the people. An essential factor in achieving this is the maintenance of high environmental quality, as manifested in conditions such as unpolluted air, clean waters and the availability of natural areas for recreation. Therefore, economic development should be carefully managed so that it will not occur at the expense of a healthy environment.

In the face of the large-scale development planned for South Johore (Fig. A.3), it is imperative that environmental considerations be given the required attention and incorporated in the planning and implementation of these proposals.

SITUATIONAL ANALYSIS

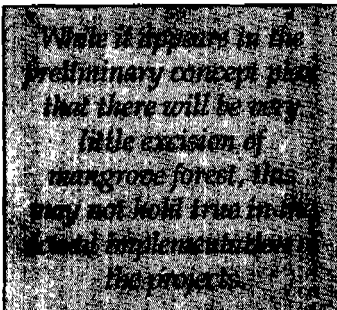
The three major development projects for South Johore are those associated with the proposed second linkage with Singapore, the petrochemical industrial estate at Tg. Langsat and the international resort at Desaru.

**Developments Associated
with the Second
Linkage to Singapore**

The West Johore Bahru District will be the location of major developments associated with the proposed second linkage (Fig. 7.10). As mentioned in Chapter 1, these include a long high-level bridge connecting both shores, residential and industrial developments, government institutions, a park and related infrastructure. There will also rise a new town center, Bandar Baru Piai, which will eventually merge with Gelang Patah. Another proposal is the construction of a second port on the east bank of the mouth of Sg. Pulai. In addition, a bridge and a road crossing Sg. Pulai and the mangrove forest reserves are proposed.

There are also concurrent development proposals for areas north of the second linkage in anticipation of the tourist influx into the area. Thus, in Kukup town, improvements in the infrastructure for further tourism development are planned. Around Kukup to Tg. Piai, very extensive residential, tourism and agricultural projects are proposed, while P. Kukup and Tg. Piai are under consideration by the government as possible mangrove parks.

The infrastructure improvements at Kukup town, which primarily concern the road and market place, seek to allow for the growth of the tourism industries here. Other developments associated with the second linkage include a 951-ha residential project along the coast surrounding Kukup and toward the north, the expansion of Kukup town, and various agricultural projects on 4,100 ha between Kukup and the Sg. Pulai Mangrove Forest Reserve, such as orchards, "leisure farms" and plantations. There are also three tourism projects covering a total of 1,400 ha, including one resort with a marina on reclaimed land on the west side of P. Kukup, a camping ground-caravan park development just north of Tg. Piai and a hotel/convention center with an 18-hole golf course between Tg. Piai and the Sg. Pulai Mangrove Forest Reserve.



While it appears in the preliminary concept plan that there will be very little excision of mangrove forest, this may not hold true in the actual implementation of the projects.

It appears in the preliminary concept plan that there will be very little excision of mangrove forest, but this may not hold true in the actual implementation of the projects. The industrial area is proposed to be located directly adjacent to the mangroves on Sg. Pendas, Sg. Bahan, Sg. Perepat, Sg. Melayu, Sg. Skudai and Johore Strait. Residential areas are proposed directly adjacent to the mangroves on Sg. Pulai. The siting of these facilities has a significant impact on the mangrove ecosystem through runoff of pollutants and sediments and the diversion of water. These direct discharges, runoff and leaching will also increase the pollutant load in Johore Strait, the Sg. Pulai river basin and five other rivers. The increased pollutant load would reduce the water quality and affect the fish stocks in the area, which are already under stress from the heavy fishing effort. It could also affect the suitability of the area for aquaculture.

Furthermore, building directly adjacent to the coastal bunds will increase the risk of loss from future coastal erosion and decrease the water quality of surface water flowing into the mangroves. An increase in soil erosion during construction is expected, with the resultant impacts on mangroves and water quality.

The building of a second port at the mouth of Sg. Pulai will certainly have major effects on the mangroves in the surrounding area through conversion, reclamation and changes in sediment flow. First, the construction and operation of the port will require continuous extensive dredging, resulting in high turbidity of the coastal waters. Second, the discharge of pollutants associated with port and ship operations will also significantly reduce the water quality in this area, affecting fisheries and aquaculture.

With all these developments, there will be a concomitant increase in population and dislocation of the local inhabitants, resulting in dramatic changes in their existing agrarian and fishing lifestyles.

Thus, the CRM issues arising from these developments should include mangrove forest conservation, water quality protection, coastal erosion control, development compatibility with fisheries and aquaculture, increase in population and the socioeconomic impacts of development on nearby communities.

The Proposed Industrial Estate at Tg. Langsat

A 3,000-ha industrial estate is being planned by SEDC (Fig. 3.3) at Tg. Langsat. This estate, which will be even larger than the one in Pasir Gudang, is being proposed specifically for heavy-industry facilities such as petrochemical factories and steel mills. The current plan for this industrial estate includes its own port facilities, an oil sludge disposal system on Sg. Santi and an oil sludge/oil slop reprocessing facility on Sg. Lebam.

While the conceptual framework for the establishment of this new industrial estate at Tg. Langsat is being prepared, the Pasir Gudang estate, which is currently the largest in Johore and Johore Port, continues to expand. Land that was previously planned for residential areas is already being considered for industrial development. Virtually all the heavy industries in the state, excluding the palm oil and rubber mills, are currently located in Pasir Gudang. Petrochemical factories and steel mills are also being planned to be sited here.

Besides industrial development, there are other plans for this area. Tourist development is one (Fig. 8.2). The construction of a resort hotel and a marina near Kg. Perigi Acheh (next to Sg. Kim Kim), and the expansion of tourist facilities at Kong Kong, are being planned. Along the Kota Tinggi side of Sg. Johore, plans to restore and promote the historical sites of Johore Lama and Panchor have been proposed. A resort and a marina are also proposed for

Belungkor, along with a ferry terminal to link it with Changi, Singapore. A large resort and holiday home complex is proposed at Penggerang. On the other hand, there are plans for aquaculture development along Sg. Lebam, Sg. Belungkor and Sg. Buah Besar through programs of KEJORA and SEPU (Fig. 3.2). More growth in the fisheries, aquaculture and nature tourism industries is expected for the entire Sg. Johore estuary. There is also interest in sand mining in this estuary (Fig. 5.1).

However, all these future developments in Pasir Gudang will only aggravate the current water quality problems in the area. The existing water quality monitoring system is inadequate to meet the needs of the expansion. Hazardous industries will certainly present a serious problem if these are established near food factories, particularly during accidents at petrochemical facilities and others that handle dangerous substances.

The preliminary design of the proposed Tg. Langsat industrial estate has three layout options, each entailing the reclamation and conversion of mangrove forest. The industrial facilities, e.g., the two oil sludge systems, will contribute to the increase in pollutant load in the waters. There is the potential reduction in water and air quality, which can cause problems for the fishing, aquaculture and tourism industries in the area. As it is, this area is already threatened by poor water quality in the downstream section of Sg. Johore and its estuary. In addition, the factories on the estuarine shore will certainly have an unpleasant visual impact on the tourism industry. This major change in land use will mean the relocation of fishing and farming communities, who will experience dramatic changes in lifestyle, also a consequence of the second linkage-associated developments. These are only some of the socioeconomic impacts of the proposed estate.

Sand mining in the Sg. Johore estuary can also reduce water quality, affecting fisheries and aquaculture. The major aquaculture development planned for this area will also require a significant conversion of mangrove forest, which will have a potential impact on the local fisheries.

It is evident that the Tg. Langsat industrial development will give rise to potential conflicts in coastal resource use. These value differences will be especially evident between mangrove conservation and maintaining good water quality on one hand, and the pursuit of more profit-oriented goals, such as the development of heavy industries, tourism, aquaculture and fisheries, on the other.

The KEJORA has received development proposals for the entire area of Desaru (Fig. 2.4), the main one being the 1,600-ha Desaru International Resort, which has already been approved by the Johore state government. It involves over M\$1.6 billion in investment and the construction of a total of 14 hotels with over 4,000 rooms, 4,000 holiday homes, 5 golf courses, a 350-slip marina, large man-made lakes and waterways, an amusement park consisting of a winter wonderland, and a wilderness reserve.

One socioeconomic impact of the proposed industrial estate is the relocation of fishing and farming communities, who will experience dramatic changes in lifestyle.

The Proposed Desaru International Resort Development

Given this scale at which tourism development will be carried out, several potential conflicts and issues can be expected. These involve primarily impacts on water quality, the beach and the coastal forest environment, and the socioeconomic conditions of the local population.

**RECOMMENDATIONS
FOR MANAGEMENT**

The goal of this entire CRM plan and the area-specific action plans that are given in this chapter is to effect the sustainable development of coastal resources by incorporating environmental criteria in all development plans. This can only be achieved through a process of integrated resources management and land use planning.

The specific management plans for the major coastal resources and CRM issues (Chapters 2 to 10) provide general policies to guide resource development, and details for specific action and day-to-day management. Management plans are provided for coastal forests, mangroves, aquaculture, sand mining, coastal erosion, water quality, tourism development, fisheries, and offshore islands and marine protected areas.

These specific management plans may be integrated for use within areas where there are multiple resource uses and conflicts, as in the case of the three large development proposals presented below.

**For the Second Linkage-
Associated Developments**

**Potential water
quality impacts and
construction setbacks**

The upcoming Bandar Baru Piai development and other projects associated with the proposed second linkage to Singapore pose a high pollution risk for the mangrove forests, Sg. Johore and its estuary, and West Johore Strait. An EIA should be prepared for both the overall plan as well as for the individual factories, housing estates and other facilities.

Furthermore, as the area is used widely for fishing and is suitable for aquaculture development, it is important to establish the construction setback proposed in this plan to prevent the detrimental impacts caused by leaching, runoff and direct discharge from industrial, residential and tourist developments. Setbacks of 1,000 m from mangroves, rivers and the coast for industrial facilities; 500 m for housing estates; and 100 m for tourist facilities are recommended (Fig. 7.10).

Chapter 11. Area-specific Action Plans

The type of industrial activity that will be allowed should be controlled to maintain the water quality conditions necessary for continuing the beneficial uses of the resources in the area. The development should be limited to light industries that do not discharge effluents and do not pose potentially hazardous pollution problems. Heavy industries should be consolidated at Pasir Gudang and Tg. Langsat. Strict pollution controls should also be enforced and comprehensive environmental monitoring programs should be established for all development projects. In addition, soil erosion control measures should be taken by the developers.

All facilities should have adequate sewage treatment systems to meet the needs of the growing population. For the industrial estate and large housing developments, a centralized sewage treatment system would be more efficient and cost-effective than individual septic tanks. The appropriate system should be investigated and agreed upon by DOE and DPW prior to construction. A satisfactory arrangement for maintaining these facilities should also be established.

Proposed Inland port

It is necessary to have a freight forwarding center in this area to ship the goods produced by the local industries. However, the proposed seaport at the mouth of Sg. Pulai will have major impacts on the area's coastal resources. The massive dredging and reclamation that will be required for its construction will significantly increase the turbidity of the surrounding waters. It would be more efficient and less environmentally damaging to build an inland port with a free trade zone for storage and the necessary customs services for freight forwarders. Thus, the manufactured goods can be packed into containers at the inland port, and transported by an efficient rail or road system to Senai Airport or Johore Port in Pasir Gudang for transshipment. By doing this, Johore could retain its shipping business, and Sg. Pulai's fishing and aquaculture industries will not have to bear the cost of the increased siltation and pollution associated with the construction and presence of a port within the vicinity.

Moreover, the initial dredging of the several kilometer-wide mudflats in the area will certainly be very expensive. Since Sg. Pulai carries a heavy load of sediments into the strait every day and the mudflats constantly shift in the current, the port basin and ship channels will have to be continuously dredged. The high cost of this operation may itself be a factor against building a seaport here.

Water quality monitoring program

In view of these proposed massive developments, a comprehensive water quality monitoring program should be implemented. More stations are needed in Sg. Pulai and some in Johore Strait. The DOE should evaluate the adequacy of its water quality monitoring database and determine specific locations for additional stations.

Tourism projects

The two tourist areas proposed for Tg. Piai should be small or medium in scale and integrated with the mangrove state parks, and the local agriculture and aquaculture developments. These should also maintain a 100-m construction setback from the mangrove forests.

The tourism project proposed for P. Kukup, on the other hand, should be shelved since the major reclamation that it requires will be detrimental to the mangrove island ecosystem. Another characteristic that makes the area unsuitable for such a development is the considerable erosion and accretion here, resulting in the shifting of the whole place over the last 20 years. For instance, the western side of the island, where the resort and marina have been proposed, has been wearing away. The island should instead be protected as a park and not irretrievably damaged by the reclamation and resort projects. Tourism development should concentrate around Kukup town and Tg. Piai. Compatible and nonconsumptive tourism on and around P. Kukup and Tg. Piai mangroves should also be encouraged.

Proposed road and bridge across Sg. Pulai

The road that is proposed to go through the Pulai Mangrove Forest Reserve and cross Sg. Pulai will certainly have a localized impact on the mangroves, and potentially far-reaching effects on the whole forest reserve. An EIA by the developers should be evaluated and approved by DOE before final approval can be given. Building a road through the mangroves will be a very costly proposition and is estimated to be more expensive than building a bridge across the strait. If the state approves the construction, the road should be built entirely on pilings, allowing the free flow of water sufficient to accommodate a 50-year flood. This is important for the maintenance of the water exchange in the mangrove ecosystem.

Mangrove-fringed coasts

For development along mangrove-fringed coasts, the recommended setbacks for the various types of development should be followed.

Relocation of affected local community

The relocation of the people living in the area should be done with due consideration for their lifestyle and with adequate compensation for the inconvenience.

Need for a new local authority

The proposed development in Bandar Baru Piai is so extensive that the existing local planning authority structure cannot handle this additional responsibility. A local authority created especially to manage the Gelang Patah area in the West Johore Bahru District will be needed.

**For Developments
along the Sg. Johore
Estuary**

There is a need for zoning, since current development pressures indicate the potential incompatibility of resource uses in the Sg. Johore estuary. The Tg. Langsat industrial estate for petrochemicals and heavy industries, which overshadows all other development pressures in terms of potential impact, needs particular attention in the zonation.

**Improved water quality
monitoring program**

There is a lack of data on the water quality of Sg. Johore and its major tributaries. Since these are areas where major developments are proposed, the data gap is critical. The problem stretches of the Sg. Johore and its tributaries, including Sg. Temon, Sg. Berangan, Sg. Remis and Sg. Sebol, which are identified in the plan, should be investigated to determine if there are any factories that do not meet DOE's requirements. Development controls should be more strict in the water catchment areas upriver. It is also essential to establish more monitoring stations in Sg. Johore, Sg. Lebam, Sg. Belungkor and Sg. Santi.

Tg. Langsat industrial estate

An EIA should be carried out to address the potential impacts of this heavy-industry estate. For each facility, an EIA should also be prepared as part of the planning and site selection process, and not after land purchase agreements have been signed.

Several measures should be taken to ensure the environmental protection of the Sg. Johore estuary, including the following recommendations:

1. For the Tg. Langsat area, the industrial estate should be sited inland behind the mangrove forest lining the Sg. Johore estuary, but should still maintain a 1,000-m construction setback. Only the necessary port and cargo handling facilities should be on the coast. This measure would help prevent water pollution in the mangroves, which, in turn, would filter the water runoff from the industrial estate before it reaches the river. In this way, the existing fishery, forestry and aquaculture production can be maintained. Option 2 of SEDC's proposed layout comes closest to this recommendation (Fig. 3.3). This layout is for the original area size of the proposal, which is half of its current proposed size. Nonetheless, the recommendations remain the same, with the additional area being inland.

The proposed industrial estate at Tg. Langsat should be sited inland behind the mangrove forest lining the Sg. Johore estuary, but should still maintain a 1,000-m construction setback.

In addition, the siting of the industrial estate inland of the mangroves would be beneficial to the tourism industry in the Sg. Johore estuary. The presence of petrochemical and heavy-industry factories right on the shoreline of the estuary would greatly reduce the attractiveness of the site to visitors.

Chapter 11. Area-specific Action Plans

2. The Sg. Johore estuary is a tourism center with recreational developments at Kong Kong Laut, proposed resorts near Kg. Perigi Aceh, Belungkor and Penggerang, and existing river cruises. Therefore, high water quality should be maintained.
3. Strict pollution controls for both air and water should be required of all the facilities in this estate. These include the establishment of treatment facilities, oxidation ponds and other technologies that help minimize the volume and toxicity of effluent discharges.
4. A comprehensive water and air quality monitoring program, funded by the factory owner and designed by DOE, should be implemented to check for any discharge of pollutants. The sampling should be carried out monthly at the discharge point for each plant at the owner's expense. There should be only one effluent discharge point per plant, unless given prior approval by DOE. The plant owner should then make quarterly water quality monitoring reports to DOE. The SEDC should also carry out a comprehensive area-wide monitoring program and submit the results to DOE, which will make regular spot checks.
5. Strict safety procedures should be followed when handling and storing hazardous chemicals.
6. Up-to-date inventories of these chemicals should be kept and a standard report made to DOE on a quarterly basis.
7. The DOE should make periodic spot checks of these chemicals to ensure that proper storage procedures are implemented.
8. A comprehensive emergency response plan should be established for each petrochemical plant, covering various accident scenarios. The plan would have to meet the approval of DOE and be implemented as the plant goes into operation. A response team should be ready with the necessary equipment on hand and in working order. The DOE should do spot checks on this emergency response program's readiness, and test runs should be made periodically. The costs to be incurred for this program would be borne in full by the plant owner.
9. In addition, JPA, SEDC, DOE, the Fire Brigade and MD would be required to draw up an emergency response plan for accidents that spread beyond the confines of the private company's area and its ability to handle the accident. The DOE should have an emergency response office on site.
10. To pay for this increased surveillance and monitoring, the plant owner should be levied a fee, which is the amount of each hazardous chemical in the plant multiplied by the risk factor, based on the toxicity of the chemicals.

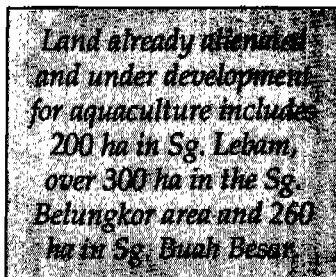
11. Strict erosion control measures should be implemented during the construction of the industrial estate to ensure that no increase in the sedimentation of the river has occurred.
12. The proposals call for the relocation of at least two *kampong*. Since the people's lives will be dramatically changed, the developer should be responsible for compensating them for land, property, change of lifestyle, relocation, job training and provision of employment. Ongoing social programs, such as counselling, will also be required to facilitate the transition.

Other industrial development proposals

Also proposed for the Sg. Johore estuary area are two other industrial facilities: an oil sludge/oil slop disposal site along Sg. Santi and an oil sludge reprocessing plant along Sg. Lebam. The problem here is that these facilities are proposed on sites where other uses incompatible with the facilities exist. For one thing, it is adjacent to a mangrove forest reserve along a river used for fishing and aquaculture. The groundwater in the area may be very close to the surface, hence, there is a possibility of these oil wastes leaching before degradation. Potential impacts on the mangrove forest reserve, the groundwater and river, and safety along the transportation route, should be carefully evaluated.

These types of pollutive industries should be consolidated physically to facilitate waste treatment and emergency response, so that in the event of an accident, there would be more equipment and personnel on hand to respond, and JPA and DOE would be able to oversee and monitor the operation more closely. It is recommended here that the request to build these plants in the proposed locations be disapproved. Instead, the developers should be encouraged to site the facilities at the new petrochemical industrial estate being planned by SEDC at Tg. Langsat. EIAs should be prepared for both facilities for evaluation and approval by DOE.

Aquaculture development



Land already alienated and under development for aquaculture includes 200 ha in Sg. Lebam, over 300 ha in the Sg. Belungkor area and 260 ha in Sg. Buah Besar.

The KEJORA has plans for aquaculture development in Sg. Lebam, Sg. Buah Besar and Sg. Santi. The SEPU, on the other hand, has an aquaculture project in the Sg. Belungkor area. These developments would require the conversion of large tracts of the existing mangrove forest reserves. The land already alienated and under development for aquaculture includes 200 ha in Sg. Lebam, over 300 ha in the Sg. Belungkor area and 260 ha in Sg. Buah Besar. Commitments have been made by KEJORA to private companies for an additional 400 ha for aquaculture in Sg. Lebam.

In 1986, the Sg. Lebam Mangrove Forest Reserve measured 1,354 ha; the Sg. Belungkor Mangrove Forest Reserve, 1,261 ha; and the Tg. Sura Stateland Mangrove Forest near Sg. Belungkor, 777 ha. The aquaculture development of over 900 ha represents a conversion of nearly 27% of the mangroves for

aquaculture in the Sg. Lebam and Sg. Belungkor areas. In addition, a large resort being planned will require the excision of at least another 100 ha of mangroves in the Sg. Belungkor area. The total conversion of nearly 30% of the mangroves in this area will certainly have a significant impact on the area's shrimp and finfish fisheries. In addition, the water quality is expected to be reduced since soil erosion will probably increase due to pond construction and forest clearing.

While a large portion of mangrove land has already been transferred for aquaculture use, approximately 750 ha of mangrove land remain unalienated on the Sg. Lebam Mangrove Forest Reserve; 960 ha in the Sg. Belungkor Mangrove Forest Reserve; 700 ha of stateland mangrove forest around Sg. Belungkor; and most of the 2,500 ha of the Sg. Santi Mangrove Forest Reserve.

The KEJORA and SEPU are strongly advised to stop further alienation of mangrove land for aquaculture. Rather, they should review their plans in the light of this study and focus on other types of aquaculture that do not require conversion of mangrove land, such as cage and raft culture. The potentials for aquaculture development of other land areas behind the mangroves should be tapped.

In the event that the state still wants to pursue the conversion of mangrove land into other uses, as opposed to the recommendations of this report, the following guidelines should be followed:

1. An EIA should be undertaken and the cumulative impact of the conversion, evaluated. This should be required even if the conversion will be done in phases and not all at once.
2. Any aquaculture development should follow the required 400-m construction setback to provide a buffer between the ponds and the river.
3. Aquaculture developments should follow this plan's recommendation that for every 1 ha of developed land in a given area, 4 ha of undisturbed mangrove forest should be protected (1:4 ratio). This will help preserve the mangrove ecosystem while protecting the water quality of the ponds.
4. The water quality of the river should also be carefully maintained so that it is not deteriorated by the high concentration of aquaculture operations.

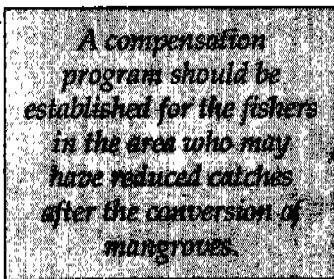
Resort at Belungkor

The proposed resort at Belungkor will require mangrove conversion to accommodate a marina and a hotel. For this project, an EIA should be prepared, evaluated and approved by DOE. The practicality of building a private marina is questionable in the light of the proposals for four other marinas in this region, and the rather limited market for these facilities. The ferry terminal will also be sited here as a destination point from the Changi Airport ferry terminal. In building the terminal and the jetty, the site should be selected to minimize the conversion of mangrove land.

Instead of reclaiming or dredging so much of the mangroves in this area, it is recommended that the mangroves be incorporated into the resort concept--through trails, nature tourism, fishing, birdwatching and other nonconventional and compatible activities. Recreational projects should take advantage of the surrounding environment and include educational programs on local fishing and traditional culture, and the important role played by mangroves in the local ecology and life of the local people. A boardwalk could be constructed through the mangroves with interpretive panels. The developers should be required to use the local population for direct or indirect employment at the resort as much as possible.

A setback of 100 m from the mangroves should be maintained for any permanent construction. If a marina is to be developed, strict pollution controls on vessel discharges should be imposed. A pump-out facility for used oil and human sewage, and a solid waste receptacle should be provided. A centralized sewage treatment for the resort and holiday homes, and an effluent and water quality monitoring program (at the cost of the private developer) should be established. The buildings should be inconspicuously built, not exceeding six stories, to fit in with the surroundings.

As a more detailed plan for the project is being prepared, KEJORA should seek advice from the various relevant technical agencies to minimize the proposal's impacts on the mangroves. A compensation program would also have to be established for the fishers in the area who may have reduced catches after the conversion of the mangroves.



Resort at Penggerang

The proposed tourist resort development at Penggerang would consist of several hotels, shopping complexes, over 1,000 holiday homes and several golf courses. Approximately 100-150 acres of the area proposed for this development are in the Sg. Santi Mangrove Forest Reserve. The developers are planning to convert some of these mangroves into golf courses and an airfield.

The mangrove is an important natural feature of the area that should be highlighted, not removed. The recommendations given previously for the Belungkor resort also apply to this tourist development. In addition, runoff from the golf course should be carefully monitored to prevent the pollution of the river or the inland waterways.

For the Desaru Tourism Area

Water pollution control

1. The coastal waters currently have very good water quality. Thus, every effort should be made to maintain it, not only for recreational use, but also for aquaculture operations (such as that south of Tg. Penawar). The developer should work with DOE to develop a water quality monitoring program and an acceptable reporting procedure.

2. The development could either have individual sewage treatment units for each hotel or a centralized one for the whole complex. The size of the systems should be adequate for the maximum population, and should be located in an area where no leaching could occur. The main sewage treatment plant should also be linked with Bandar Penawar to provide the municipality with adequate sewage treatment. After sewage undergoes at least secondary treatment in settling and oxidation ponds, the sewage outfall may be acceptable if it can be shown to have no detrimental effect on the nearshore waters' quality. A monitoring program on effluent quality should be implemented to ensure that the effluent discharge meets DOE requirements.
3. Measures should be taken by the developer to prevent the leaching of excessive levels of nutrients into the waterways and man-made lakes. Leaching may come from septic tanks, golf courses and solid waste dumps.
4. The marina should be built without changing the hydrological regime existing along the coast. During the building phase, all safeguards for the environment should be established (e.g., silt curtains) to curtail siltation of the surrounding waters. There is a need for pump-out facilities for used oil from the boats' engines and human waste from the boats' sanitation tanks. Solid waste receptacles are also necessary at the marina to prevent dumping wastes into the sea.
5. A solid waste management plan should be developed. The disposal site should be a sanitary landfill equipped with a liner and pump system to prevent the leachate from entering the ground or surface water. Its location should be in an area where the ground and surface water will be safe from any leaching.
6. The entire coastal forest should be preserved as much as possible, by following these recommended guidelines. However, the developers should continue to work closely with FRIM to develop an effective coastal forest management plan and to ensure that the design of facilities would have the least impact on the coastal forests.
 - a. The developers should conduct a detailed survey to determine forest types, extent of forest, waterways, drainage patterns and soil types. A report on arboretum development in Desaru (Manap et al. 1988) written for KEJORA by scientists from UPM analyzed an area that lies within the Desaru International Resort project site. Data from this report may be used as a starting point in doing a detailed survey of this area. In this protected forest, the indigenous species should be left in their natural state and the nonindigenous ones should not be introduced or planted. If an arboretum is desired, it would be useful

The marina should be built without changing the hydrological regime existing along the coast.

to develop it as a natural coastal forest garden, limiting the tree species to coastal forest types. In the "wilderness park" of the Desaru International Resort, it is unclear whether alien or exotic species will be brought in and what endangered species will be bred there.

In the protected area, the ratio of the area to its perimeter should be as high as possible; that is, the area should be as compact as it can be. This will minimize forest damage through the "edge effect".

- b. A minimum size of forest should be protected to maintain a healthy forest ecosystem. This could be based on the preservation of a minimum breeding population size for certain species. Since species diversity is usually quite high in coastal forests, there may be only several individuals per hectare. Therefore, blocks of coastal forest with a minimum size of 100 ha should be protected.
- c. In the protected area, the ratio of the area to its perimeter should be as high as possible; that is, the area should be as compact as it can be (a large circle as opposed to a long polygon). This will minimize forest damage through the "edge effect," which occurs when the exposed forest dries out. The "edge effect" is noticeable in the small islands of forest remaining in the Desaru golf course area, which are now drying up and dying.
- d. Endemic, endangered or threatened species and their location should be identified. The highest priority for protection should be given to the area with the highest concentration of these species.
- e. Corridors of coastal forests in the hinterland should be maintained to allow the sustenance of breeding plant and animal populations.
- f. Since the drainage pattern follows waterways, the protective forest should include as many of these streams as possible. Developments in the upstream areas of these waterways, however, affect the water quantity and quality of these rivers in the coastal forest. Thus, the encroaching agriculture and urban developments should not move any closer to the forest.

If development upstream should continue, it should follow the soil erosion and pollution control recommendations in the water quality and land use management plan (see Chapter 7). The extensive man-made lakes and waterways that are planned for this project will change the natural drainage pattern of the land. Thus, their effects on the coastal forests should be carefully evaluated.

- g. The coastal forest should be zoned into three main types. One would be the multiple-use area within which the resorts and other tourist facilities would be built. Here, the amount of forest removed should be minimal and a carefully planned landscape design for the utilization of the remaining forest should be carried out. Also, the retention of the coastal belt of *kapur* forest along the shoreline would serve to check coastal erosion, act as a windbreak and dampen storm surges.

The second forest zone would be for recreation and should feature interpretive trails, signs and observation towers. This area should also include some waterways since these make walks through the forest interesting for visitors. This follows the concept of the jungle trails already established at Desaru.

The third zone, which would cover as much of the coastal forest as possible, would be a wilderness area where no development, even trails, should be allowed. This is to provide a sanctuary for plant and animal wildlife from human intrusion.

The second and third areas, that is, the buffer recreational forest and the core-protected wilderness areas, respectively, should be gazetted as Protective Forests.

Coastal erosion

A minimum of 60 m from the waterline should be maintained by any development. Areas with a more rapidly eroding coastline should have a wider construction setback. The developers should work with DDI's CECU to evaluate the site's specific requirements. Any shoreline structure will certainly affect sediment transport and thus should be carefully assessed.

Socioeconomic Impacts

The socioeconomic impacts on the Malay reserve community living just south of the development site at Tg. Punggai should be determined, and measures should be taken to identify how this people can benefit from the development.

Public access and facilities

There are two sites allocated for public beaches in the Desaru International Resort. Considering the expected population growth in the area and the popularity of the beaches among local day-trippers, these two sites may not be adequate. It is unclear whether there will be public access to the other beaches in the area, or what facilities are available for public use. Since the existing low-cost chalets are very popular, similar replacements should be provided in the new resort complex.

**Environmental
Impact assessment**

An EIA should be done for this project to address the concerns enumerated above. Particular attention should be given to the proposed water and winter parks, which will have very pronounced impacts on the surrounding ecology. The DOE's approval should be obtained before the project's implementation, no matter how tedious or politically unpopular the process may be.

Since the project is so massive and will be built in stages, it is important that an overall EIA is done for the whole project, instead of carrying it out in stages according to the building schedule. This is because the total cumulative impact of the project on the environment needs to be evaluated realistically.

The first preliminary EIA submitted in late 1990 to DOE was more of a desk-job EIA, which was not acceptable. Thus, it is recommended that the developer submit a comprehensive EIA based on sound data acquired from the project site *in toto*. Each individual phase would also need a separate EIA.

Need for a local authority

The Desaru area is at present under the jurisdiction of KEJORA. This will change because the state is implementing a policy to privatize most of the tourist developments there. However, KEJORA will remain the most influential organization in terms of the management of the coastal forests and the developments in the area. Once privatized, the area should fall under the management of Bandar Penawar, which will be in charge of reviewing future development proposals. The recommended development guidelines given here should be incorporated into the local plan.

ANNEXES

Annex A. The scientists and their corresponding research tasks for the formulation of the integrated CRM plan for South Johore, Malaysia.

Task code	Subtask code	Report title	Researcher(s)
210-M		Coastal Forest Management Plan	Dr. Chan Hung Tuck Duncan Parish
220-M		Water Quality Management Plan	Dr. Lim Poh Eng and Dr. Leong Yueh Kwong
230-M		Geographical Information System (GIS) for Coastal Resources Management	Dr. Kam Suan Pheng and Dr. Leong Yueh Kwong
240-M		Assessment of Coastal Erosion	Ir. Sieh Kok Chi, Ir. Zamali Midun, Ir. Lee Say Chong, Mr. Ismail Iman, Dr. Sharifah Mastura and Dr. A. Aziz Ibrahim
	241-M	Data on Physiography	
	242-M	Causes and Extent of Coastal Erosion and Remedial Measures	
	243-M	Management Guidelines for Sand Mining	
	244-M	Movement of Dredging Residue and Dispersion of Pollutants	Dr. Koh Hock Lye, Dr. Lim Poh Eng, Ir. Sieh Kok Chi, Ir. Zamali Midun and Ir. Lee Say Chong
	245-M	Identification of Alternative Sand Mining Sites	Ir. Zamali Midun, Ir. Lee Say Chong and Mr. Ismail Iman
250-M		Prawn Stock Assessment for Inshore Areas	Dr. Mohd. Zaki b. Mohd. Said, Dr. A. Sasekumar and Mr. Lui Yen Pong
260-M		Present Status and Economics of Aqua- culture Practices and Potential Areas for Development	
	261-M	Present Status of Aquaculture Practices and Potential Areas	En. Hambal Hanafi and Mr. Ismail bin Abu Hassan
	262-M	An Economic Analysis of Coastal and Pond Mariculture and Aquaculture	Dr. Jahara Yahaya
270-M		Development of Management Plans for the Johore Causeway	Ir. Zamali Midun, Ir. Lee Say Chong, Dr. Koh Hock Lye and Dr. A. Aziz Ibrahim

(Continued)

Annex A

Annex A (continued)

310-M	Socioeconomic Survey	Dr. Wong Poh Kam, Mr. Chang Yui Tan and Ms. Norimah bte Dali
320-M	Guidelines for Coastal Resources Management for Tourism	En. Ahmad Tajuddin Hj. Kechik, Dr. Mansor Ibrahim and En. Amran Hamzah
410-M	Legal and Institutional Studies	Ms. Ch'ng Kim Looi
610-M	Resource Management Plan Formulation	National Steering Committee, Johore State Consultative Committee, National Coordinator, Coastal Resources Planner, Scientific Officer and ICLARM
611-M	Guidelines/Policies for CRM in Malaysia	
612-M	Formulation of Action Plans for Issue Areas and Important CRs	
613-M	Formulation of Management Plans for Marine and Estuarine Protected Areas	Ms. Ch'ng Kim Looi and Ab. Rahim Gor Yaman
614-M	Formulation of An Integrated Coastal Area Management Scheme for Johore	National Steering Committee, Johore State Consultative Committee, National Coordinator Coastal Resources Planner, Scientific Officer and ICLARM
615-M	Coastal Resources Management System	
810-M	Operation and Integration	Ms. Ch'ng Kim Looi and Ms. Christy Thomas

Annex B

Annex B. The members of the CRM plan development team and their affiliation.

DOF	Mr. Mazlan bin Jusoh Ms. Ch'ng Kim Looi
DOE	Dr. Abu Bakar bin Jaafar Mr. Mohd. Redzuan bin Yusoff Mr. Ahmad Ibrahim bin Mohd.
PMD	Ms. Wan Rubiah bte Wan Abdullah Mr. Selwyn Dass
DTCP	Mr. Jebasingam Issace John Ms. Norimah bte Dali Mr. Abbas bin Abdul Wahab Mr. Ismail bin Hj. Ibrahim Mr. Razali bin Ahmad
DOFor	Dato' Leong Hin Ning
DDI	Ir. Sieh Kok Chi Ir. Neo Tong Lee Ir. Zamali Midun Ir. Lee Say Chong
DSM	Mr. Chan Peng Yue Mr. Chia Wee Tong Mr. Abu Husin bin Jantan
DGS	Mr. T. Suntharalingam
DOA	Mr. M. Sivanaser
FRI	Mr. Lui Yean Pong Ms. Chee Phaik Ean
FRIM	Dr. Chan Hung Tuck
MLCD	Tuan Hj. Mohd. Hamdan bin Hj. Shamsuddin
Ministry of Culture and Tourism	
FELDA	En. Mohd. Akhir Ibrahim
SEPU (Johore)	Dato' Hj. Ishak bin Md. Yusoff Tuan Hj. Abd. Karim bin Hj. Hassan
DOF (Johore)	Mr. Siow Kuan Tow

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Annex B

Annex B (continued)

Agency/Institution	Team member
DOE (Johore)	Mr. Patrick Tan Hock Chuan
DTCP (Johore)	Ms. Halimaton Sadiyah bte Hashim Mr. Rosazanam bin Khalid
DOFor (Johore)	En. Sheikh Ibrahim bin Sheikh Ali Mr. Thai See Kham
DDI (Johore)	Ir. Tan Jin Tun Ir. Martin Dorai Ir. Chan Choong Cheong
Department of Mapping (DOM), (Johore)	Mr. Teo Cheng Piau
DGS (Johore)	Mr. Wahid bin Rahman Mr. Low Chiok Hoong
DOA (Johore)	Dato' Abdul Mutalib bin Ahmad Mr. Tan Choo Laik
SDLM (Johore) Johore	Datin Padukka Hj. Fatimah bte Abdullah Mr. Hamsan bin Saringat
KEJORA	Mr. Hj. Mohd. Salleh bin Hj. Kuraish Mr. Ahmad Kamal Hj. Ariffin Mr. Yusof bin Hj. Ahmad Mr. Zainal Abidin bin Ali Ms. Eidah bte Mahmood
SEDC (Johore)	
JPA	Mr. Yahya Abd. Ghani
MD (Johore)	Captain Ahmad bin Othman Dato' Captain Hamzah bin Mohd. Nor Mr. Rosnan bin Fathial
MDO	Tuan Hj. Mohd. Noah bin Hj. Ahmad
Kota Tinggi District Office	Mr. Zainal Abidin bin Mohd. Zin
Pontian District Office	Mr. Md. Yunus bin Mohd. Salleh
LKIM (Johore)	Mr. Othman Yusof
Brackishwater Fisheries Research Station, Gelang Patah	Mr. Hambal Hj. Hanafi Mr. Ismail Abu Hassan

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Annex B

Annex B (continued)

Agency/Institution	Team member
University of Malaya	Dr. Jahara Yahaya
USM	Dr. Lim Poh Eng Dr. Koh Hock Lye Dr. Kam Suan Pheng
UPM	Dr. Mohd. Zaki bin Modd. Said
Universiti Teknologi Malaysia	Mr. Ahmad Tajuddin Hj. Kechik
Socioeconomic Research Sdn. Bhd.	Dr. Wong Poh Kam Mr. Chang Yii Tan
CRMP-Malaysia/ICLARM	Dr. David Tarnas Ms. Christy Thomas
ICLARM	Dr. Chua Thia-Eng Dr. Alan T. White Dr. Louise Fallon Scura

Annex C

Annex C. The two main committees involved in the CRM planning process.



1. National Steering Committee (federal)	DOF DOE PMD-Implementation Coordination Unit DTCP DOFor DDI DSM DGS DOA FRI FRIM MOD
2. State Consultative Committee (Johore)	SEPU (Johore) DOF (Johore) DOE (Johore) DTCP (Johore) DOFor (Johore) DDI (Johore) DOM (Johore) DGS (Johore) DOA (Johore) SDLM (Johore) KEJORA SEDC (Johore) JPA MD (Johore)

Annex D

Annex D. Current conditions being imposed on federal licenses by the technical committee in approving offshore sand mining applications.

1. Before the commencement of a proposed mining operation, the applicant is required to submit sand samples taken from 2-m and 4-m depths within the approved area to the Chief Mines Inspector for determination of the mineral content, if any.
2. During the mining operation, the applicant is also required to submit sand samples taken at grid intervals of 1 km² and at 2-m and 4-m depths, to the Federal Department of Land and Mines (FDLM) for analysis.
3. The sand sample taken from each layer should not weigh less than 10 kg.
4. If, at any time, it is ascertained that the minerals/other metals found to be present in the approved area (upon analysis of the sand samples) indicate that these substances can be extracted using economical means, the government will proceed to discuss such method with the applicant. This method will be used for mining these metals in the said area.
5. Officers from FDLM reserve the right to enter the approved area and obtain separate sand samples, if necessary, at any time.
6. The applicant is required to hand over the samples and geological data, e.g., bore cores and seismic profiles, to MLCD and MD.
7. The applicant is thereby informed about military operations and restricted areas adjacent to the approved site and that the government will not be responsible for any accidents/mishaps that may occur.
8. At the conclusion of all mining and dredging operations, whether or not the license has expired, the applicant is required to conduct an investigation and a hydrographic survey (reports on which should be submitted later), in cooperation with the Department of Navy for the purpose of updating bathymetry/marine charts, should any changes occur on the approved area. A deposit in the form of a bank draft, cashier order or postal order made payable to the Malaysian government and marked "account payee" is to be submitted before the commencement of the sand mining operation.
9. If the boundary coordinates circumscribing the approved area are located too close to submarine cables traversing the area, all safety measures to prevent damage to the cables must be instituted. The applicant is also required to make the necessary compensation (such as financial payment) for any damage to the cables.
10. The submarine cable area is declared off-limits and a corridor having a width of 2,000 m on each side of the cable is to be designated as a prohibited area within which dredging, mooring and other related activities are not permitted.
11. All barges are to be registered in Malaysia and the relevant certificates are to be submitted to the Harbour Master concerned for checking.
12. On the date of the operation's commencement, the applicant is required to submit to MLCD and the Harbour Master concerned details on the coordinates of the working area and the working method to be used. These data shall then be forwarded to MD.
13. Barges are to comply with international standards/conditions approved by the Harbour Master concerned.
14. Hydrographic survey based on a scale of 1:10,000 and a maximum survey line interval of 50 m (in the drawing, the interval should be less than 0.5 cm) is to be completed before commencement and is to be conducted at yearly intervals during the operation. Four copies of this study are to be sent to MD. When the mining work has been completed, a final hydrographic survey covering the entire area is to be carried out.

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Annex D

Annex D (continued)

15. The working area is to be marked by not less than four lighted marker buoys of a design approved by MD.
 16. Dredges and all other equipment are to be appropriately marked with approved lighting and in compliance with other conditions based on international regulations approved by MD.
 17. Treasures, sunken ships and other significant objects uncovered by any party concerned are the properties of the government and MD is to be accordingly informed immediately. None of these objects are to be retrieved or taken out of the area.
 18. Two copies of the results of all tests conducted (e.g., seismic survey and borehole tests) are to be submitted to MD.
 19. The applicant is required to comply with all relevant provisions under the Customs Act (1967), especially with regard to documentation of shipping and import/export.
 20. The applicant is required to submit details on the plan of operation, copies of agreement between the licensee and the buyer of sand, dredging capacity of the machinery/dredges used and the loading capacity of barges.
 21. The applicant is required, under the Environmental Quality Act (1974, revised 1985) and the Exclusive Economic Zone Act (1985), to carry out an EIA of the mining operation/activity, draw up a list of mitigation measures to overcome these impacts and then submit both to DOE and MLCD. The licensee is also required under the above acts to take the necessary measures to protect the existing environmental condition, including marine resources in the water column (pelagic). A dredging operation shall be permitted only upon the submission of a written approval from MLCD.
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Annex E

Annex E. Recommended operational conditions to be imposed on riverine sand mining operators.

I. Management conditions

1. The permit holder should make sure that no erosion/bank slip/scouring shall occur on the riverbank.
2. If the operation has caused damage to the river, costs for its reinstatement should be shouldered by the operator.
3. Access for the movement of vehicles and machines should be separate.
4. The permit holder should not make holes or dig below ground level in and around the dumping area when sand is being removed from here.
5. Extraction should be carried out in uniform layers without forming isolated holes and pits on the riverbed and/or side slopes.
6. The permit holder should not divert, block and/or obstruct in any way the flow of river water within or outside the area.
7. The permit holder should not cut and clear grass and vegetation thriving on the riverbanks and slopes.
8. A permit shall be valid for a period of only one year, and application for renewal should be referred to DDI for comment before it can again be approved.
9. The permit holder shall be held responsible for any form of pollution of the river resulting from the excavation activities and shall take necessary actions to avoid such pollution.
10. The permit holder shall be held responsible for damage or nuisance to the public caused by the operation.
11. Every detail regarding the method of pumping, including building of any structure, should be according to the approved plans.
12. The permit holder should pay the stake deposit in the form of a bank draft addressed to the government of Malaysia.
13. A signboard giving information on the details of the license should be erected by the permit holder at the sand extraction site.
14. If the government has to carry out maintenance or any construction work that is incompatible with the approved mining operation, it has the right to withdraw the permission and the company's license to operate in that area immediately with written notice.
15. Upon the expiry of the license, the permit holder should remove all items from the site and make satisfactory compensation for all damages incurred on the river, its banks and reserves.
16. Failure to comply with all these conditions and additional requirements that may be imposed from time to time shall mean the suspension or termination of the permit.

II. Technical conditions

1. Extraction is only allowed in the part of the river section as determined by the approving authority (tentatively fixed as the middle-third section of the river).
 2. The rate of sand extraction shall be determined by the approving authority.
 3. The stockpile shall be placed at a safe distance from the riverbank, whose height (as designated by the approving authority) should be taken into consideration.
 4. The digging to extract sand from the riverbed shall not exceed a depth, as determined by the approving authority, below the existing riverbed level.
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