Identification of "Wasteland" in Riau, Sumatra

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researched by

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Contents

1. EXECUTIVE SUMMARY

WWF Indonesia: Identification of "Wasteland" in Riau

In August 2003, WWF Indonesia and Asia Pulp and Paper / Sinar Mas Group reached agreement on a road map towards the development of a sustainable wood supply plan for the company. WWF Indonesia subsequently commissioned a study that would identify potential so-called wasteland in the Province of Riau. WWF defined wasteland as presently not or not efficiently used areas with low conservation value.

Interpretation of an initial set of 2002 Landsat satellite images identified over 400,000 hectares of potential wasteland. Newer, cloud-free images with higher resolution would likely allow identification of more potential wasteland. One quarter of the areas identified as potential wasteland (104,464 ha or 24.8%) was surveyed on the ground. One half of those areas (49,809 ha or 47.7%) were found to be actual wasteland.

Wasteland were 68 to 238 km distance from the APP/SMG mill, several were close to existing APP/SMG concessions. Owners of confirmed wasteland were individuals, village cooperatives, or companies including APP/SMG itself. Some wasteland were abandoned logging or oil palm concessions. Three of APP/SMG's own concessions were sampled for comparison. An average 40.0% of the APP/SMG concessions were not covered by either acacia, degraded forest or forest, thus qualifying as wasteland under the definition used in this study. Socio-economic-cultural assessments in two villages showed that village wasteland owners gained almost no economic benefits from wasteland, that lack of funds to invest was cited as the main reason why the wasteland lay barren, and that in general, villagers lacked good understanding of what it would mean to plant acacia on their land.

The study found large areas of potential and confirmed wasteland in the Province of Riau. Based on these findings it recommends that APP/SMG:

1. Begin purchase negotiations with owners of confirmed wasteland allowing an independent group to monitor negotiations with communities.
2. Put temporary moratorium area between Giam Siak Kecil and Bukit Batu protected areas under permanent protection as plenty of alternative wasteland areas were identified by this study.
3. Accelerate acacia planting in company owned wasteland after solving all potential community conflicts allowing an independent group to monitor mediations.
4. Employ high resolution satellite images to identify additional potential wasteland.
5. Ground check all areas identified as potential wasteland.

2. INTRODUCTION - WHY WAS THIS STUDY CONDUCTED?

In Riau Province, hundreds of thousands of hectares of natural forests have been clearcut to supply mixed tropical hardwood (MTH) to two pulp and paper companies, Asia Pulp & Paper Co. Ltd. (APP) and Asia Pacific Resources International Holding Limited (APRIL). Both companies are far from reaching a sustainable plantation wood supply for their mills and will require additional hundreds of thousands of hectares of natural forests in the next few years. APP alone will pulp over 60,000 ha of natural forests during 2003. Natural forests will be cut inside and outside of the concessions of these companies and their joint venture partners. WWF Indonesia is very concerned about the ecological and social impacts of the existing forest conversion plans, which were developed without appropriate social and environmental studies, and would destroy some of the most unique natural forests on earth and thus their outstanding conservation values.

Official statistics by the Ministry of Forestry on the existence of unproductive and low conservation value forests in Riau led WWF to believe that large areas of so-called "wasteland" exist in Riau. This study defines wasteland as areas of land with low conservation value that are currently not or only inefficiently used. So far, Riau's pulp companies have not been interested in utilizing such wasteland for their plantation development. It has been much more lucrative to use land covered by natural forest that can be pulped first. While that is understandable economically it is not acceptable ecologically. This study was designed to evaluate the companies' often stated argument that "there is no wasteland available in Riau."

The study fulfills one of WWF Indonesia's commitments made in a Letter of Intent signed with Asia Pulp and Paper and Sinar Mas Group forestry companies on 19 August 2003.

WWF believes this study proves that there are indeed significant areas of wasteland available in Riau, and recommends that Riau's two pulp and paper companies seriously invest in identifying available wasteland, acquiring it, and developing is as pulpwood plantations in exchange for protecting the remaining high conservation value forests (HCVFs) in their existing concessions.

WWF intends to disseminate the result of this study widely to stimulate discussion and encourage all relevant authorities to create an environment that helps these companies to access wasteland for pulp wood plantation development.

3. BACKGROUND

3.1. Deforestation in Riau

Throughout Indonesia, forest clearance began in the lowland areas where topography and soil fertility were most favorable to human settlement, agriculture, commercial logging, plantation establishment etc. In 2001, a World Bank report predicted that Sumatra's dry lowland plains, such as Riau's Tesso Nilo forest, would lose all their forest cover soon after 2005. After the disappearance of the dry lowland forests, land clearing pressure would continue to wet lowland forests and, as these forest types disappeared, pressure would move to the hill and mountain forests. The World Bank study predicted that wet lowland forests, such as the Giam Siak Kecil and Kerumutan peat swamps that APP is currently converting to timber plantation concessions, would disappear soon after 2010.

The rate of deforestation in Riau Province has been extremely high in the last two decades (Table 1). Analysis of historical Landsat satellite images showed that 3,330,468 hectares of forest were destroyed between 1985 and 2002. Riau lost on average 196,000 hectares of forest each year during this period.

Table 1. Forest Cover change between 1985 and 2002

	1985*	1990**	1995***	2000****	2002*****
Remaining Forest Cover	6,346,140	5,220,000	4,102,735	3,469,578	3,015,672
Forest Loss between study years		1,126,140	1,117,265	633,157	453,906
Average yearly deforestation		225,228	223,453	126,631	226,953

Data sources: * Forest cover interpretation from 1985 Landsat MSS satellite images, ** Dirjen Intag, Ministry of Forestry, 1994 *** Dirjen Intag, Ministry of Forestry 1999, **** Forest cover interpretation from 2000 Landsat ETM 7 satellite images, ***** Forest cover interpretation from 2002 Landsat ETM 7 satellite images

3.2. Causes of deforestation in Riau

There are two main underlying causes for the high rate of forest loss in Riau. The first cause is the very high installed capacity of all types of wood-based industries. In 1999, Riau's wood based industries included 2 pulp mills, 15 plywood mills, 3 chip mills, 27 molding factories and 345 legal sawmills[4]. Collectively, these wood-based industries were capable of consuming some 16 million m^3 of wood. Riau's legal timber production from natural forests during the same year amounted to only 6 million m^3 [5].

The second cause for the high rate of deforestation in Riau is the promotion of palm oil production by government policy makers, the business community and local people. More oil palm plantations mean, unfortunately, more forest conversions since the new plantations are likely to be built by converting natural forests and not by planting barren land. 2,056,951 hectares of forest in Riau have been granted for oil palm plantation development. About half of that area had already been cleared and planted by 2003[6].

3.3. Pulpwood timber plantation concessions and deforestation in Riau

Among the wood based industries in Riau, the pulp and paper industry has been the largest consumer of forests in Riau. In 1999, APP and APRIL together consumed 10.6 million m^3 of wood. That is 66% of the total 16 million m^3 of installed capacity by all the wood based industries[7]. Today, APP and APRIL consume about 19 million m^3 of wood to produce ca. four million tons of pulp per year[8].

Timber plantations have been a lucrative business in Riau since the mid 1980s. Incentives by government included providing interest-free loans to fund their development[9], and allowing license-holders to use trees cleared from their timber plantation concessions at minimal cost[10]. A report by CIFOR[11] examined the conversion of Indonesia's natural forests into timber and tree crop plantations and concluded the following:

1. timber plantation development policies legitimize the degradation of natural forests;
2. tree crop plantation developers request more land than they need to get added profits from the

[4] Dinas Kehutanan 2001, cited by Potter & Badcock 2001
[5] Table 3 in Potter & Badcock 2001
[6] Riau Province Estate Service (July 2003)
[7] Potter & Badcock 2001
[8] Barr (7 May 2003)
[9] Kartodihardjo &Supriono (Jan 2000)
[10] Barr (2000)
[11] Kartodihardjo & Supriono (1999)

timber on the lands they clear;
3. overlapping and chaotic forest land use classification systems work to the benefit of private plantation developers at the expense of the rights and livelihoods of forest-dwelling people.

According to governmental regulations, timber plantation concessions (HTI) can be developed only in *Permanent Production Forests* (*Hutan Produksi* of TGHK)[12] where the natural forest is not "productive forest", as defined by MoF as a forest with a timber potential of over 20 m^3/hectare[13]. However, in contravention of the above regulations, companies have managed to get HTI licenses issued for healthy and productive forests, even in areas zoned a *Limited Production Forest* (*Hutan Produksi Terbatas* of TGHK) or *Protected Forest* (*Hutan Lindung* of TGHK).

The Indonesian timber plantation (HTI) programme makes it more profitable to establish HTI in productive forest areas rather than "wasteland" because 1. HTI licenses include the right to obtain permits (IPKs) to clear-cut and sell the standing natural timber; and 2. the establishment of plantations on degraded lands can be more expensive because it may require considerable investments in soil rehabilitation[14]. Indonesia's HTI programme thus promotes deforestation.

Easy and cheap availability of natural wood reduces the inclination of plantation companies to develop and harvest timber plantations. This is very obvious in Riau. About 1.6 million hectares of forest have been designated for conversion by Timber Plantations (HTI) in Riau (Table 2). Even if all natural forest remaining inside the HTIs (808,388 ha) were to be protected, Riau's HTIs would still have 673,674 hectares of land that currently has neither forest nor acacia cover and which could probably be developed into acacia plantations. This would likely be enough acacia to supply the 19 million m^3 of wood required by both APP and APRIL, if acacia plantations were developed and managed properly. Landsat images showed that only 9.4% (154,362 hectares) of the 1.6 million hectare designated for HTIs has been planted with acacia (Table 2). An additional 259,521 hectares have been planted outside official HTIs. This means that despite the huge area set aside for timber plantations, Riau currently grows only 413,883 hectares of acacia, just about half of what is required to service the currently installed pulp capacity at the two mills.

Table 2. Vegetation cover inside designated timber plantations (HTI) in Riau

Vegetation Cover in HTI	Area (ha)	Area (%)
Degraded Forest	59,135	3.6
Forest	749,253	45.8
Acacia	154,362	9.4
Other Cover	673,674	41.2
Total	1,636,425	100.0

Source: 2002 Landsat ETM 7 satellite images

The low percentage of acacia cover inside designated timber plantations suggests that planting and harvesting plantation trees has not been driving the dramatic increase in timber plantation concessions in Riau. More likely, the increase was driven by Government's generous financial subsidies to this and the right to clear-cut standing timber in the concessions[15].

[12] Kartodihardjo & Supriono (Jan 2000) p. 1
[13] The Minister of Forestry's Decree (No. 200/Kpts-IV/1994)
[14] FWI/GFW (2002)
[15] FWI/GFW (2002) For example, private firms developing HTIs are eligible for capital participation by the government in the amount of 14% and zero-interest loans of up to 32.5%, both drawn from the "Reforestation Fund", which is collected from logging concession holders.

3.4. Wasteland in Riau

As Riau's forests have decreased, wasteland have increased. MoF reported in the late 1980s that about 1,437,963 hectares could be considered as wasteland in Riau (area categorized as unproductive dryland and wetland)[16]. By 2002, MoF reported that the potential wasteland area had increased to 1,655,746 hectares (categorized as shrubby grass, bare soil, swampy shrubby grass, and dry land agriculture mix with grass)[17]. Our analysis of historical Landsat satellite images found that almost all of these wasteland were forested in 1985, the 1990's, and some even as recently as 2001.

Wasteland can be created in many different ways in Riau:

1. Loggers often do not comply with government regulations on silviculture practices, over-harvest their concessions and cause a significant decline in forest quality and quantity. Some of these heavily degraded forests have to be considered wasteland.
2. The timber plantation industry focuses on harvesting of natural trees rather than building of plantations. Most pulpwood and oil palm concessions were granted for forested areas where the owners were able to harvest and sell the natural trees before they were required to plant plantation crops. Many appear to not have bothered establishing the actual plantations. The timber was harvested, but the land was left abandoned and was not developed as called for in the concession permit. Many of these abandoned lands apparently are not yet attractive to plantation developers. As long as there are forests left, new developers and enabling government offices tend to repeat the practice of applying for permits to clear the forest and selling the wood before planting crops, rather than developing already cleared land to plantations.
3. Land is left abandoned because it is claimed simultaneously by concession holders and local communities. Rather than solving the conflict, both parties step back and the areas are left unused after the logging has finished.
4. Bupatis (District Leaders) issue IPK (small scale forest conversion) licenses that many permit holders used to "launder" wood illegally cut elsewhere[18]. The sites at which the wood is actually cut had no conversion license and therefore is left as wasteland after the removal of the natural trees. The ready availability of IPK licenses and the easy way in which they can be misused thus leads to an increase of wasteland.
5. The establishment of the two giant APP and APRIL pulp mills created a huge market for pulpwood. Illegal loggers, previously operating on a selective basis to supply plywood mills, and legal and illegal saw mills, switched strategies and began grabbing whatever wood was left in an area. Big diameter trees were still sold to the plywood industry or saw mills, but smaller trees now had a market and were sold to the pulp mills. Today, many intensive illegal logging activities leave a completely stripped area behind, another wasteland.
6. Serious human elephant conflict may lead to the creation of wasteland as many people who have established agricultural fields or oil palm plantations near forests with elephants eventually give them up after they are raided by elephants over and over again.
7. Land speculation generates wasteland. A common practice, acknowledged by most villagers interviewed, is based on the belief that an individual who clears a forest becomes the owner of the land. Often individuals clear forest in areas that have suddenly become generally accessible (e.g. for oil exploration and exploitation, for access roads to plantations or logging operations). Once the forest is cleared, the land is abandoned while the "clearer-now-owner" waits for buyers or for some type of compensation.
8. Urban migration may lead to creation of wasteland as people abandon their agricultural land and move to towns and cities to find jobs.

[16] Dirjen Intag, Ministry of Forestry, 1994
[17] Pusat Perpetaan Baplan, Ministry of Forestry, 2003
[18] Personal communication with WWF Indonesia field team, Personal communication with RAPP staff during sustainable wood audit.

4. STUDY METHODOLOGY

4.1. Definition of "wasteland"

For this study, the authors defined ***wasteland*** as areas that:

1. are not primary, secondary or logged over forest that may recover to a normal forest.
2. are zoned as "Production Forest", "Conversion Forest", or "Area for Other Land Uses" according to the forest use plan issued by the Ministry of Agriculture and Forestry (number 173/Kpts-II/1986 *Tata Guna Hutan Kesepakatan / TGHK*) and the Provincial Land Use Planning issued by Government of Riau (*Rencana Tata Ruang Wilayah Province / RTRWP)*.
3. do not rate as High Conservation Value Forests according to the Forest Stewardship Council's Indonesia Toolkit.
4. are not located in an area that may have a biological corridor function.
5. are not surrounded by good forest.
6. are not part of the home range or any important ecological process (such as breeding ground, feeding ground, etc) of any endangered species.
7. are not part of the home range of certain species that could become pests for the crop grown in that area.
8. are not part of a conservation area either by designation or function (e.g. riverine zones, etc).
9. existed as waste land in 2002 or before.
10. are derived from anthropogenic causes (i.e. are not natural).
11. are not sacred places of any culture.
12. are not productive agricultural areas or part of a productive agriculture cycle.
13. have been cleared, but could not be used as planned because of external factors (like lack of investment capital, pests, etc) and are now left abandoned.
14. are open, but there is no plan to use it (cleared for land speculation).
15. are located in peat swamp less than 3 meters in depth.
16. have less than 40% slope.
17. are located 100 meters or more from a river.

Communities interviewed during the study had their own perceptions of wasteland. They categorized wasteland as land covered by:

1. Grass (usually dominated by *Imperata cylindrica*).
2. Shrubby Grass, grassland that has some tree species as seedlings or early sapling stage. Usually shorter than 3 meters.
3. Shrub, land dominated by trees in sapling stage in areas where grass is not common.

4.2. Methodology

4.2.1. Phase I – Detection of potential wasteland using satellite images

Six Landsat ETM 7 images taken between April and August 2002 were analyzed to identify potential wasteland in Riau as follows:

1. Images were geo-referenced using landmarks located by GPS.
2. Individual images were merged into one continuous image.
3. Image appearance was enhanced through contrast stretch and other industry-standard statistical manipulations.
4. Images were automatically classified. Where cloud, haze and moisture content in some of the images made that impossible, images were visually interpreted as follows:
    a. Digitized and masked out natural forest
    b. Digitized and masked out acacia plantations
    c. Digitized and masked out oil palm plantations
    d. Digitized and masked out rubber plantations
    e. Digitized and masked out settlements
    f. Digitized and masked out oil well locations
    g. Digitized and masked out infrastructure and facilities

    h. Digitized and masked out detectable agriculture
5. Of the remaining areas the following were assessed as potential wasteland:
    a. Shrub, grass, recently cleared or bare soil along roads
    b. Shrub, grass, recently cleared or bare soil inside oil palm concessions
    c. Shrub, grass, recently cleared or bare soil near settlements
6. Next patterns and secondary data were taken into consideration for refining the classification of potential wasteland. For example:
    a. Areas that showed up as potential wasteland in the southern part of Riau where settlements are typically older than in the North were ranked less probable as they were more likely part of long-established local agriculture systems.
    b. Areas that showed recent disturbance were ranked more probable in districts with lots of land speculation or with intensive forest harvest practices.
    c. Areas with overlapping land claims were considered potential wasteland.
7. Then expert knowledge on land ownership was added to the analysis. That resulted in degraded areas under concession to nine companies but without any visible development to be regarded as potential wasteland.
8. Finally, forest status, land use plans and the Province of Riau's conservation vision map were used to judge whether the identified potential wasteland could really be considered wasteland.

Pilot ground-truthing of the findings of the first round of Landsat image interpretation identified the following issues:

1. Landsat ETM 7 image analysis could easily distinguish acacia plantations, oil palm plantations, rubber plantations, wet rice paddy, natural forest, roads, and water.
2. Other land cover types could easily be detected through patterns visible on the image such as oil wells, settlements, forest / land clearing for plantation, and logging sites.
3. Landsat ETM 7 could not easily be used to directly identify wasteland areas. Landsat images only have a 30-meter resolution and a number of crops are too small to be detectable. Potential wasteland was therefore identified through its association with a type of land cover that could be detected from Landsat ETM 7 images: bare soil, recently cleared land (shown as pinkish in a composite image with bands 5, 4 and 3), grass, shrubs or degraded forest were all highly correlated with wasteland. Potential wasteland were then verified by field visits to make sure there were no small crops planted on these areas.

4.2.2. Phase II – Ground truthing of image interpretation

Ca. 25% of the potential wasteland identified during Phase I was verified through spot checks along about 800 km of roads in Riau and through information gathered during two aerial surveys. Ground surveys were conducted along the main road between Pekanbaru and Dumai along; Purnama in Dumai; Pelintung in Dumai; along the main road between Pekanbaru and Siak Sri Indrapura and Bunga Raya; along the main road between Pekanbaru and the west of Kerumutan; along the main road between Pekanbaru and Bukit Tigapuluh and Taluk Kuantan and Pekanbaru.

4.2.3. Phase III – In-depth assessment of two potential wasteland sites

Ecological and socio-economic-cultural surveys were conducted in two potential wasteland areas as case studies: 1. Pelintung Village in Dumai Municipality, and 2. Langkai Village in Siak District. The two areas were chosen based on the results of phase I and II.

4.2.3.1. Ecological Assessment

The ecological assessment included the following steps:

1. Field teams concentrated on areas where land cover was dominated by, but was not limited to: *alang-alang* (*Imperata cylindrica), senduduk* (*Melastoma malabaricum*), *terong pipit* (*Solanum sp*); and some pioneer species such as *mahang* (*Macaranga spp*), *balik angin*

(*Homalanthus sp*), and *anggrung* (*Trema orientalis*).

2. Tree regeneration was measured distinguishing four developmental stages:
    a. Seedling: a tree between 30 and 150 cm tall
    b. Sapling: a tree taller than 150 cm but with a diameter breast height (DBH) of less than 10 cm
    c. Pole: tree with a DBH of between 10 and 20 cm.
    d. Tree: tree with a DBH of over 20 cm.
3. Representative sample plots were established on each land cover type, at least one plot every 10 hectares. Each plot was 20 by 20 meter. Within each plot, seedlings were sampled in a 2 by 2 meter area, saplings were sampled in a 5 by 5 meter area, and poles were sampled in a 10 by 10 meter area.
4. Plot condition, inventory vegetation type, condition and population, soil type and soil condition were surveyed.
5. General land condition was determined based on the vegetation types found:
    a. When land was covered only by *alang-alang* (*Imperata cylindrical*), *terong pipit* (*Solanum sp*), or *senduduk* (*Melastoma malabaricum*), it was taken as an indication that the land had been cleared before and because the soil is poor it is unlikely to bring this area back into forest.
    b. When some pioneer species like *mahang* (*Macaranga spp*), *anggrung* (*Trema orientalis*), *balik angina* (*Homalanthus sp*), or *pulai* were found in the area, it was taken as an indication that the regeneration process would continue to turn this area back into forest.

4.2.3.2 Socio – Economic – Cultural Assessment

Structured interviews were conducted based on questionnaires. First the people responsible for a specific wasteland were identified, then respondents for the questionnaires were chosen at random from this group.

5. STUDY FINDINGS

5.1. Where was how much potential wasteland found?

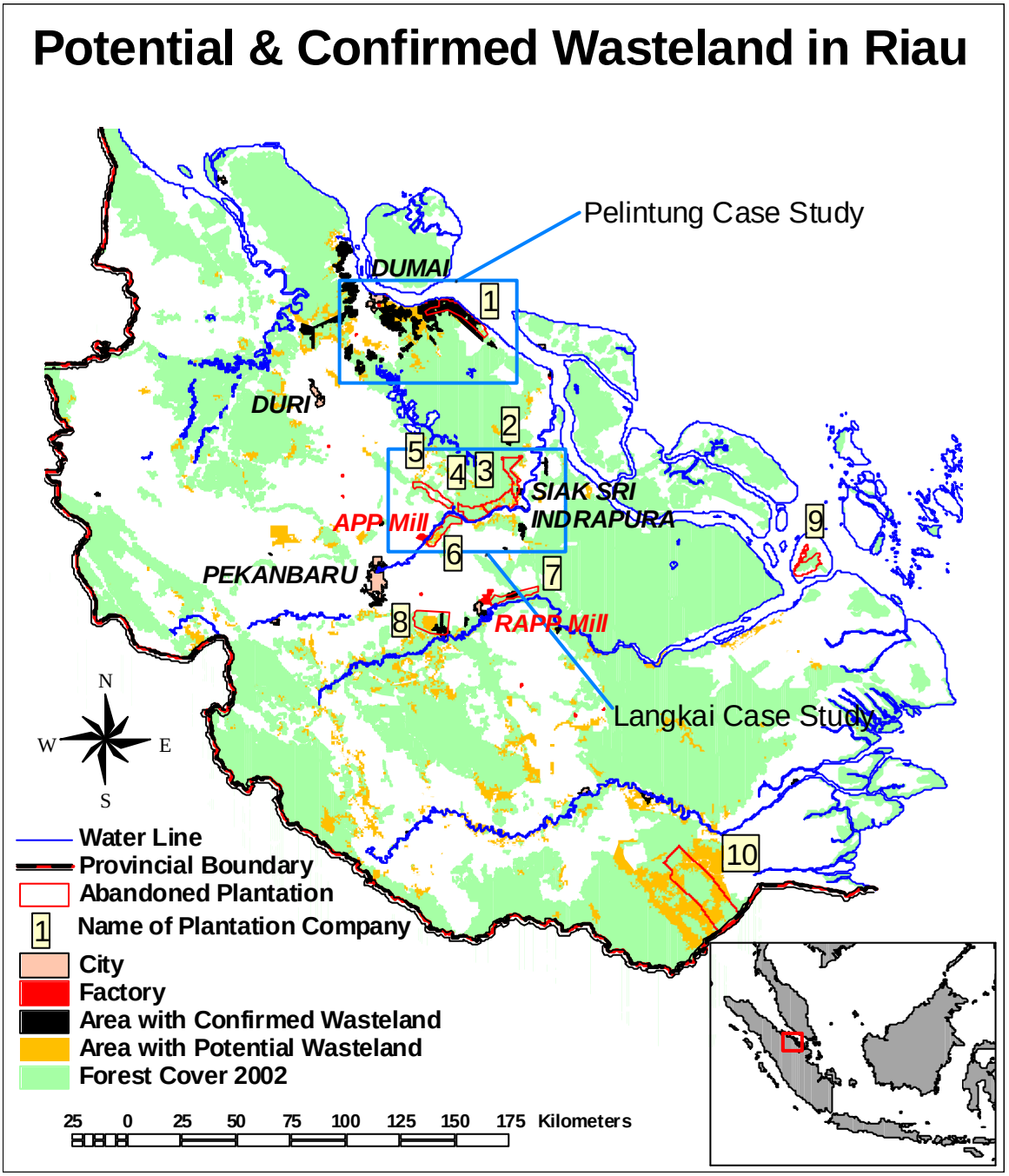
Interpretation of 2002 Landsat satellite images identified 421,294 hectares of potential wasteland in Riau Province (Map 1 - yellow polygons).

The 421,294 hectares estimate is likely to be low as:

1. some parts of the satellite images were covered by clouds under which potential wasteland might have been hidden.
2. areas identified as mixed agricultural lands were not considered wasteland though they may contain them.
3. areas identified as degraded forests were not considered wasteland as no thorough ecological assessment of these forests has been made yet.
4. any areas where classification was not certain were not considered wasteland though they could have been.
5. areas classified as small scale plantations may include areas that are no longer active plantations for reasons, such as, flood, poor soil or pest.

We expect that additional potential wasteland in Riau could be found using:

1. additional Landsat ETM 7 satellite images to cover the areas that are under clouds in the satellite images used by this study (see Figure 1).
2. satellite images with better resolution such as SPOT 5 (2,5 meter resolution), Ikonos (1 meter resolution), or Quick Bird (60 cm resolution).
3. exploring the acacia zones identified in Fig. 1 (white areas) which are outside natural forests, and outside non-timber plantation zones identified by Riau and MoF.



Map 1. Potential & Confirmed Wasteland in Riau

1 PT. Budidaksi Dwi Kusuma
2. PT. Teguh Karsawana Lestari
3. PT. Gelora Sawita Makmur
4. PT. Wana Subur Sawit Indah
5. PT. Surya Inti Sari Raya
6. PT. Priatama Riau
7. PT. Langgam Inti Hibrindo
8. PT. Raja Garuda Mas Sejati
9. PT. Trisetya Usaha Mandiri
10. PT. Agroraya Gematrans

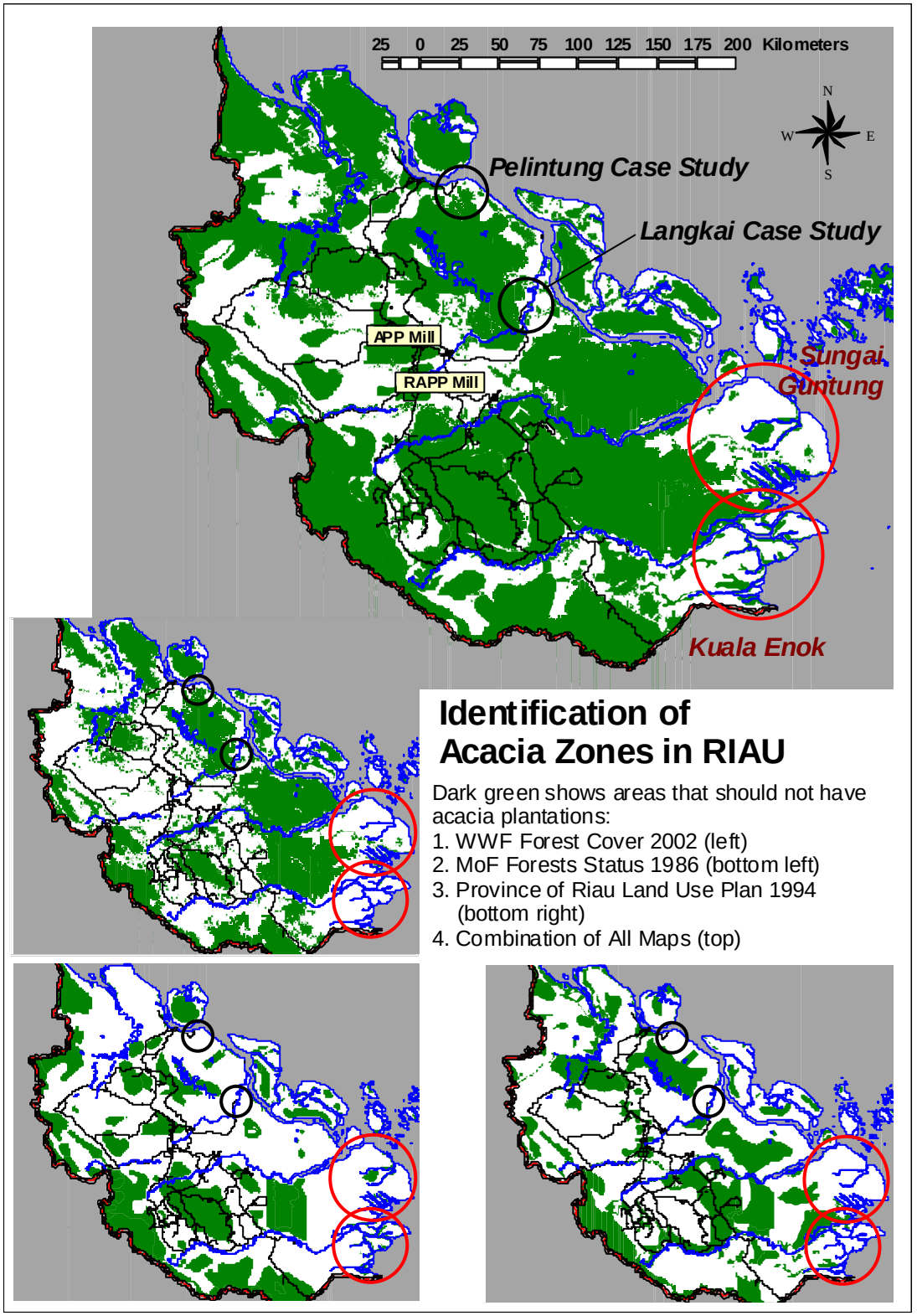


Figure 1. Identification of Potential Acacia Zones in Riau Province

5.2. Where was how much potential wasteland confirmed as wasteland?

37 out of 561 polygons of potential wasteland blocks, covering a total area of 421,294 hectares, were surveyed on the ground. The 37 polygons covered 24.8% (104,464 hectares) of the total potential wasteland. 49,809 hectares (47.7% of ground surveyed potential wasteland) in 35

polygons were confirmed as wasteland during these surveys (Map 1 – black polygons, Table 3 and Table 4).

Table 3. Total area, largest and smallest wasteland block found at the respective location and distance to APP mill for confirmed wasteland. See names marked in low on Map 1 for locations.

Location	Total area of wasteland (ha)	Largest block of wasteland found (ha)	Smallest block of wasteland found (ha)	Distance to APP mill by road access (km)
Bukit Kapur	6,710	2,014	133	182
Pelalawan	3,759	1,056	223	70
Pelintung	25,610	15,315	64	238
Purnama	6,926	3,383	8	234
Siak	2,281	848	35	84
Sungai Dumai	3,258	2,785	471	189
Pekanbaru	787	787	787	68
Total	49,809			

Table 4. Owners of confirmed wasteland

LOCATION	Identified Owners
Bukit Kapur	Individual, company (oil palm plantation: PT. Murini Wood Industri, logging concession: PT. Rokan Permai Timber)
Pelalawan	Individual, company (oil palm plantation: PT. Langgam Inti Hibrindo, PT. Raja Garuda Mas Sejati, PT. Pusaka Megah Bumi Nusantara)
Pelintung	Individual, two village cooperatives, seven village farmer group, company (oil palm plantation: PT. Surya Dumai Agrindo, PT. Budidaksa Dwi Kusuma, PT. Tobe Indah, logging concession: PT. Sri Buana Dumai & timber plantation: PT. Surya Dumai Agrindo)
Purnama	Individual, company (timber plantation: PT. Surya Dumai Agrindo, PT. Ruas Utama Jaya, logging concession: PT. Sri Buana Dumai)
Siak	Individual
Sungai Dumai	Individual, company (oil palm plantation: PT. Surya Dumai Agrindo, timber plantation: PT. Satria Perkasa Agung)
Pekanbaru	Individual

Many more wasteland are likely to be confirmed once all potential wasteland is checked on the ground. In addition, we expect that a lot more wasteland could be identified in Sungai Guntung and Kuala Enok (areas with red circles in Figure 1) where satellite images reveal a lot of development and very little forest cover.

5.3. Abandoned Concessions

Discussions at the Riau Forest Service (Dinas Kehutanan Riau) revealed that nine oil palm concessions had not been planted after the forests had been clearcut forests and the timber had been sold: PT Teguh Karsawana Lestari; PT Priatama Riau; Raja Garudamas Sejati; PT Agroraya Gematrans; PT Wana Subur Sawit Indah; PT Gelora Sawita Makmur; PT Trisetya Usaha Mandiri; PT Langgam Intri Hibrindo and PT Surya Inti Sari Raya. These concessions add up to 113,804 hectares.

These concessions were labeled “abandoned concessions” and identified by red polygons in Maps 1, 5 and 6. Although the actual operational status and the ecological and conservation values of these concessions need to be confirmed, we believe that at least some of the area could be used for

the establishment of acacia plantations. In fact, there have been at least two cases in Riau where oil palm concessions were turned into acacia plantations: 1. the former oil palm concession of PT Trisetya Usaha Mandiri (24,400 hectares), and 2. the PT Budi Daksa Dwi Kusuma concession (about 11,800 hectares) in Pelintung[19].

Our study confirmed the following abandoned concessions in Dumai Municipality (Map 5):

- Logging concession PT. Surya Buana Dumai (ca. 14,500 hectares) is no longer active in the field. This company owns two additional concessions (total ca. 66,800 hectares) elsewhere. A source in the Riau Forestry Service said the company is in the process of returning their concession to government.
- Timber plantation concession PT Surya Dumai Agrindo (ca. 7,800 hectares) south of Pelintung Village does not appear to be active. The local community and respondents in our field survey in the area reported no activity in the concession.

From an ecological and conservation point of view, four out of the nine concessions identified as "abandoned concessions" by the Riau Forest Service may not be considered as wasteland because PT Agroraya Gematrans is located in a biological corridor between Bukit Tigapuluh National Park and Kerumutan Wildlife Reserve while three other concessions, PT Wana Subur Sawit Indah, PT Gelora Sawita Makmur and PT Teguh Karsawana Lestari still have significant amounts of natural forest left.

5.4. How much available land was found inside APP HTI concessions?

Vegetation cover of selected APP concessions in three areas, Dumai, Duri-Minas and Kampar (Maps 2 - 4), was analyzed using Landsat satellite images (Table 5).

APP concessions had surprisingly low Acacia coverage :

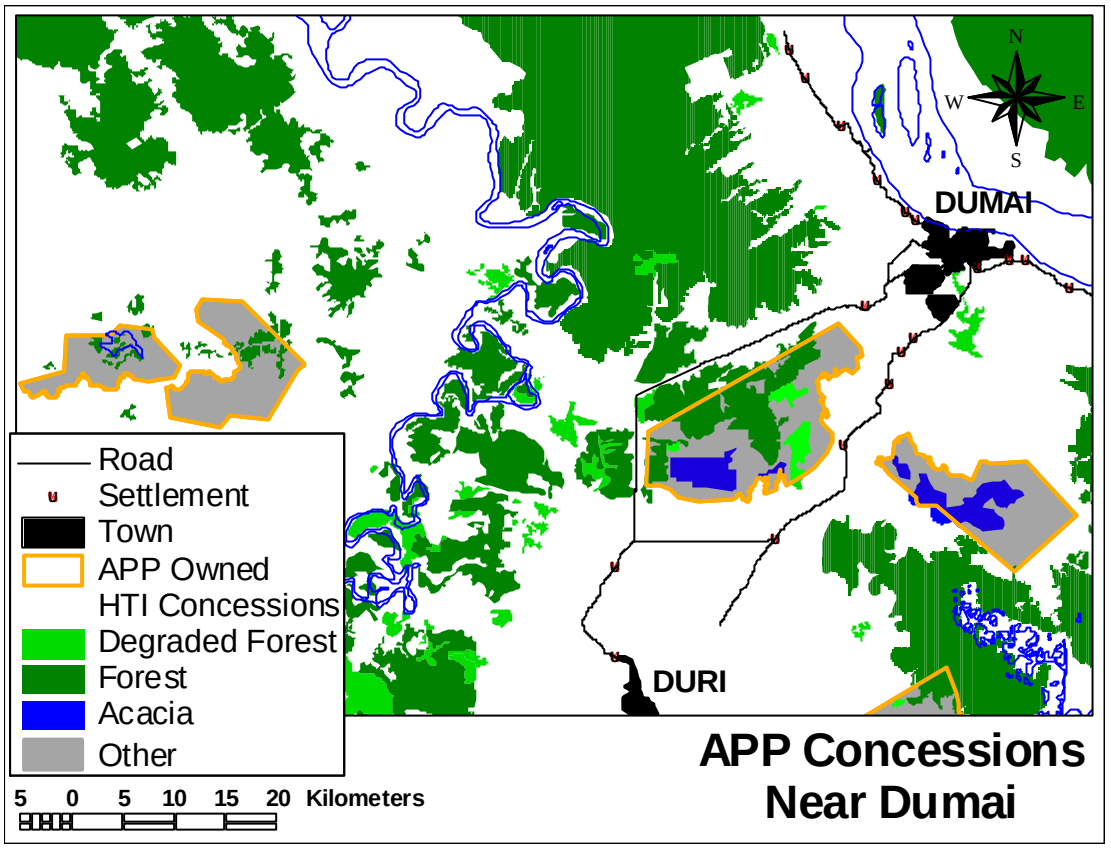
- Near Dumai, only 4,176 (10.8%) of 38,638 hectares had identifiable acacia cover (Map 2),
- in Duri – Minas, only 67,428 (42.5%) of 157,100 hectares had identifiable acacia cover (Map 3)
- In Pangkalan Bunut and Tesso, 55,607 (70.5%) of 78,914 hectares had identifiable acacia cover (Map 4).
- On average, only 46.3% of the sampled concession area appeared to be under identifiable acacia cover.

For comparison, between 18.5% and 68.9% of the same concessions were identified as "other covers" which could potentially be planted with acacia. These areas add up to 109,216 hectares in total for the three areas analyzed.

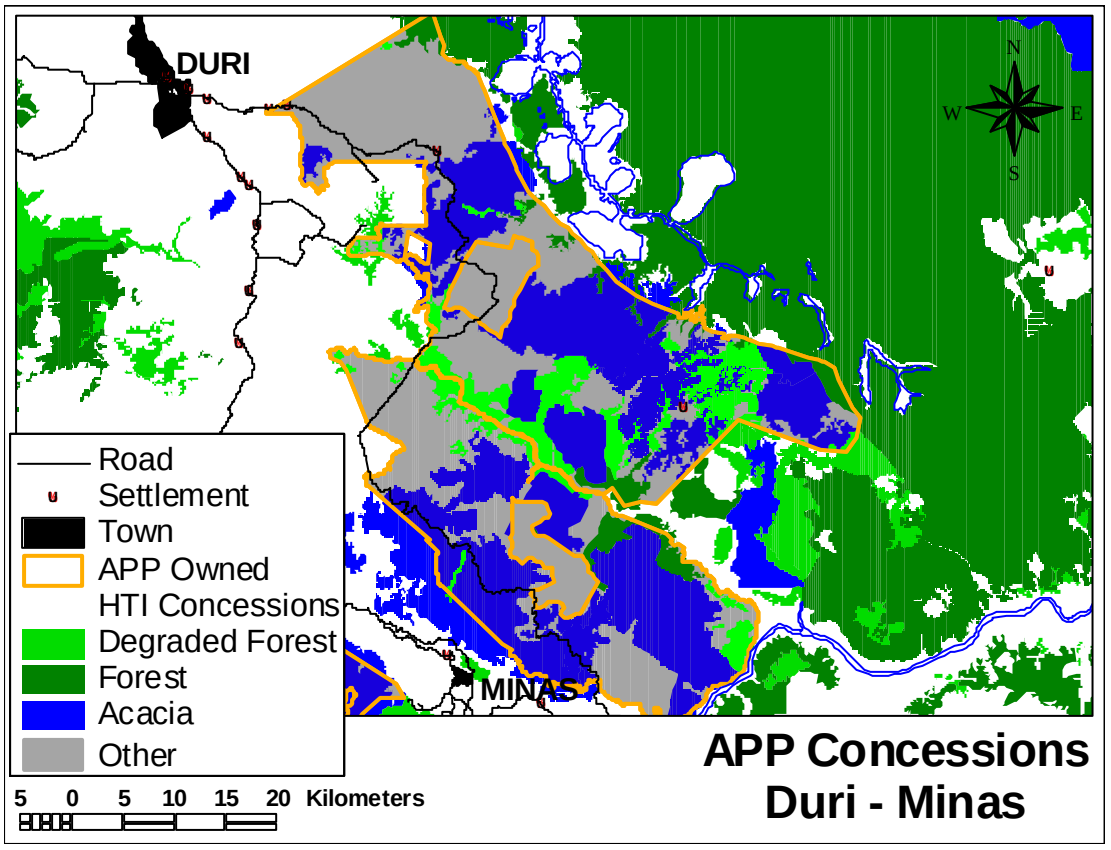
Table 5.—Land cover inside selected APP concessions based on Landsat images (all areas in hectares), see also Map 1.

	Acacia (dark blue)	%	Degraded Forest (green)	%	Forest (dark green)	%	Other covers (grey)	%	Total
Dumai	4,176	10.8	1,179	3.1	6,648	17.2	26,634	68.9	38,638
Duri – Minas	67,428	42.9	15,301	9.7	6,394	4.1	67,978	43.3	157,100
Kampar	55,607	70.5	3,128	4.0	5,575	7.1	14,604	18.5	78,914
Total	127,211	46.3	19,608	7.1	18,617	6.8	109,216	40.0	274,648

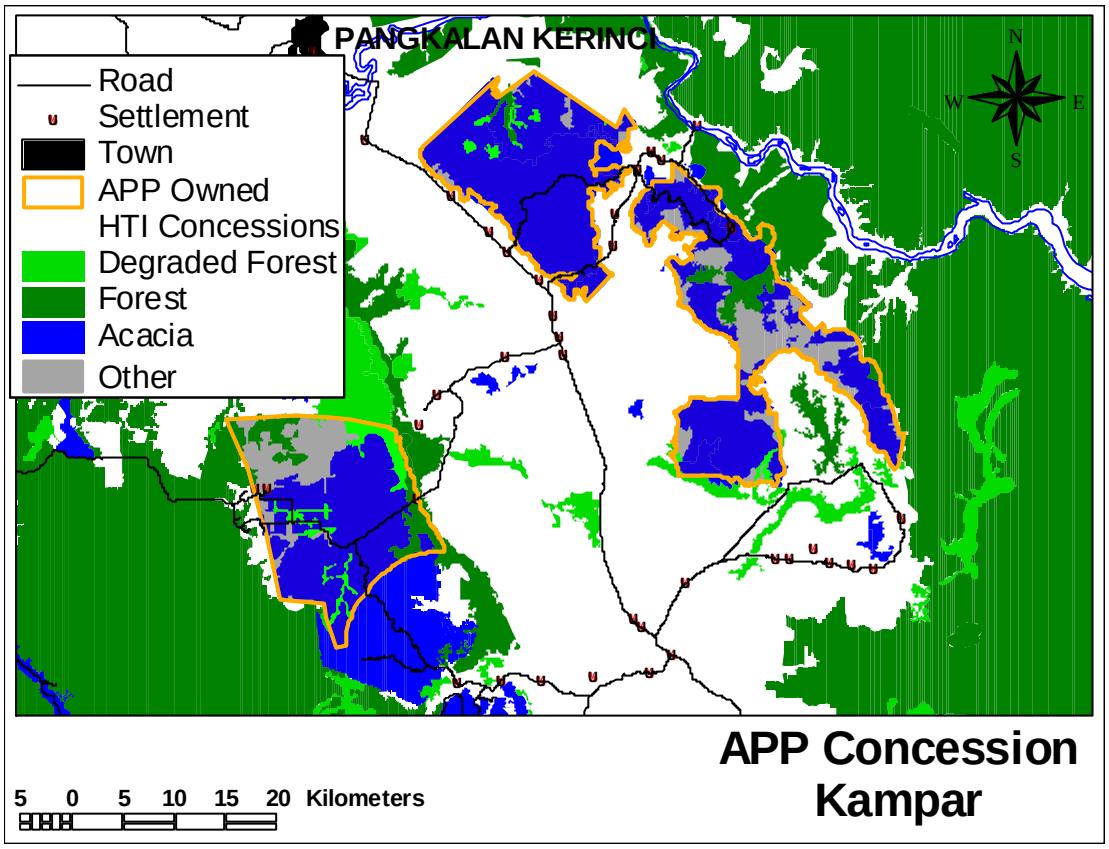
[19] Personal communication with Riau Province Forestry Service staff



Map 2. APP Concession Near Dumai



Map 3. APP Concession Duri - Minas



Map 4. APP Concession Kampar

5.5. What did communities think about the wasteland?

In-depth ecological and socio–economic–cultural assessments were conducted as case studies of two communities near confirmed wasteland in Dumai Municipality and Siak District, respectively (Appendix 2). None of the villagers had a good understanding of what it would mean to plant acacia on their land. Peat swamp communities in the Siak area were discouraged by the poor performance of any of the crops they had tried on their land. Communities in the Dumai area had a pretty good understanding of what they would like to grow, though acacia did not rank high on their agenda. In most cases lack of funds to invest was cited as the main reason why the wasteland lay barren.

6. KEY FINDINGS

- Interpretation of 2002 Landsat satellite images identified 421,294 hectares of potential wasteland in Riau Province.
- Further studies with cloud free higher resolution images are likely to identify additional potential wasteland.
- 37 (104,464 hectares) out of 561 (421,294 hectares) polygons of potential wasteland blocks, were surveyed on the ground. For 49,809 hectares in 35 polygons wasteland was confirmed. That means 47.7% of potential wasteland was confirmed as actual wasteland.
- Wasteland blockss are of various sizes (ranging from 8 to 15,315 hectares), owners include individuals, cooperatives and companies, including APP/SMG.
- Distances between wasteland and the APP mill are between 68 to 238 km by road. Wasteland near Pelintung Village are close to existing APP concessions and wood could be transported to the mill by boat/barge.

- More wasteland would likely be confirmed once the remaining 75% of potential wasteland are checked during field surveys. Additional potential wasteland might be identified in the eastern part of Riau near Sungai Guntung and Kuala Enok, areas with high development and low forest cover.
- Some "abandoned concessions", including oil palm plantations and logging concessions, might be available for acacia development. Two such concessions were identified in in Dumai Municipality, PT Surya Buana Dumai with ca. 14,500 hectares and PT Surya Dumai Agrindo with ca. 7,800 hectares.
- Satellite image analysis of selected APP concessions in three areas (Dumai, Duri-Minas and Kampar) revealed overall low Acacia coverage (46.3% on average). The undeveloped areas, covering ca. 110,000 hectare (40.0%) of the three concessions were neither acacia, degraded forest nor forest (in another words, wasteland), and therefore appear to be available for immediate acacia planting.
- Socio-economic-cultural assessment in two villages revealed that wasteland areas currently give the owners almost no economic value. In most cases, lack of funds to invest was cited as the main reason why the wasteland lay barren.
- None of the villagers had a good understanding of what it would mean to plant acacia on their land.
- Oil palm appears to be the favorite plantation crop as it provides significant and regular income. At the current market price, an oil palm plantation owner can expect a yield on four-year old plantations of about Rp. 800,000 to 1,200,000 per hectare per month.
- Rubber is the second favorite plantation crop. At the current market price, the yield per hectare per month is about Rp. 600,000 to 1,000,000.

7. RECOMMENDATIONS

1. Priorize establishment of acacia plantations in wasteland areas classified by this study under "other cover" (109,216 hectares) within company owned concessions. Wherever there are social conflicts in "other cover", work towards an immediate resolution of these social conflicts.
2. Commission a feasibility study about using the wasteland confirmed by this study for acacia plantation development.
3. Conduct an independent and transparent comprehensive study using higher quality aerial/satellite images and in-depth field surveys to confirm potential and identify additional wasteland that could be planted with acacia.
4. Hold stakeholder consultations on the development of potential joint venture schemes for acacia plantations in wasteland. Carefully explain the costs, benefits and implications of the schemes to reach consensus with potential partners.
5. Involve third party observer in all negotiations to protect the rights and benefits of potential partners.
6. Avoid causing land conflicts with the communities over the use of wasteland.
7. Immediately pursue development of wasteland to acacia in exchange for protecting all remaining HCVFs within company owned concessions and those of their joint venture partners.
8. Put temporary moratorium area between Giam Siak Kecil and Bukit Batu protected areas under permanent protection as plenty of alternative wasteland areas were identified by this study.

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APPENDIX 1. FOREST STATUS AND LAND USE TYPES IN RIAU

Riau Province's mainland and islands stretch over 9,456,160 hectares. Two land use plans are currently active for Riau Province: a forest use plan issued by the Ministry of Agriculture and Forestry (number 173/Kpts-II/1986 *Tata Guna Hutan Kesepakatan / TGHK,* Table 6) and a Provincial Land Use Plan of 1994 (*Rencana Tata Ruang Wilayah Province / RTRWP 1994,* Table 7) issued by the Government of Riau. Both plans define different land use types. In this appendix, we therefore only provide the raw data without attempting to compare the two plans.

Table 6. Forest Status according to TGHK in Riau (1986)

Forest Status	Area (Ha)	(%)
Conservation Forest / *Hutan Lindung*	397,150	4.20
Protected Area / *Hutan Suaka Alam dan Hutan Wisata*	451,240	4.77
Production Forest / *Hutan Produksi*		
Permanent *Tetap* /	1,866,132	19.74
Limited / *Terbatas*	1,971,553	20.85
Conversion Forest and Other Land Uses / *Hutan Produksi yang Dapat Dikonversi dan Areal Penggunaan Lain*	4,770,085	50.44
Total	9,456,160	100.00

Source: SK Menteri Kehutanan No. 173/Kpts-II/1986 tanggal 16 Juni 1986

Table 7. Land use types according to RTRWP in Riau (1994)

Land Use Type	Area (Ha)	(%)
Forestry Zone / *Pengembangan Kawasan Kehutanan*	2,707,761	28.63
Conservation Forest / *Hutan Lindung*	448,357	4.74
Peat Conservation Forest / *Kawasan Lindung Gambut*	882,243	19.33
Protected Area / *Cagar Alam / Suaka Alam / Suaka Margasatwa*	522,948	5.54
Other Non Forestry Zone / *Kawasan Pengembangan Lain (non kehutanan)*	4,894,851	51.76
Total	9,456,160	100.00

Source: Peraturan Daerah No. 10 Tahun 1994, tanggal 19 Agustus 1994

APPENDIX 2: IN-DEPTH ANALYSIS OF WASTELAND NEAR COMMUNITIES

Wasteland Case Study 1: Pelintung Village

Village name: Pelintung Village, Medang Kampar Sub-District, Dumai
Village location: 101.58°E 1.63°N, ca. 35km east of the City of Dumai
Village land area: about 43,750 hectares
Population: 3,460 (1,807 male and 1,633 female) in 723 families.
Ethnicity: Malay with some migrants from Java, North Sumatera and South Sulawesi

Ecological Assessment

Fourteen survey plots with various land cover types were surveyed within the wasteland. Nine plots were covered by shrubs, one plot was in young secondary forest, one plot was in logged over forest, one plot was in an abandoned oil palm plantation and the other plot was in the border of the village.

Topography: Large part of Pelintung Village is located on peat swamp of less than three meters in depth, and mainly flat and wet.

Vegetation Cover: Vegetation cover along the road from Dumai to Sungai Pakning through Pelintung Village has very few spots that have natural vegetation. The first two types of land cover (grass and shrub) are mainly located near the main road and up to about five kilometers from it, while the other two land cover types are found further then 5 kilometers from the main road. The four general types of land cover found in this area are:

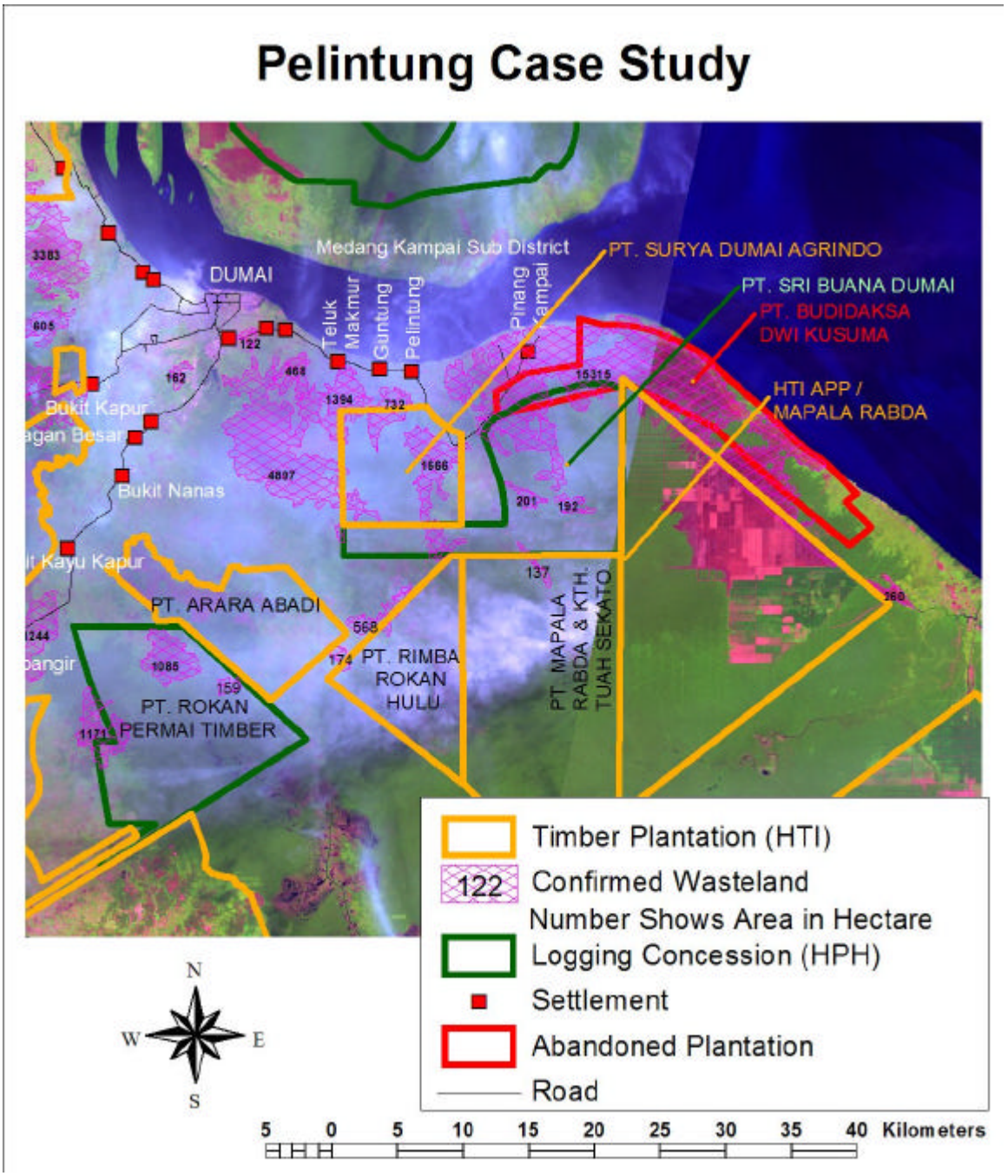
- ***Grass*** with some few bush consisting of *alang-alang* grass (*Imperata cylindrica*), *resam*, fern and *karamunting* (*Melastoma malabaricum*). From a forest succession point of view, this vegetation indicates disclimax with poor soil content.
- ***Shrubs*** with some pioneer tree species like of *mahang* (*Macaranga hypoleuca*), *perijak burung* (*Evodia odorata*), *kayu putih* (*Melaleuca leucadendron*), *jambu-jambu* (*Eugenia* sp). From forest succession point of view, this signals a direction toward climax, and if left alone, it could come back to climax vegetation. So, it has some ecological value, but given the location is close to where people live and that there is a high encroachment rate, it is very unlikely that the area will be allowed to regenerate into climax forest.
- ***Logged over forest*** with some primary forest trees. Trees found including mendarahan (Myristica sp), kempas (Kompassia malacensis), meranti rawa (Shorea uliginosa), balam (Palaquium sp), kelat (Eugenis sp), arang-arang (Dyospiros sp), pisang-pisang (Xylophia sp). This logged over forest is in good condition, since it is far from where the settlements are. The activity found in this area was mainly illegal logging. Once the valuable timber is gone, it is also possible that people come and encroach this area. From the practical point of view, looking at the current threats, it will be difficult to maintain this area as forest.
- ***Good Secondary forest***. In this site, some tree species in pole stage are found, including *mendarahan* (*Myristica sp*, with 15 cm diameter and about 10 meter tall), and *punak* (*Tetramerista glabra*, with 14 cm diameter, and about 7 meter tall). During field survey, a pair of horn bill birds was seen.

Socio – Economic – Cultural Assessment

Current Land Use

Most of the people here own parcels of productive land (with no legal title yet) and use it to grow rubber trees, oil palm, and some other short term crops for subsistence. One correspondent has one hectare of rubber plantation, which gives about 200 to 350 kilograms of rubber, equal to almost Rp. 600,000 to 1,000,000/month (the current market price is around Rp 2.900 /kg) depending on the season and availability of man power to tap the rubber resin. Even though rubber gives a similar

yield to oil palm, due to the higher maintanance needed for rubber, people's interest in switching the land into oil palm plantation is growing. One villager started planting 12 hectares of oil palm in 1998 and now is earning about Rp. 9 to 14 million/month (depending on market price and total harvest).



Map 5. Waste land identification case study in Dumai District.

The local community admitted that wasteland exists in their village. They refer to wasteland as land that has been abandoned after the forest was cleared for various reasons. In some cases, it was used, but mostly never been used again. For land that has been used before, usually they abandon it after one or two attempts to grow crops if what they grow didn't yield at the level they expected or was destroyed by fire. Major abandonment of land owned by the community started in 1999 when big fire destroyed a lot of their crops. On average, each family in Pelintung owns one and a half to ten hectares or more.

About five kilometers south of Pelintung PT. Sri Buana Dumai own a 35,000 hectares forest

concession. This company started their exploration in 1995, then built canals and access in 1996. They harvested the wood starting in 1997 at that time their operation was more like land clearing than logging. They cleared most of the forest, sold the big timber to saw mills or plywood factories, and the small diameter wood to a pulp and paper mill. In 1999 the company left this area, leaving some wasteland within their concession.

Once the company left, this concession became more like open access land. People started claiming the land and were supported in this activity by the village head. Two cooperatives and seven farmers groups finally came and took over most of the concession. They started with logging, harvested as much timber as possible, sold the big logs to Malaysia and the smaller ones to the pulp and paper mill. Now that land has become unproductive, and the respondents admit that they don't have money to start cultivating that land.

Cause for Creation of Waste Land

Local community owned wasteland is generally created when local people clear forest for land claim purpose but have not since planted the area. At the present time most of these areas are covered with shrubby grass. No land certificates have been issued in this village. Most villagers only have *Surat Keterangan Tanah* or Land Ownership Note issued by the village head (this has no legal validity).

For community owned land, it become unproductive mostly because of capital problems. Their community land was peat swamp, which needs expensive drainage systems to be built before they could grow oil palm, not to mention capital needed to purchase oil palm seedling. (The field survey found that one certified oil palm seed cost about Rp. 8,000 to Rp. 9,000). Fires during the dry season often destroy oil palm or rubber that people just planted. As this can happen many times, people run out of capital to re-grow oil palm.

Economic Value of Waste Land

Short term crops are not suitable on peat swamp soils, so a only few people grow these crops for personal or family consumption. Basically no economic benefit is received by the people from this wasteland, except if it re-grows, since they could sell some tree for poles.

People's Plan to Use Waste Land

Nine out of ten respondents want to grow oil palm, and only one respondent pick rubber to be planted on his waste land. Oil palm has become a favorite crop as it gives promising and continous cash income as seen by the example of Pak Hamzah.

Rubber is still picked as commodity by one respondent as it has long been part of the Pelintung economy since two to three generation ago. This gives him knowledge and full understanding on how to cultivate rubber. He also thinks that after two to three years, the rubber doesn't need attention anymore. Rubber seed is also cheaper than oil palm, only Rp. 800 per certified seed.

Capital is still the main constraint for the respondents to make their plans happen. With their current income, it will be difficult to realize this plan except if they could get some unexpected cash.

Possibility for Investors

Respondent also said that investors are welcome as long as it could give mutual benefit for both sides. Respondent who own land two hectares or less usually are not interested in inviting an investor to come, as they think they could manage by themselves. On the other hand people with big parcels of land tend to like this idea as they do not have enough resources to manage their whole parcel. Oil palm and rubber are the two main plantation crops that the respondents are eager to grow.

Previous Experience with Investors

The community has little previous experience with investors. Some collaborative or joint venture schemes in oil palm, rubber and pineapple were offered to them, but none have been followed up. These previous offers are only known by limited number of people. People from Medang Kampai

Sub District and Selinsing hamlet for example had never heard about this before.

Possibility to Use People's Waste Land to Grow Acacia
When respondents were asked whether they would agree to grow acacia, two respondents agreed, six said no, while the other two said, "let's think and examine it first, and we can discuss the possibility."

Two respondents that own land bigger than 2 hectares are willing to accept an investor who wants to grow acacia because they thought it would give them some additional economic benefit from their wasteland which now is not giving anything. Investors usually have proper equipment and for sure could manage the land and make it suitable to a profitable acacia plantation.

Eight other respondents said that they don't have any prior knowledge on acacia and how much yield they could get from it. All of the respondents don't know what kind of collaborative management or joint venture scheme they could expect nor had heard about joint venture scheme offers by other acacia grower companies before.

Joint Venture or Collaborative Mechanism to Use People's Waste Land to Grow Acacia
Some economic benefits are expected from this scheme, specially profit sharing and giving employment opportunity. Without prior knowledge on how much they could get from selling acacia wood, they are anticipating around Rp. 350,000 per ton of acacia. This price is solely based on existing oil palm experience.

Respondents think that they are willing to do some work in acacia cultivation, including: nursery, land preparation, plant, maintenance, thinning, and guarding the plantation. They consider this work as something that can open employment and monthly salary.

Some respondent said this joint venture could last for a long time so that wasteland becomes productive, but some others prefer to try one or two cycles of acacia before deciding to continue a joint venture.

Respondents think profit sharing should be paid monthly or at least annually. Beside this, respondents think that the acacia plantation company should be responsible for building some facilities in the village.

Discussion and decisions could be made individually for individual land claims, but if the land is owned by a group, preliminary discussion should be held with group leaders and the village head. Ideally in the follow up, all the members should be consulted in bigger discussion before a decision is made to make an acacia plantation.

Waste Land Case Study 2. Langkai Village

Village name:	Langkai Village, Siak Sri Indrapura Sub-District, Siak District
Village location:	102.03°E 0.90°N
Population:	2,247 (1,141 male and 1,106 female) in 450 households.
Ethnicity:	Malay with some migrants from Java and North Sumatera
Village land area:	ca. 10,800 hectares

The majority of the people are farmers (90.62%) while others work as government employees, businesses and work in the private sector.

Previously most of the people in this village grew rice paddy in a 400 hectare paddy field. They grow rice once a year starting at the end of dry season and harvest before water floods their field. During the dry season they couldn't grow paddy as no water available. To make this field more productive, people propose to the government to build an irrigation channel to control the water level during dry and wet seasons, with the hope that they could grow paddy rice twice a year.

Irrigation construction began in 1997, unfortunately instead of solving people's problem; this irrigation channel becomes more like a drainage canal than water control. The field becomes dry all the time and basically unusable ever since. But as this area has been designated as rice field in the land use plan, the government insists that people only grow rice and forbid them the switch to long term crops.

At the time the field survey was conducted in October 2003, most of Langkai people owned productive land in which they grow oil palm, rubber and short term crops. No land titles have been issued, the only proof of ownership is *Surat Keterangan Tanah* issued by village head, but there was a case in which such land was sold to others.

A good asphalt road connects this village to district capital, Perawang and Pangkalan Kerinci. As this good road increases goods movement, it also facilitates illegal logging by transporting wood to the surrounding city destinations, especially when government control of logging and wood transport is not functioning.

Illegal logging focuses on several commercial species such as *Kempas* (*Kompassia malaccensis*), *bintangur* (*Calophyllum soulatri), meranti* (*Shorea uliginosa*), *punak* (*Tetramerista glabra*), *medang* (*Alsedophapne* sp), *terentang* (*Camnosperma auriculata*). Illegal logging workers were mainly migrants.

Ecological Assessment

Wasteland sites surveyed by the ecological team were located in Parit Baru, Langkai, Pelintai and Bunga Raya villages. Seven plots were surveyed, with four plots in shrubby land, one plot in young secondary forest, one plot in logged over forest, and one in an area where oil palms had been planted (Map 6).

In Bunga Raya village where land is used quite intensively the area of wasteland is smaller than the other villages. Bunga Raya is a transmigration settlement and its irrigation channel is properly functioning and is used.

Topography

Most part of the area is flat, peat swamp less than three meters in depth and wet.

Vegetation Cover

Three types of land cover were found in the waste land:

- Grass with a few bush, consisting of *alang-alang* grass (*Imperata cylindrica*), *resam*, fern and *karamunting* (*Melastoma malabaricum*). From a forest succession point of view, this vegetation indicates disclimax with poor soil content. Usually found on ex-farm land.
- Shrubs with some pioneer tree species like of *mahang* (*Macaranga hypoleuca*), perijak burung (*Evodia odorata*), laban (*Vitex pubescens*), dan panai-panai (*Pimeleodendron papaviroides*). From a forest succession point of view, this signals a direction toward climax, and if left alone, it could come back to climax. So, it has some ecological value, but given the location is close to where people lives and, there is a high encroachment rate, it is unlikely that the forest will reach climax state.
- Logged over forest with some primary forest trees. Tree found included mendarahan (Myristica sp), kempas (Kompassia malacensis), meranti rawa (Shorea uliginosa), bintangur (Calophyllum soulatri), punak (Tetramerista glabra), medang (Alsedophapne sp), terentang (Camnosperma auriculata), medang (*Litsea* sp), and Lalan (*Santiria laevigata).* This logged over forest basically is in good condition, since it is far from where the settlements are. Activity found in this

area is mainly illegal logging. Once valuable timber gone, it is also possible that people come and encroach this area. From the practical point of view, looking at the current threats, it is difficult to maintain this area as forest, except if a strong will could manage and maintain the present situation. Gibbon calls were heard coming from this forest during field survey.

Social, Economy and Cultural Assessment

Respondents in Langkai think wasteland is land that is not used, and is covered with shrubby grass. One of the examples is 400 hectares of ex rice paddy that they abandoned in 1997. Respondents each own one to ten hectares of wasteland.

Causes

Besides the faulty irrigation system, respondents also said that land is abandoned when the owner chooses to work in a government project where they could earn cash monthly. At this time Siak District has a lot of development projects that requires a lot of workers.

Capital was mentioned as one of the causes for them to leave land unproductive. From experience they learned that in the peat soils and with the faulty irrigation system they often couldn't get enough yield to cover even the costs of planting a particular crop because the land was unsuitable for it. Pests make cultivation costs even higher, further reducing their chances to make a profit.

Even though the field is not suitable anymore, the government insists that they still stick to growing rice. Any attempt to switch to growing other crops is rejected by the government officers.

Economic Value

There is almost no economic value that people could get from owning wasteland. Most of the land is covered by shrubby grass. Some people collect small amounts of fire wood from their waste land.

People's Plan to Use Waste Land

So far we could conclude that wasteland in Langkai mostly exists because of the faulty irrigation design, but on the owner's side, they still hope that they could use it for cultivation in the near future. If the government could accept their idea to switch crops, eight respondents said that they would like to grow oil palm, while two respondents still want to cultivate rice. Two people also think that they should cultivate multi crops like paddy and rubber or paddy and oil palm.

Oil palm is again chosen because it can give a steady income for a longer period, on the second rank, rubber is preferred because it doesn't require much attention and the price of seed is cheaper. In Langkai oil palm seeds sell for Rp. 8,000 to Rp. 9,000 per quality certified seed, while rubber is only Rp. 800 per seed.

Previous Experience with Investors

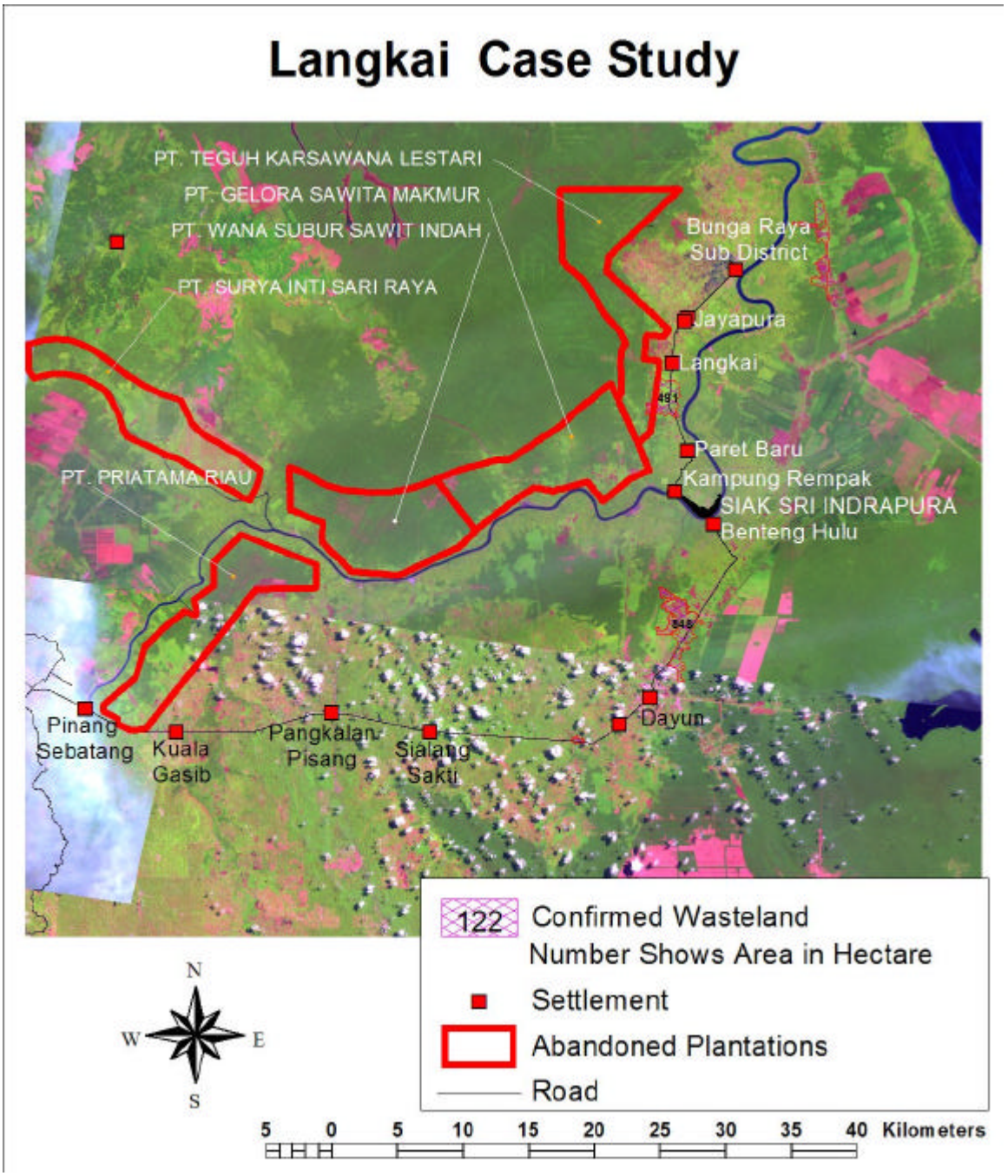
The community had no experience with investors. Some collaborative or joint venture schemes had been offered to them, but none were followed up. The two crops mentioned at that time were bananas and pineapples. Although no schemes were developed, people liked the suggestions as they thought it would give them additional income.

Possibility to use People's Waste Land to Grow Acacia

When respondents were asked whether they would be willing to grow acacia, none of the respondents were in agreement. In their perception wasteland only exists temporarily and later they will have to make use of it. Two other reasons for rejecting an acacia scheme were that they do not know how such a scheme would benefit them and they are afraid to change the designation of the wasteland area to other than rice.

On the other hand some other people who met the ecological team said that as long as the scheme had benefits and would have some certainty of helping them, they would think about it. Some were afraid of an acacia scheme, based on the case when they were asked to grow *sengon* (legume tree,

Paraserianthes falcataria) but now after those sengon are ready to harvest, no buyer came and they couldn't make money from it.



Map 6. Waste land identification case study in Siak District.