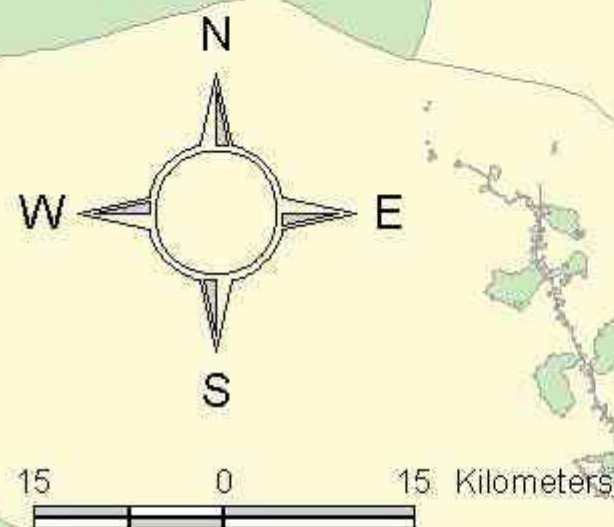


State of the Mangroves Atlas

Bengkalis Regency, Riau Province,
Sumatra, Indonesia, 2003



Yayasan Laksana Samudera
Riau



Photo: Lukman/MAP, 2003

Photo: YLS, May 2003

Photo: YLS, May 2003

Fisherfolk and the Sea - The lives of the fisherfolk can not be separated from the sea, and vice versa. Without healthy coastal ecosystem, the livelihoods and very lives of fisherfolk in coastal resource management, mangroves, seagrass beds, and coral reefs disappear.

The Communities of Bengkalis Regency

(Riau Province, Sumatra, Indonesia)

Map Scale = 1:1.500.000

BENGKALIS REGENCY

Bengkalis Regency is located on the eastern coast of Sumatra. Bengkalis has a total area of 11,481.77 square kilometers, with the following boundaries:

- North with the Malacca Strait/Malaysia
- South with Siak Regency
- West with Rokan Hilir Regency and administrative center of Dumai
- East with Karimun and Pelelawan Regency

Geographically, Bengkalis is strategically located in the busy international sea trading route of the Malacca Strait in the area known as Singapore, Malaysia, Indonesia growth triangle.

Bengkalis Regency includes 2 counties on the Sumatran mainland, and 9 counties amongst the smaller island of the Malacca Strait namely: Bantan County (424 square km), Bengkalis County (514 square km), Bukit Batu County (1,870 square km), Mandau County (3,440 square km), Merbau County (1,349 square km), Rangsang County (922 square km), West Rangsang County (, Rupert, North Rupert, Tebing Tinggi and West Tebing Tinggi County. And also 150 village administrative area or "Kelurahan".

Topography

Bengkalis Regency entirely consists of lowlands, with an average elevation of only 2-6 meters above sea level. The majority of land area is wetlands and peat moss. There are several rivers, lakes and a total of 26 large and small islands. The largest islands are Rupert island (1,525 square km), Tebing Tinggi island (1,436 square km), Bengkalis island (938 square km), Rangsang island (922 square km), Padang and Merbau islands (1,349 square km).

Flora and Founa

The most important commercial trees of terrestrial forest include "meranti" (*Shorea sp.*) "sungkai" (*Calophyllum sp.*) "punak" (*Tetramerista sp.*) and "bintangur" (*Paronema canescen*). In the mangrove we find 31 species of true mangrove trees.

Wildlife of the area include the Sumatran Tiger, Asian elephant, snakes, crocodile, honey bear, many species of monkey and deer, mousedeer, sea-eagles, monitor lizards etc.

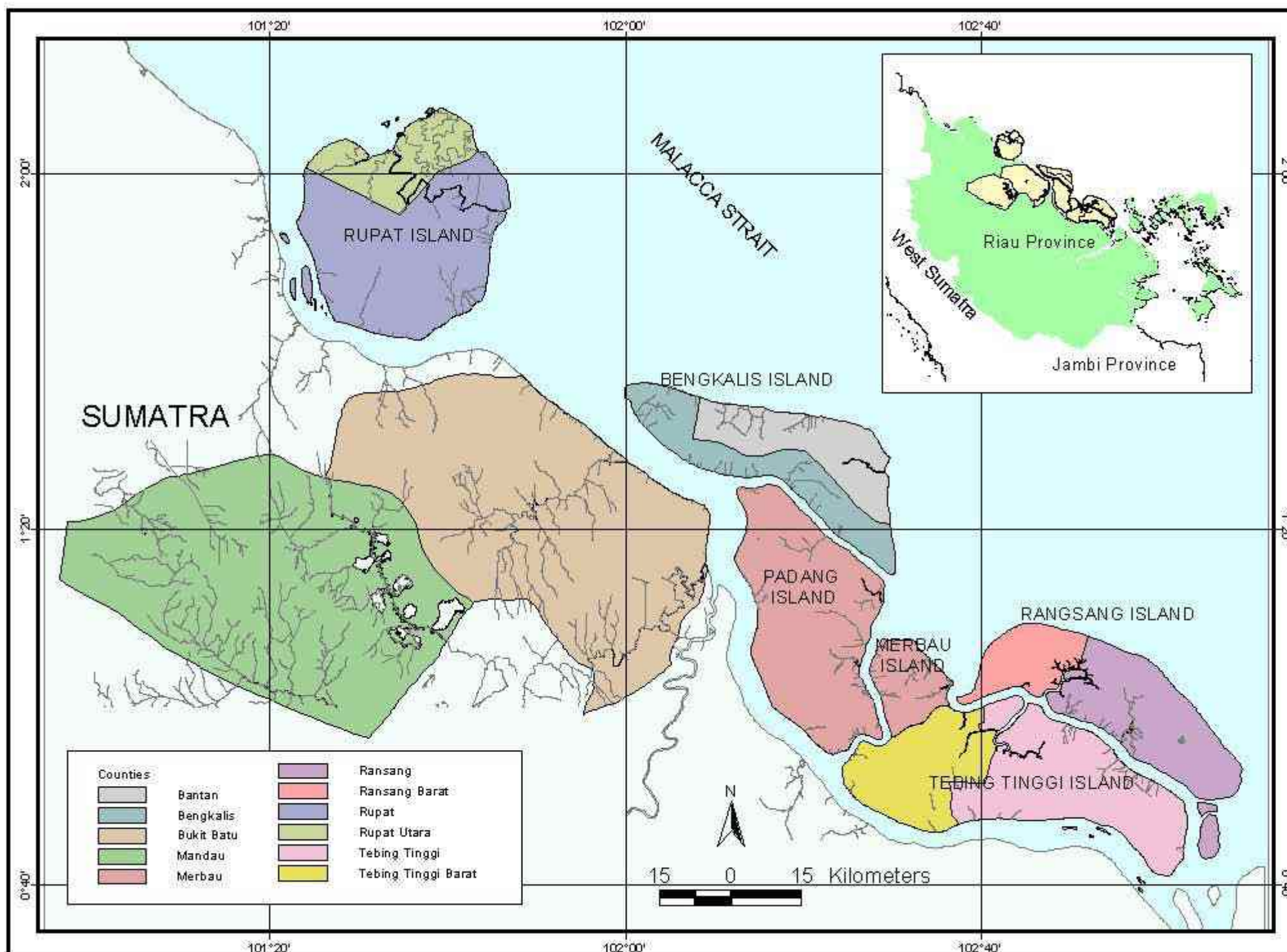


**TABLE OF MANGROVES AREA - BENGKALIS REGENCY
RIAU PROVINCE, SUMATRA, INDONESIA
YEAR 2000**

TOTAL MANGROVE AREA (COUNTY)		TOTAL MANGROVE AREA (ISLAND)	
COUNTY	Mangrove (Ha)	ISLAND	Mangrove (Ha)
Bantan	9,834.43	Bengkalis Island	12,671.81
Bengkalis	2,837.38	Rupat Island	20,156.86
Bukit Batu	2,033.94	Merbau Island	2,207.58
Merbau	8,987.32	Padang Island	6,779.73
Tebing Tinggi	5,701.58	Tebing Tinggi Island	11,165.22
Tebing Tinggi Barat	5,463.65	Rangsang Island	11,930.30
Rangsang Barat	5,822.28	Rupat Luar Island	1,588.22
Rangsang	7,371.98	Rangsang Luar Island	1,263.96
Rupat	8,389.64	Sumatra Island	2,033.94
Rupat Utara	13,355.44		
Total Area	69,797.62	Total Area	69,797.62

Data source: Riau Provincial Forestry Department

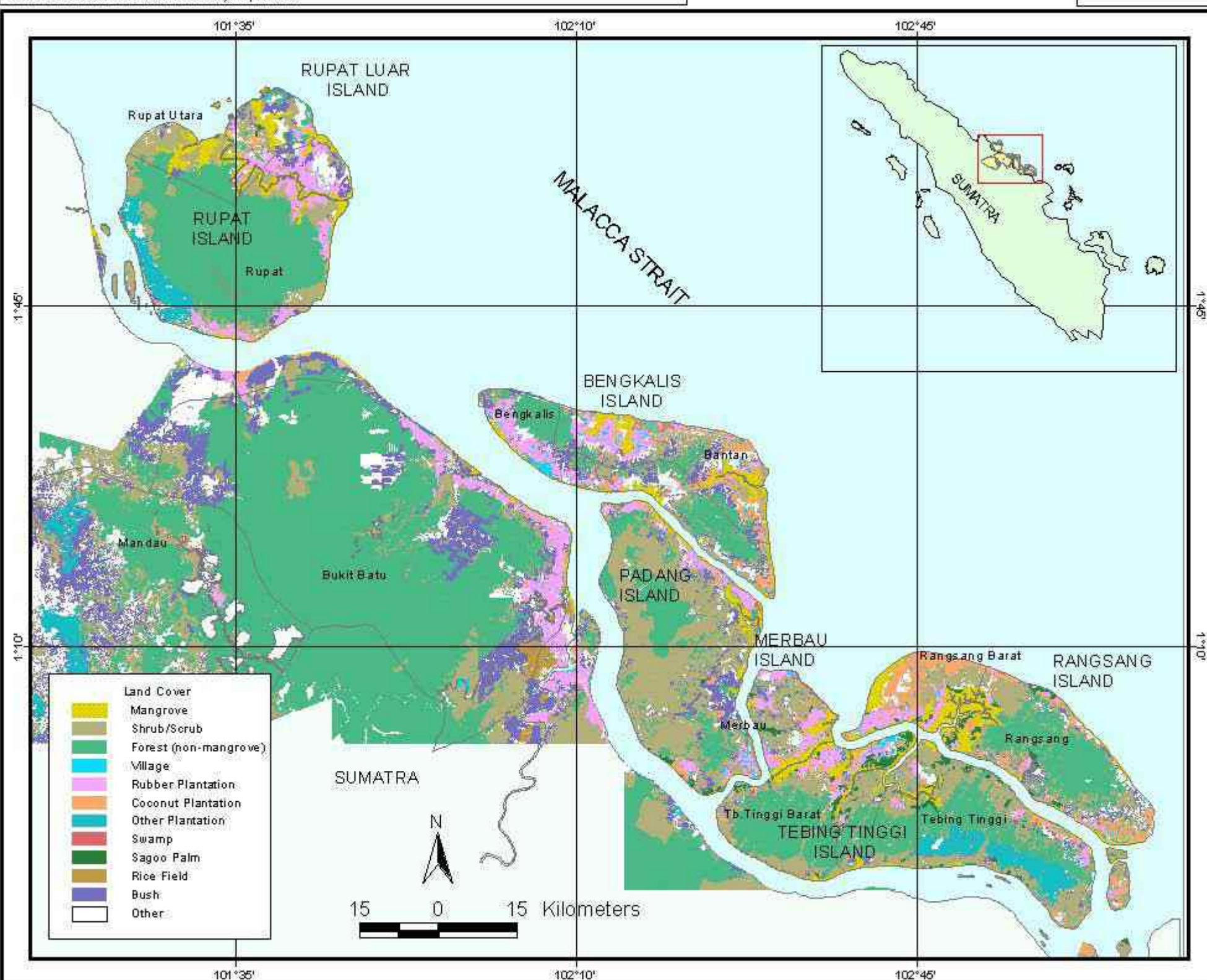
Land Cover

(Bengkalis Regency,
Riau Province, Sumatra,
Indonesia, Year 2000)

Map Scale = 1:1,313,000

Sustainable Harvest

Nypa fruticans with *Rhizophora* sp. in the background. *Nypa fruticans* often called Nypah palm, is the only true palm tree of the mangroves. Among the many benefits of Nypah palm to local communities include, fish and wildlife habitat, shoreline protection, and use for products such as roofing material, palm sugar, vinegar, tapioca starch, building material and fruit. By harvesting various parts of the Nypah palm, local villagers are provided with a steady source of income year round.



THE MANGROVES OF RIAU

Riau Province is located on the east coast of Sumatra, bordered on the east by Singapore and on the north by Peninsular Malaysia. The province of Riau is mostly comprised of freshwater marsh, with mangroves along the coast, banks of brackish rivers, and surrounding most of its small islands. Riau Province contains 235,517 hectares of mangrove forest, which is concentrated in three administrative regencies, Bengkalis Regency (29% or 66,920 hectares) Riau Islands Regency (14% or 31,696 hectares) and Indragiri Hilir Regency (57% or 135,900 hectares). During the decade between 1987-1997, Riau Province lost 43,935 hectares of its mangroves* (Riau Provincial Forestry Office, 1997)

Mangroves have been exploited commercially in Riau for over a hundred years. Most of the commercial production is to meet charcoal demand from Singapore, Malaysia and Japan, as well as for timber/building material. Locally, mangrove is used as fuel wood.

In 1997 Landsat Imagery revealed that Bengkalis Island contained 15,000 hectares of mangrove forest (Landsat Image, 1997). About 33% of this total coverage was in damage. Landsat imagery from 2000 revealed that total mangrove area was reduced to 12,672 hectares

Due to residential, industrial, agricultural and aquacultural development, the mangroves of Riau Province are in critical condition. There is a lack of awareness in the region of the economic, ecological, sociological importance of mangrove ecosystems and little active management of mangroves. There is definitely no implementation of a mangrove management plan that can be considered sustainable. Finally there is little serious effort by government to involve local communities in mangrove management, although community based coastal resource management has met with approval all over Southeast Asia as the management approach most likely to succeed in the region.

Without both immediate action and long-term integrated mangrove management plan, it is possible that Indonesia's second largest mangrove (and the third largest mangrove in the world) will dwindle to muddy coast, bereft of benefit to anyone.

TABLE OF MANGROVE AREA OF RIAU PROVINCE**

YEAR	1970	1980	1980	1993	1997
DATA SOURCE	BIPRAN (1982)	NFI (1993)	PePPPRot (1986)	GIESEN (1993)	Dishut Riau (1997)
TOTAL AREA	276,000	221,050	239,900	184,400	235,517

Source: Article: Planning and Administration of Environment by Ramses Firdaus, Environmental Study Program of Universitas Andalas - Universitas Riau, 2002.

* This loss is more than all of mangroves area that exist in Sri Lanka.

** There is no consistent timeseries data on mangroves in Riau. Available data on mangrove condition comes from various sources, direct sampling technic and Landsat analysis

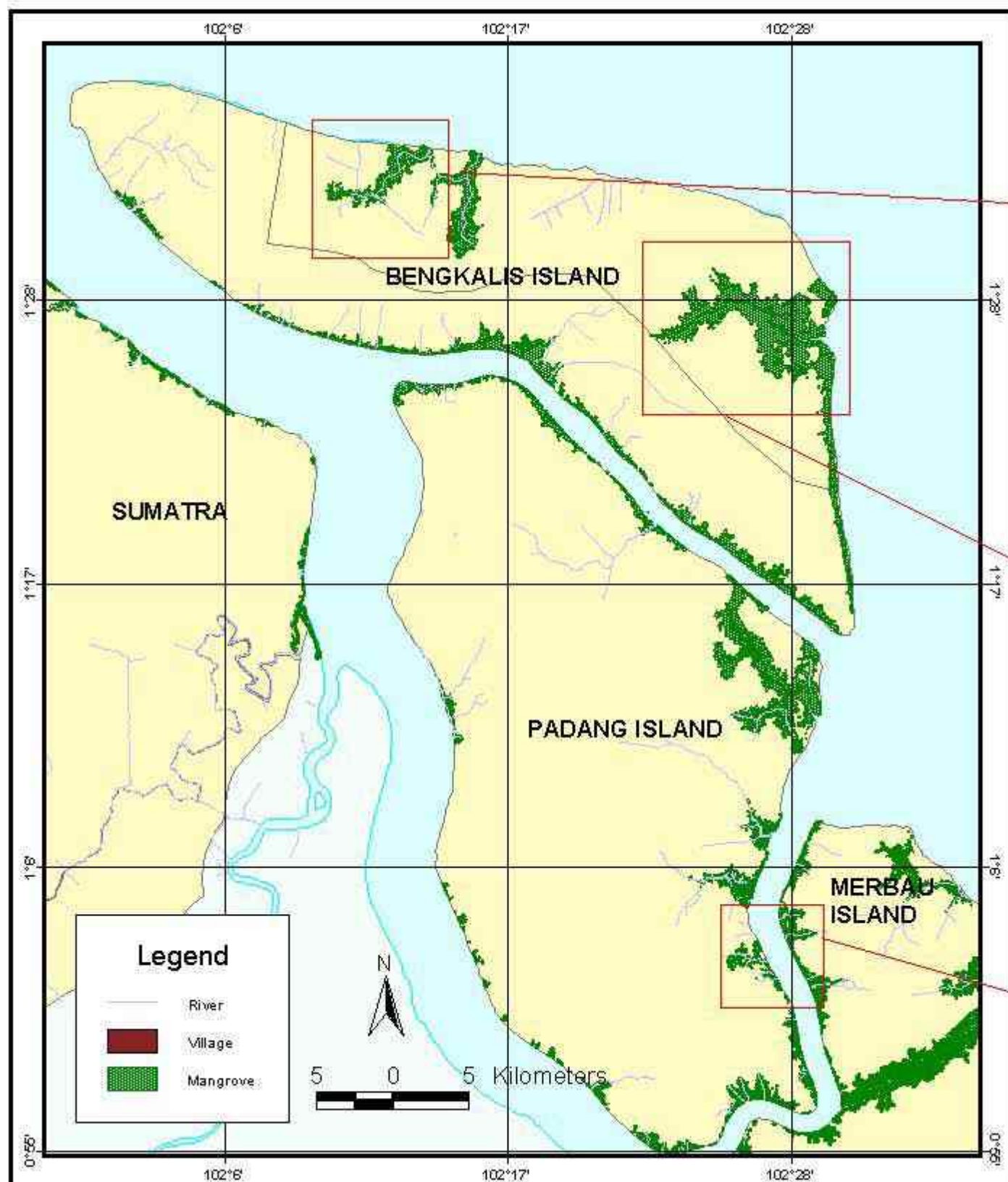
Criteria for Prioritization of Community Managed Mangrove Forest.

1. Severe threats to health of mangrove ecosystem (ex development pressure)
2. Dependence of local community on healthy mangrove ecosystem
3. Existence of local community group with committed to long term sustainable management of the coastal area.
4. Distance between the village and mangrove area.

Potential Areas for Community Managed Mangrove Forests

Bengkalis Regency, Riau Province
Sumatra, Indonesia

Map Scale = 1:390.000



In the Hands of the Fisherfolk

Fisherfolk from Teluk Belitung, a village in Merbau County have built this mangrove broadway in order to access fishing grounds within the mangrove. Subsistence gathering from the mangrove has been practiced by the community for generations.

Community Managed Mangrove Forests

Community Based Natural Resource Management has gained acceptance over the past decade as an ideal strategy to manage natural resources for the purposes of conservation and sustainable community development. A Community Managed Mangrove Forest is a mangrove forest where the primary stakeholder is the local first hand resource user, often referred to as the local "community". In a community managed mangrove forest the first hand resource users create and implement regulations on mangrove use, and are even involved in enforcement of local regulations.

Involvement of "communities" in environmental management is legally granted to coastal communities in Indonesian Law on Environmental Management (UU No. 23 1998), which in essence states that natural resources shall be managed for the benefit of local communities, which is in the best national interest.

On a more local scale, government recognition of Community Managed Mangrove Forests is often desirable and necessary, but it need not always entail formal codification of the issuance of any documents. More important is the government's fulfillment of its responsibilities defend and benefit from sustainable managed mangrove forests, whether public or private.

The concept of Community Based Natural Resource Management is not yet in practice in the mangrove areas of Bengkalis Regency. In order to indeed satisfy the intention of UU no. 23, 1997, local governments in the Bengkalis Regency will need to actively involve local communities in mangrove management decision in the coming years.

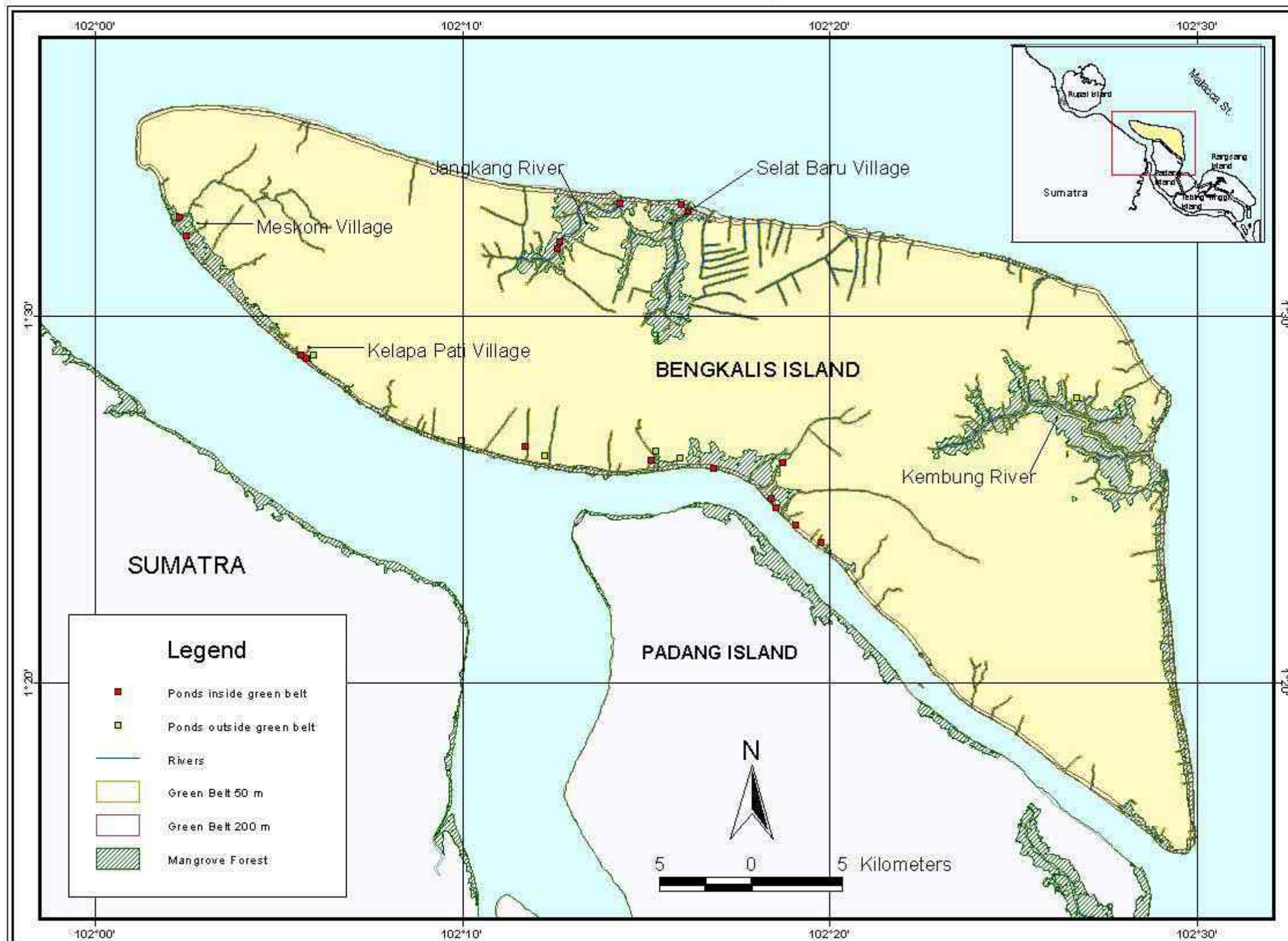
Clear cutting is the most common method of preparing a mangrove area for shrimp pond development. Once the trees are felled, dike walls and troughs are dug to control water flow in the pond areas. When a mangrove forest becomes converted to a shrimp pond, economic benefits from the mangrove (wood, fish, shrimp, crabs, medicine, etc.) are lost. In place of these long term benefits to the community, shrimp farms provide short term profits relatively few individuals.

The average life of shrimp farm is only 4 years, but mangroves often have difficulty establishing themselves (even when planted) in abandoned shrimp ponds due to changes in hydrology (flow of water), caused by the presence dikes and troughs, changes in elevation and changes in sediment type and chemical composition. Shrimp pond development often results in the permanent disappearance of mangrove forests.

Shrimp Ponds

Bengkalis Regency, Riau Province,
Sumatra, Indonesia

Map Scale = 1:382,000



High Cost - Shrimp pond development requires a large investment (USD 5,000 for one 100 x 50 pond). Profits are short term, and food production is for export, not local consumption. The shrimp aquaculture industry maintains that it provides local employment but members of fisher folk communities rarely find employment due to lack of skills and lower salaries than can be obtained fishing.



Development in the Greenbelt.

The Indonesian Forestry Department Decree (No. 507/IV-BPHH/1990) and strengthened by Presidential Decree (No. 32 Year 1990) on Protected Area Management states that a "greenbelt" or mangrove buffer shall be conserved 200 meters deep along the coastline (coastal buffer zone extending landward) and 50 meters inland from all riverbanks (riparian buffer zone).



Promoting Conservation and Unsustainable Development

The sign reads: "Healthy Mangrove, Fish Multiply, Happy Fisher Folks." Part of a government campaign funded by foreign loans, to promote protections and sustainable use of mangrove forests in Bengkalis. At the same time the Bengkalis Government has received USD 200,000 to develop shrimp ponds in the area.

Charcoal Kiln

Mangrove wood stacked in front of several charcoal kiln (panglong). 320 cubic meters of mangrove wood are needed to operate one kiln per year. There are at least 158 mangrove charcoal kilns currently operating in Bengkalis Regency, requiring the clear-felling of 640 hectares of mangrove forest per year.



Mangrove Charcoal Industry

Bengkalis Regency, Riau Province,
Sumatra, Indonesia

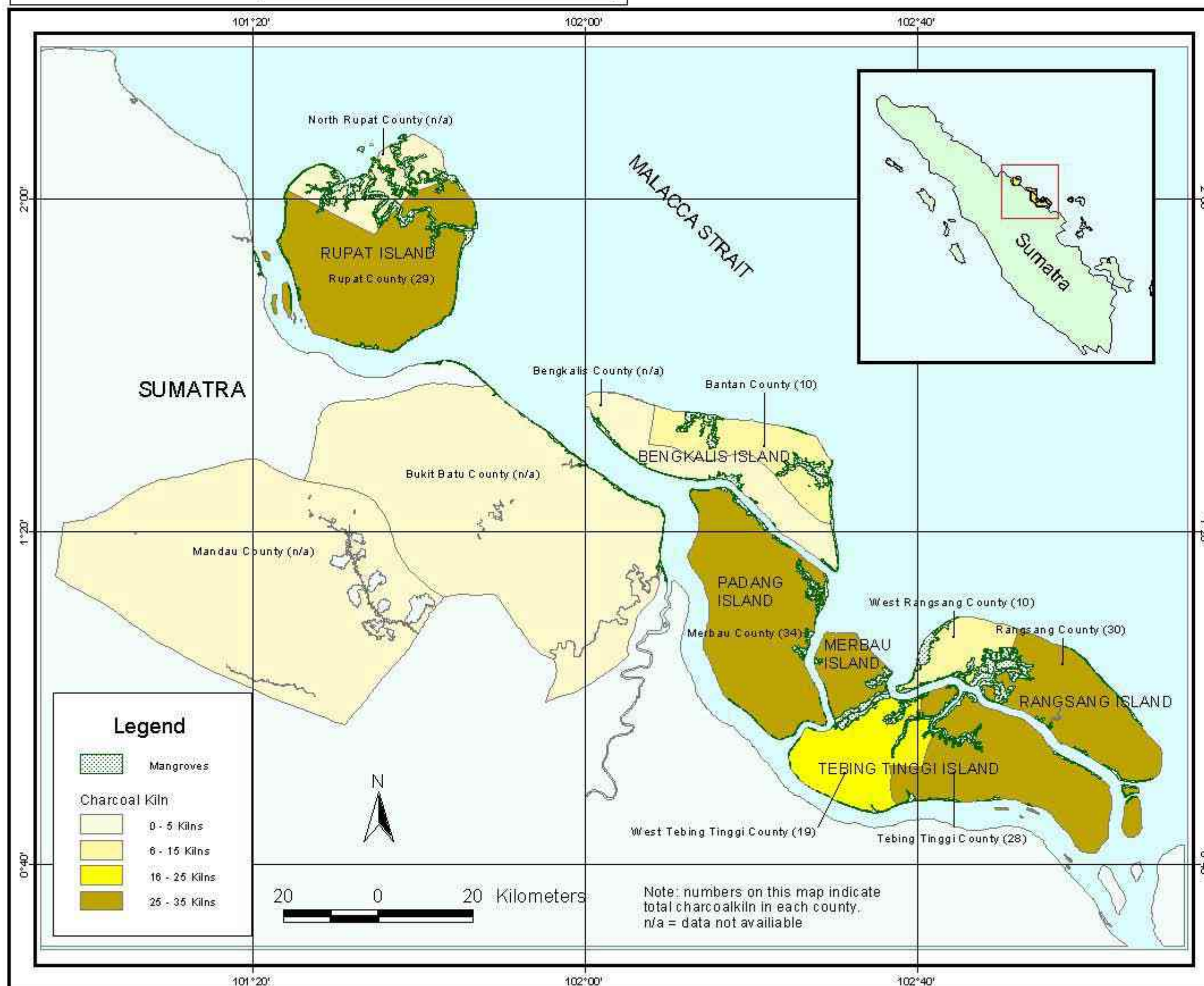
Map Scale = 1:1,500,000

About Mangrove Charcoal

Licenses to operate mangrove charcoal kilns are granted by the Provincial Forestry Department based on the National Regulation 6, 1999 on HPHH (small scale exploitation of timber and non timber forest products). HPHH is an annual license or forestry concession, allowing maximum harvest of 100 hectares of mangrove forest per year per license. The charcoal industry does not need to undergo an Environmental Impact Assessment for operation (currently mangrove logging is not included in the Ministry of Environment's regulation 11-MENLH/3/1994 on requirements for Environmental Impact Assessments).

Production of mangrove charcoal in Riau uses "traditional kilns" called "panglong". First mangroves are cut (mainly *Rhizophora* sp for conversion to charcoal, and *Xylocarpus Granatum* for firing the kilns. Mangrove wood is first dried, then loaded into the kiln for burning/carbonizing, cooled, packed and shipped. This process takes about 45 days.

In Bengkalis Regency, charcoal production facilities using a 36 square meter kiln, produce about 10 tons of charcoal each cycle. There are eight cycles per year, requiring 320 cubic meters of mangrove wood or 2 hectares of forest per kiln.



Mangrove Charcoal Forestry Concessions (HPHH)

Red areas on the adjacent map show forestry concessions for three counties in Bengkalis Regency (Data for other eight (8) counties not available). Although forestry concession areas are regulated, there is little enforcement. Resultantly the charcoal industry cut outside of concession areas, cutting in conservation areas and lack of reforestation efforts. In the case of replanting, mangrove propagules are stuck haphazardly in ground with no maintenance and low survivorship.



Shortage of Mature Mangroves

Due to poor management, and lack of reforestation, charcoal kiln operators are "forced" to cut younger and smaller mangroves, and to cut in conservation areas. Photo below depicts young mangroves, branches, roots and all in the charcoal kiln.



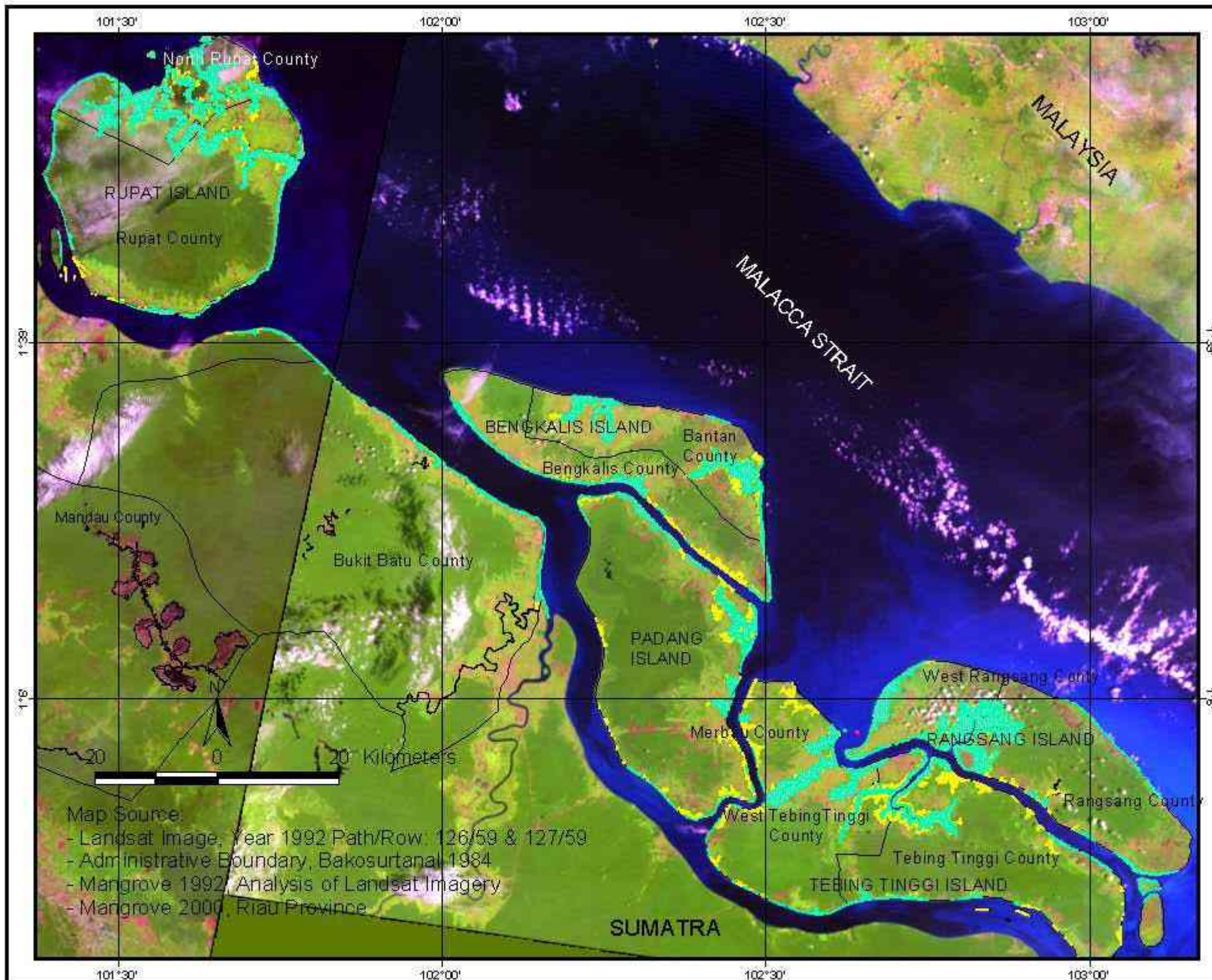
Mangroves Land Cover

(Bengkalis Regency, Riau Province,
Sumatra, Indonesia)

Legend



Map Scale = 1:1.160.000



Map Source:

- Landsat Image, Year 1992 Path/Row: 126/59 & 127/59
- Administrative Boundary, Bakosurtanal 1984
- Mangrove 1992, Analysis of Landsat Imagery
- Mangrove 2000, Riau Province

Result of Landsat Imagery Analysis on Mangrove Coverage 1992 - 2000

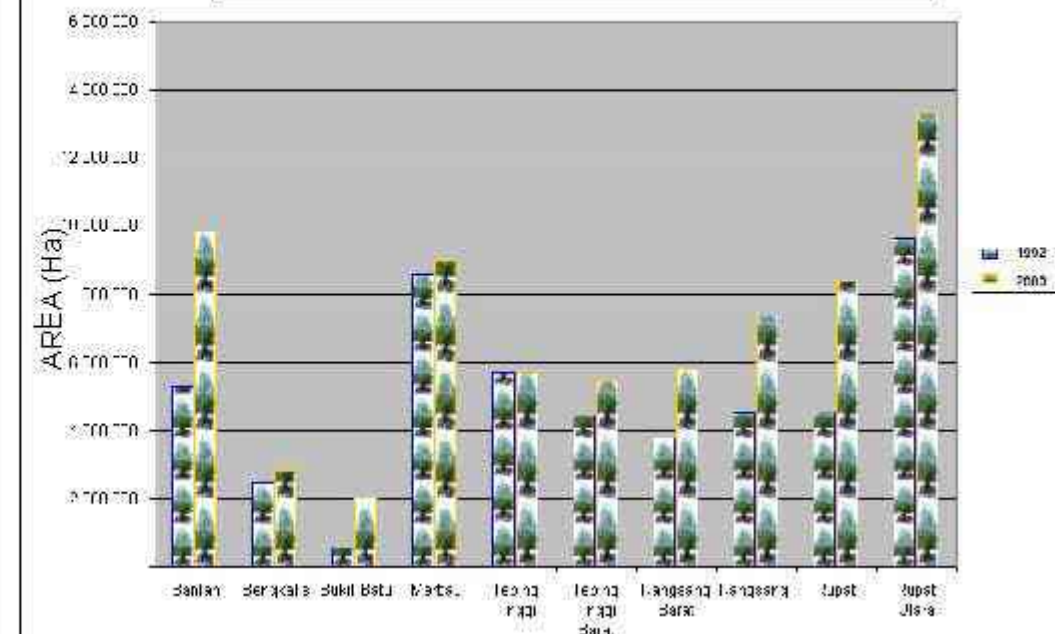
Comparison of spatial data from Landsat imagery from 1992 and 2000 reveal an overall increase in mangrove area of 20,709 hectares, from 49,098 hectares to 69,797 hectares.

This increase in mangrove area contradicts "land truth" data or data from field surveys which indicate extensive conversion of mangrove for shrimp ponds, housing, and road development and the charcoal industry.

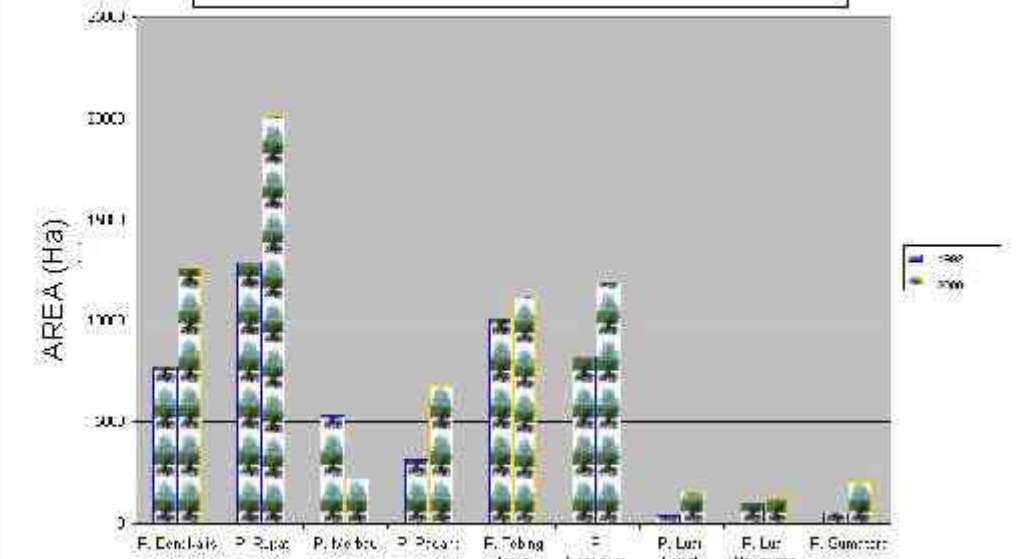
Differences can be accounted by differences in image interpretation. The 1992 imagery was analyzed by Yaysan Laksana Samudera, while the 2000 Landsat imagery has been analyzed by the Forestry Department.

In order to minimize discrepancies, there is a need for development of standardized analysis techniques and cooperation between mangrove management practitioners such as the Forestry Department and local NGO's, and technical assistance in the form of more up-to date equipment (powerful computers, GPS, software) for analysis.

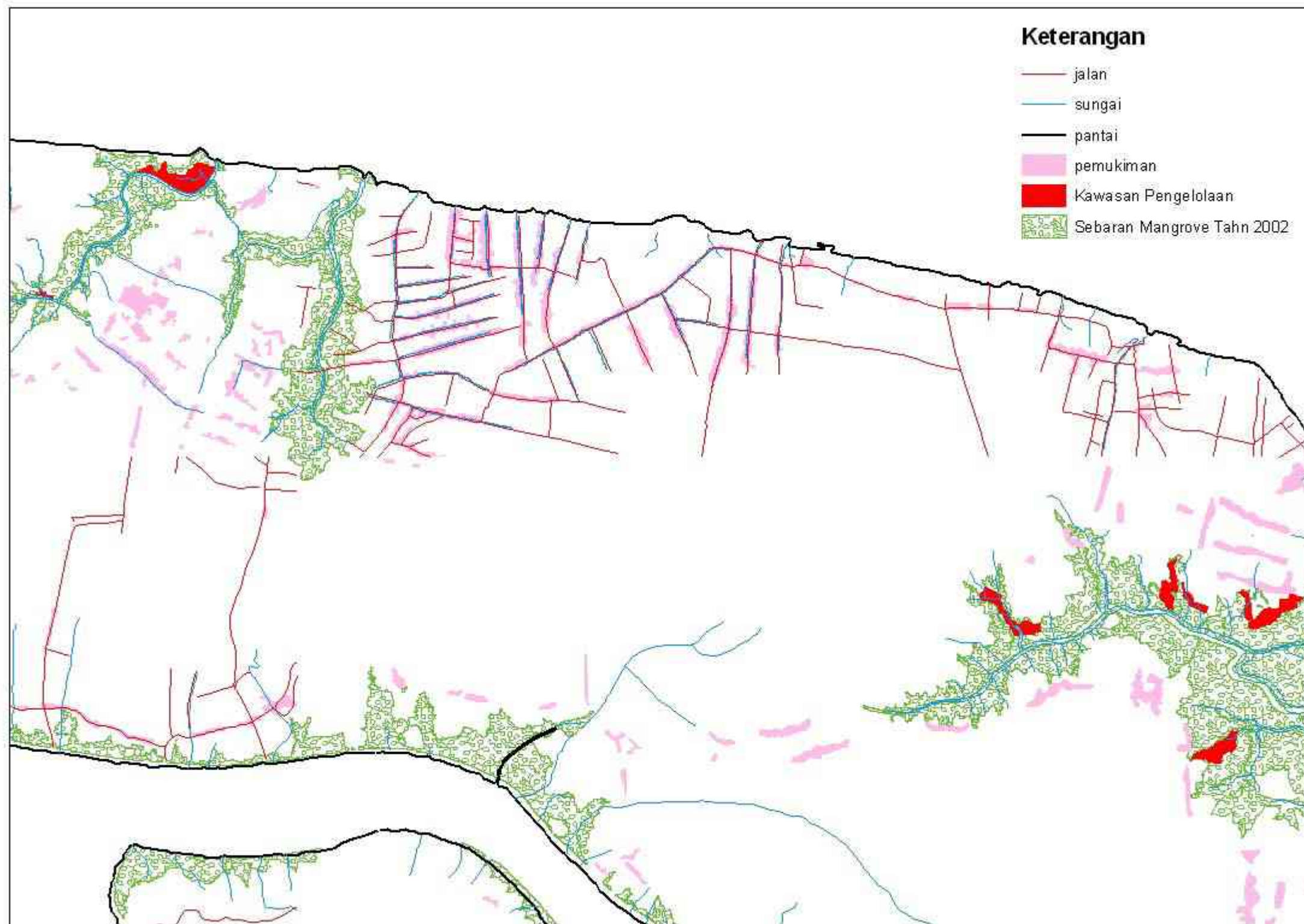
Changes in Mangroves Coverage by County



Changes in Mangroves Coverage by Island

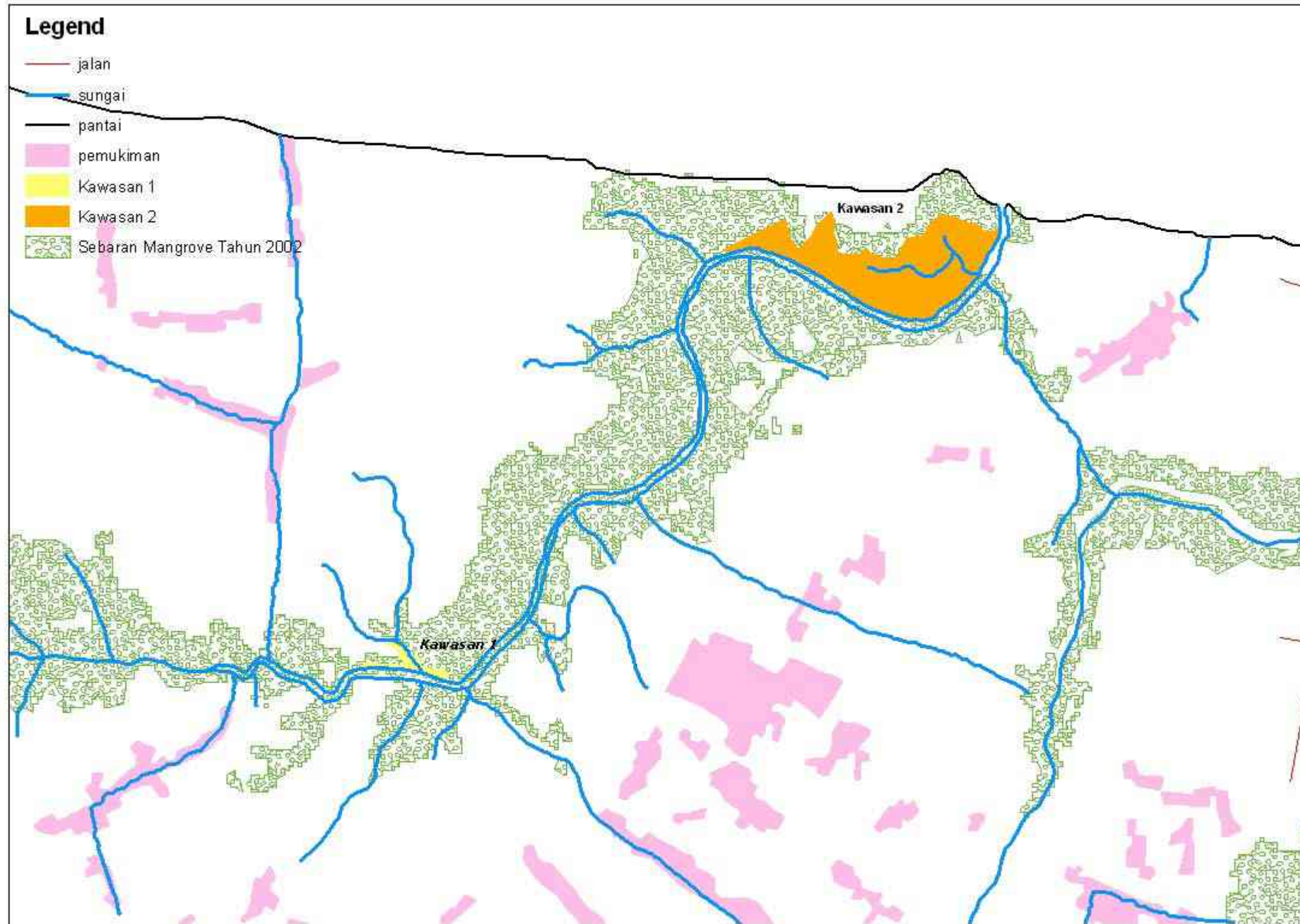


Appendix: Community Based Management Areas Along the Kembung and Jankgang Rivers as of 2005



Community Based Management Areas Along the Jangkang River

Two sites of 5 and 69 hectares
30 members per community based management group



Community Based Management Areas Along the Kembung River

Ten sites ranging between 12 - 45 hectares each
30 members per management group

