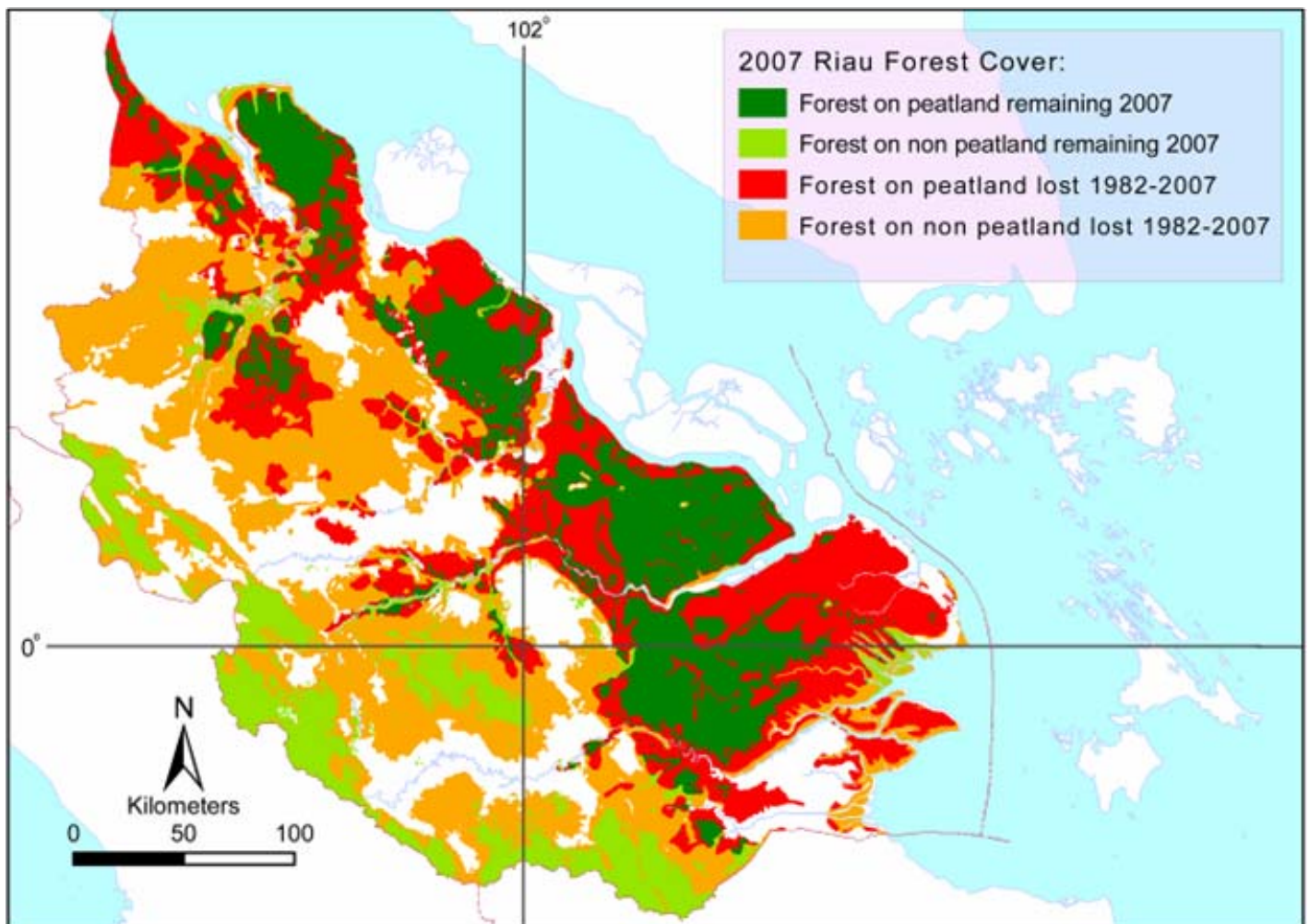
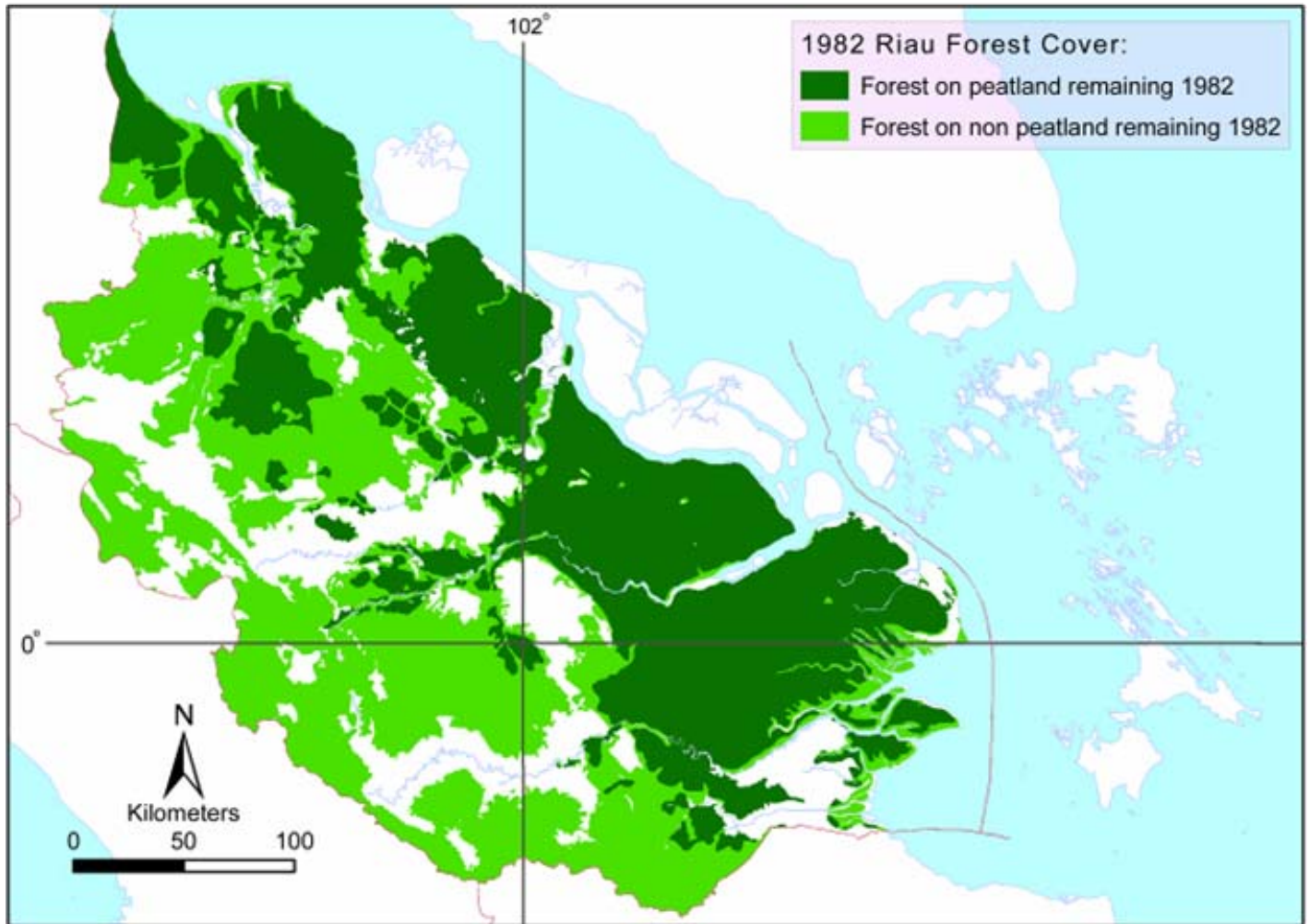




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How Pulp & Paper and Palm Oil from Sumatra Increase Global Climate Change and Drive Tigers and Elephants to Local Extinction

Excerpts from :
“Deforestation, Forest Degradation, Biodiversity Loss
and CO₂ Emissions in Riau, Sumatra, Indonesia”
WWF-Indonesia



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Deforestation, Forest Degradation, Biodiversity Loss and CO₂ Emissions in Riau, Sumatra, Indonesia

One Indonesian Province's Forest and Peat Soil Carbon Loss over a Quarter Century
and its Plans for the Future



WWF Indonesia Technical Report
www.wwf.or.id

February 2008



Sumatran tiger in Riau. © WWF Riau Tiger Survey



Log yard with wood waiting to be pulped at APP mill in Riau. © WWF Indonesia



Clearance for acacia plantation development in Tesso Nilo, one of Riau's last remaining elephant forests. © WWF Indonesia

Riau Province, in central Sumatra, Indonesia, contains some of the last significant blocks of forest habitat housing the endangered Sumatran tiger and elephant, species found only on the island of Sumatra and nowhere else on Earth. Riau is also home to vast peatlands estimated to hold Southeast Asia's largest store of carbon. However, they are all under serious threat of rapid and large-scale deforestation (*Map 1*).

“Deforestation, Forest Degradation, Biodiversity Loss, and CO₂ Emissions in Riau, Sumatra, Indonesia” by WWF-Indonesia, Remote Sensing Solution GmbH, and Hokkaido University was published on 27 February 2008. This groundbreaking study analyses for the first time exactly how deforestation and degradation of natural forests in Riau is driving both the death of tigers and elephants and global climate change.

The study analyses deforestation and forest degradation over the last quarter century, between 1982 and 2007, and projects the fate of Riau's forests until 2015. It identifies the local pulp & paper industry – Asia Pulp & Paper (APP) and Asia Pacific Resources International Holdings Limited (APRIL) – along with the palm oil industry as the key drivers of rapid large-scale deforestation. Global consumption of pulp & paper and palm oil products is the ultimate force behind Riau's deforestation.

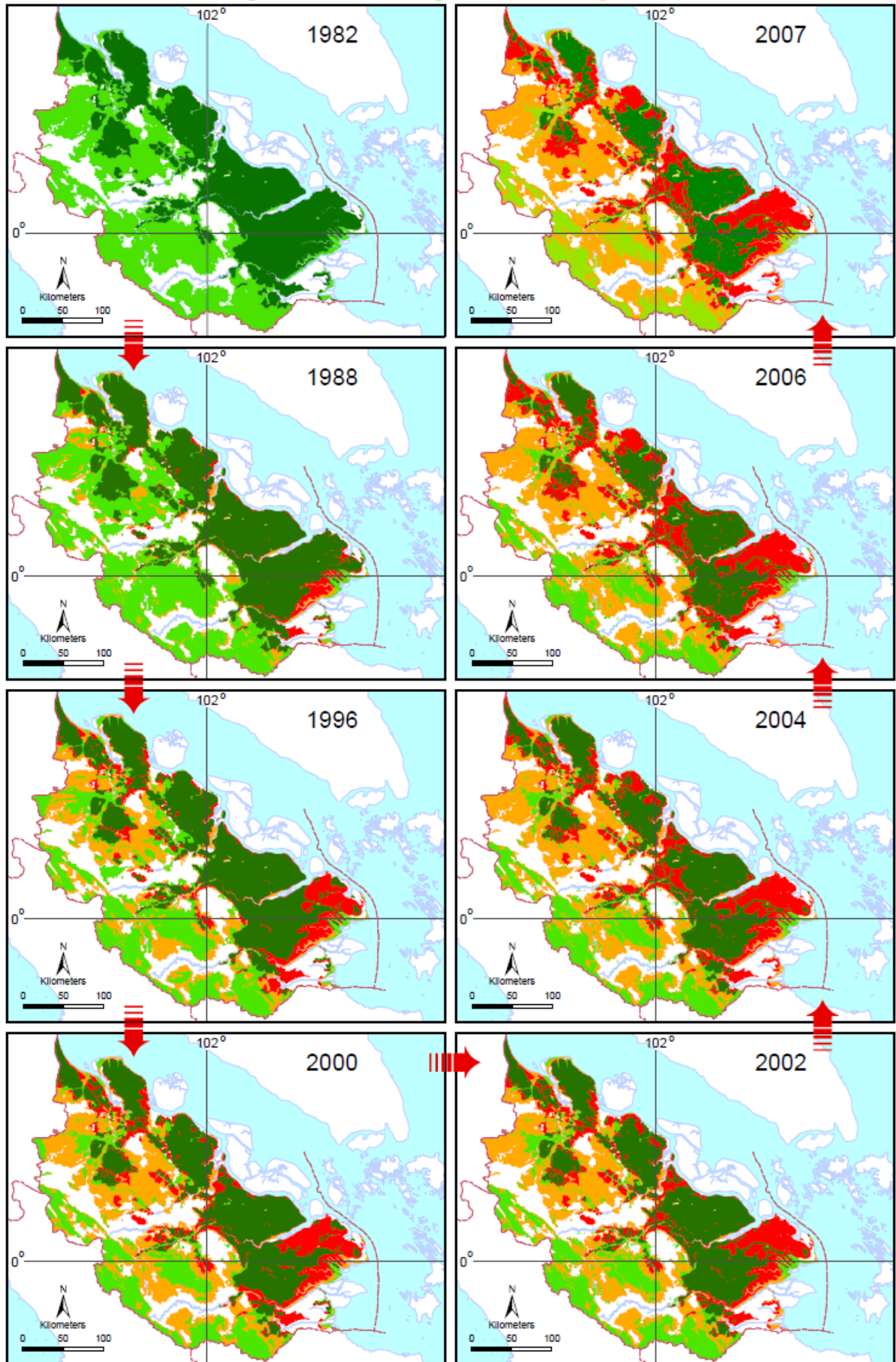
The deforestation poses the very real threat of the local extinction of Sumatran elephants and tigers, which are disappearing even faster than their forests in Riau, due to an increase in killings after conflict with people as the animals are driven from their disappearing forests.

Recently, the global significance of greenhouse gas emissions caused by deforestation, forest degradation and peat decomposition and burning in Indonesia has been recognized. The study provides data to show that Riau is the major emitter of greenhouse gas in the country. Without avoiding deforestation, forest degradation and peat degradation in Riau, a UN-backed mechanism for “Reducing Emissions from Deforestation and Forest Degradation” (REDD) in Indonesia would be much less effective.

Photo on front cover: Morning light in Bukit Tigapuluh dry lowland forest, Riau, Sumatra, Indonesia. © WWF-Indonesia/Sunarto

Photo on back cover: Three elephant calves in Riau. © WWF-Indonesia/Samsuardi

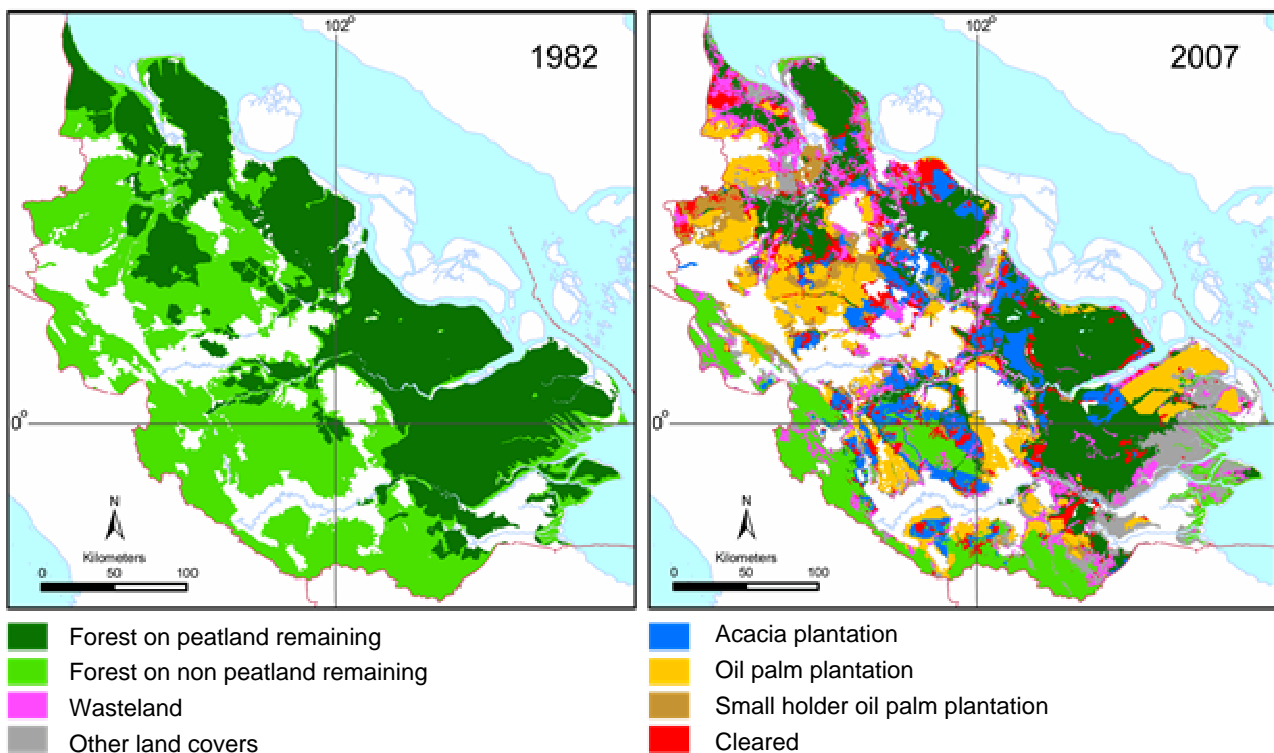
Forest on peatland remaining
Forest on peatland lost since 1982
Forest on non peatland remaining
Forest on non peatland lost since 1982



Map 1 a to h.—Deforestation on peat and non peat soils in Riau's mainland 1982-2007.

Key Findings on Deforestation and Forest Degradation

- During the last 25 years, Riau has lost more than 4 million hectares of forest (65% of the province's original forest). Forest cover declined from 78% in 1982 to 27% today. Deforestation between 2005 and 2006 was 286,146 hectares, an 11% loss in just one year. This is one of the fastest deforestation rates in the world¹.
- No other Indonesian province has as many pulpwood concessions as Riau. Two of the world's largest pulp mills, each with an annual capacity of more than 2 million tons, are operated in Riau by APP and APRIL. Together, the two companies produce more than two-thirds of Indonesia's pulp and today may "own" the concession rights to about 25% of the 8.3 million-hectare Riau mainland. Despite the fact that they have been in business for many years, both mills continue to rely to a large extent on fiber originating from illegal or legal-but-destructive large-scale natural forest clearance². WWF estimated that about 170,000 hectares of natural forests were cleared to feed Riau's two pulp mills in 2005 alone³. This number accounts for about 80% of the total deforestation detected on satellite images between 2004 and 2005.
- Of the forest cover lost in the last 25 years, 24% was replaced by or cleared for industrial pulpwood plantations, 29% was replaced by or cleared for industrial oil palm plantations and 17% became so-called "waste" land – land that was deforested but not replaced by any crop cover (*Map 2*). In reality, the pulp & paper industry – APP and APRIL – contributed to the loss of much more than 24% of Riau's forests by also acting as a local timber market, through its pulp mills. Wherever natural forests were cleared to make way for acacia or oil palm plantations, or to be left abandoned, most of the harvested wood was bought by one of the two pulp mills.



Map 2 a & b.—Fate of 1982 forest in Riau in 2007. (a) Peatland (dark green) and non-peatland forest (light green) of the mainland of Riau in 1982. (b) Peatland and non-peatland forest remaining in 2007 and various land covers that had replaced the 1982 forest by 2007.

- In an intensively studied area that covered 55% of the province, 90% of the total deforestation was due to clearing of natural forest in still good condition (canopy cover of more than 40%); 96% of the pulpwood plantations that were created here replaced such natural forest, despite the fact that Government regulations only allow the establishment of pulpwood plantations on “waste” lands: lands that are barren, grasslands, shrub or very degraded forests (*Figure 1*).

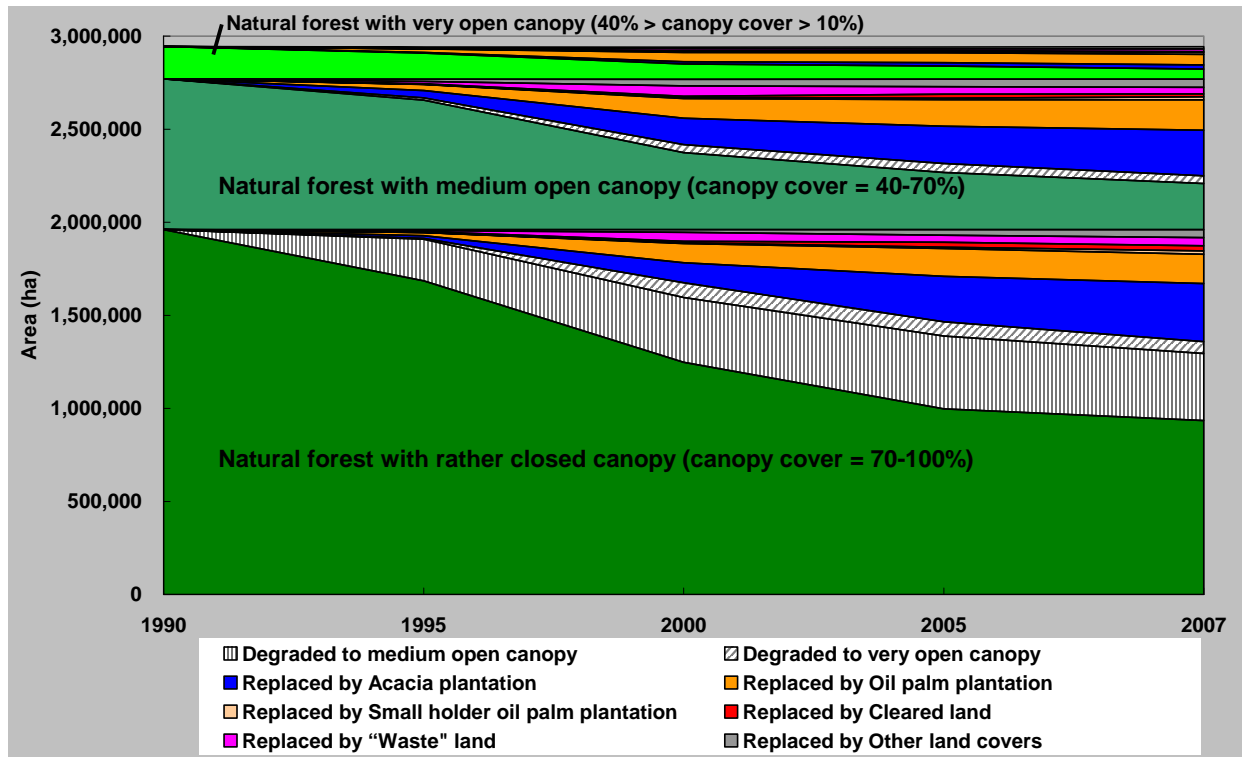
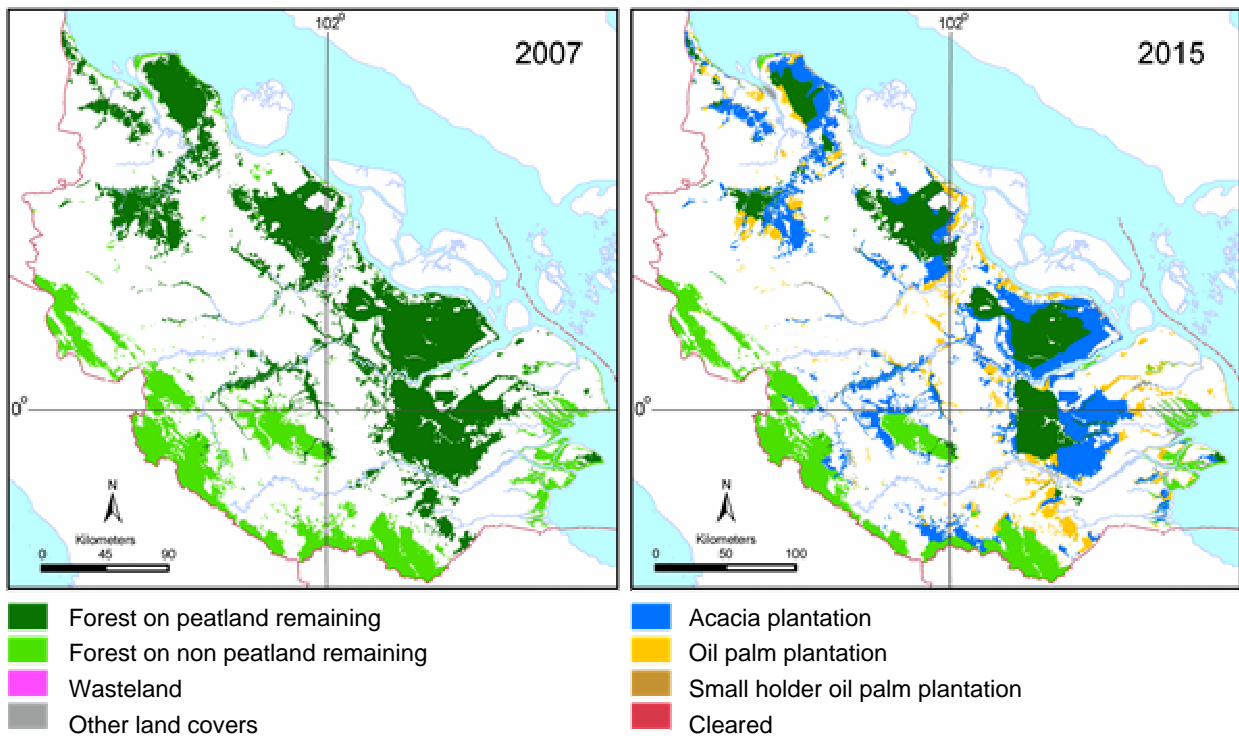


Figure 1.—Replacement of natural forest remaining in 1990 by other land covers and forest degradation by 2007 inside 4.5 million-hectare Tesso Nilo-Bukit Tigapuluh–Kampar Conservation Landscape, covering about 55% of Riau’s mainland.



Tesso Nilo forest in Riau. © WWF

- Looking to the future, a “business as usual” scenario suggests that Riau’s natural forest cover would decline to 6% (2 million hectares loss) by 2015, from 27% today. Another scenario, assuming full implementation of Riau’s draft provincial land use plan and conversion of all natural forest in industrial concessions, suggests that mainland natural forest cover would decline to 15% by 2015 (1 million hectares loss). Of that, 84% of total deforestation would happen on peat soil. 74% of all deforestation would be driven by APP and APRIL. 23% of all deforestation would be driven by oil palm plantations, mainly in already fragmented, relatively small patches of natural forests (*Map 3*).



Map 3 a & b.—Fate of 2007 forest in Riau in 2015. (a) Peatland and non peatland forest with different canopy covers in 2007. (b) Peatland and non peatland forest with predicted canopy covers in 2015 and land covers predicted to replace the 2007 forest based on Scenario (2) “Land Use Plan 2015.”



APP’s new logging highway cutting into natural peatland forest, Kampar Peninsula, Riau. © WWF Indonesia

Key Findings on Biodiversity

- In the last quarter century, Sumatran elephant population estimates in Riau – long a stronghold for elephants – declined by as much as 84%, to possibly as few as 210 individuals in 2007 (Figure 2). If the trend continues and the two largest remaining elephant forests – Tesso Nilo and a block of ex-logging concessions near Bukit Tigapuluh National Park – are not protected, Riau’s wild elephant population will no longer be viable and will face extinction.
- It is estimated that Riau’s Sumatran tiger population declined by 70% since 1982, to 192 in 2007 due to habitat fragmentation. Unless the last remaining patches of tiger habitat are connected by wildlife corridors, Riau will no longer have a viable tiger population.

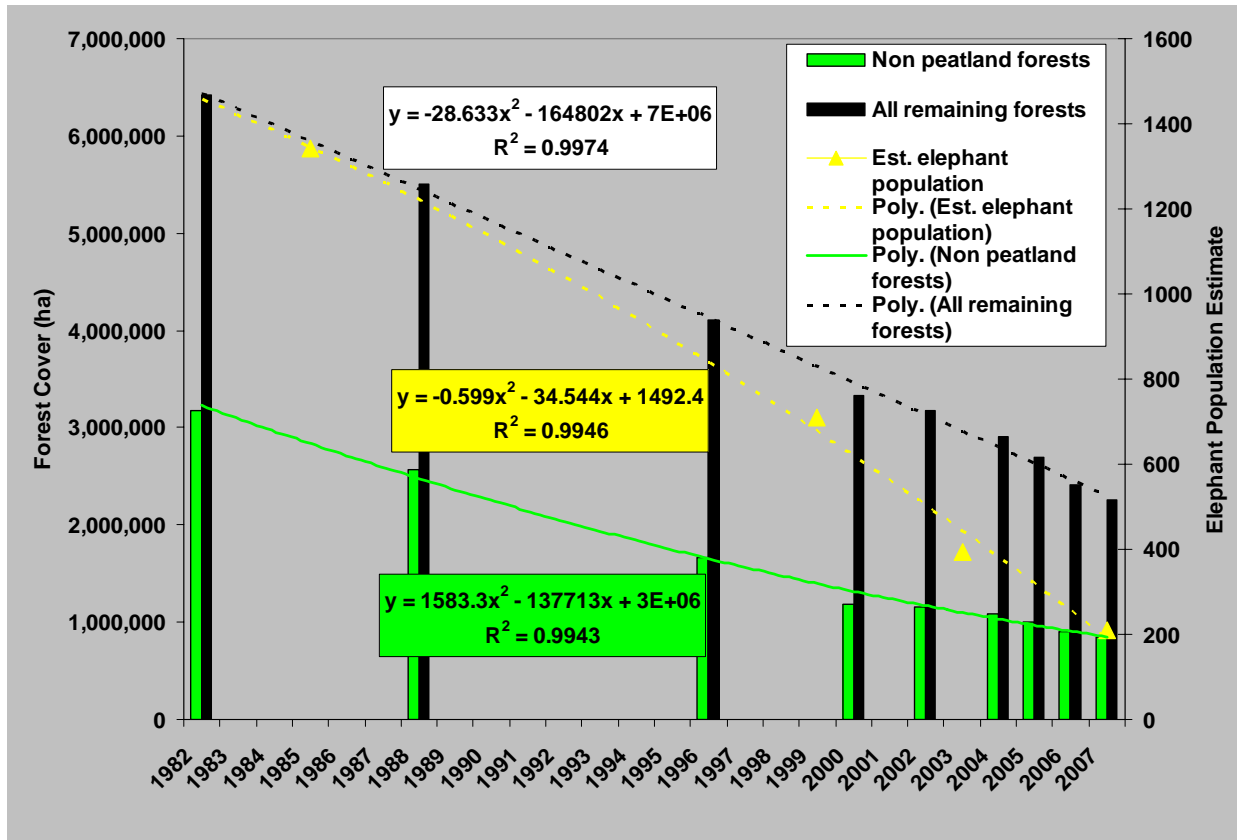


Figure 2.—Forest cover (black), non peatland forest cover (green), and elephant population estimates (yellow) in Riau, 1982 to 2007. Elephant population decline is faster than deforestation - if the trend continues, elephants in Riau could become locally extinct in a few years.



Elephant family deliberately poisoned after feeding in cropland that had replaced their forests in Riau.
© WWF Indonesia



Skull of poached tiger being traded.
© Tariq Aziz

Key Findings on Carbon Dioxide (CO₂) Emissions

- Between 1990 and 2007, estimated total emissions from deforestation, forest degradation and decomposition and burning of peat in Riau were 3.66 gigatons of CO₂, contributing to Indonesia's ranking as one of the world's biggest emitters of carbon emissions. Carbon sequestration by acacia and oil palm plantations that replaced these natural forests was just 0.24 gigatons of CO₂ (Figure 3).

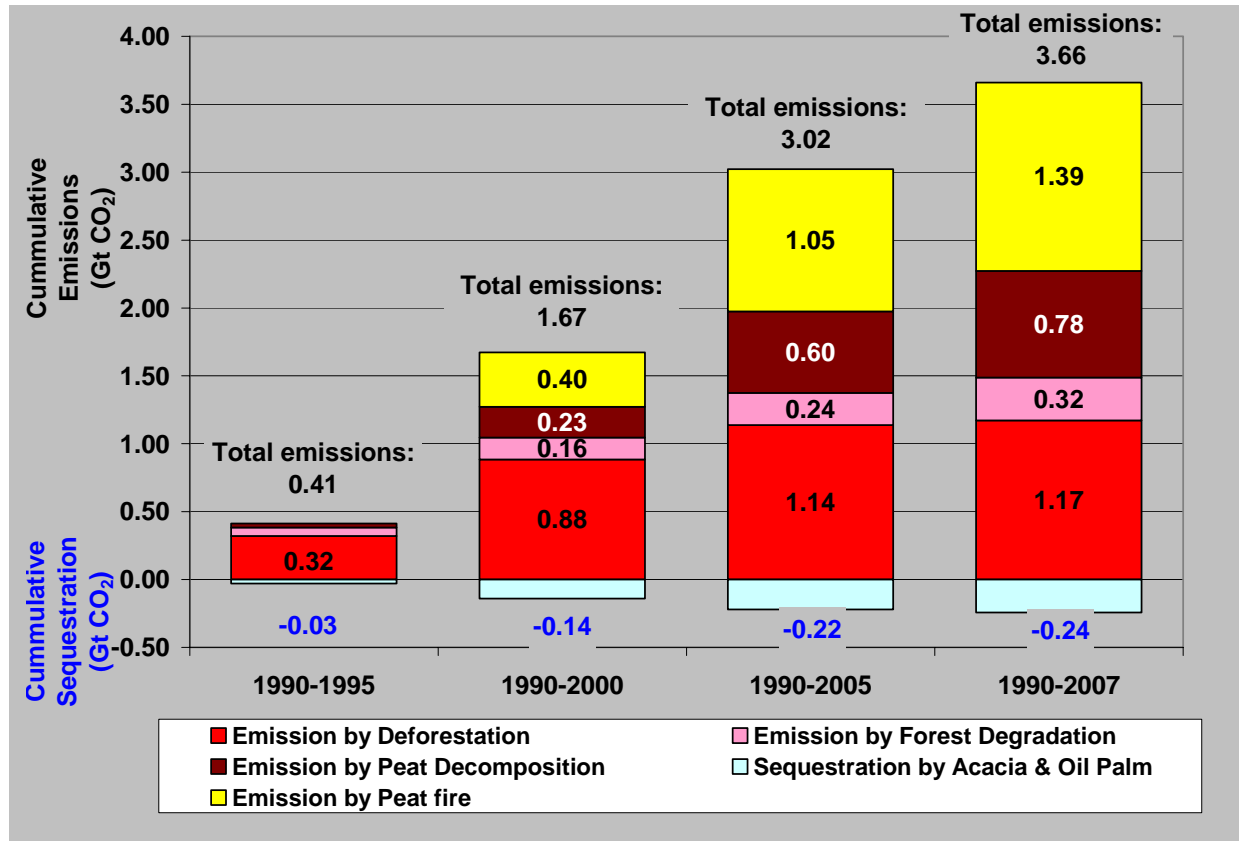


Figure 3.—Estimated carbon budget for the whole of Riau between 1990 and 2007.



- The average annual CO₂ emissions from deforestation, forest degradation, peat decomposition and peat fires in Riau between 1990 and 2007 was 0.22 gigatons, equal in 2005 to 58% of Australia's total annual CO₂ emissions, 39% that of the United Kingdom, higher than that of the Netherlands (122%), and 79% of Indonesia's total annual emissions from the energy sector in 2004 (Table 1).
- Between 1990 and 2007, Riau alone produced more CO₂ per year than Germany saved to achieve its Kyoto goals, thus eliminating any net carbon reductions by the fourth-largest industrial nation⁴.

Thick smoke plumes from illegally set fires seen over Riau moving to Malaysia, as recorded by MODIS satellite in 2005. © NASA 2005

- The average annual CO₂ emissions from deforestation, forest degradation, peat decomposition and peat fires in Riau between 1990 and 2007 is equivalent to 24% of the collective annual greenhouse gas emissions reduction target by the Kyoto Protocol Annex I countries in the first commitment period of 2008-2012.
- If Riau's draft provincial land use plan is implemented as is, an additional 0.49 gigatons of CO₂ would be released by 2015 due to deforestation alone, without even including emissions from peat degradation and burning. If "business as usual" continues and the draft plan is not implemented, double that amount would be released. Considering that most of the future deforestation would happen in areas with deep peat, total annual CO₂ emissions including peat degradation and burning could be more than 0.22 gigatons, the average annual emission between 1990 and 2007.
- The study's estimates may over- or underestimate actual carbon emissions due to the fact that for many processes, detailed data on carbon stocks and carbon emissions (stock decrease) are not available. Concerning the historical situation the study solely relied on Landsat satellite imagery, since no other data on land cover are available. Factoring in all possible errors and uncertainties, the study's authors believe that the results indicate at least the order of magnitude of the emissions correctly.

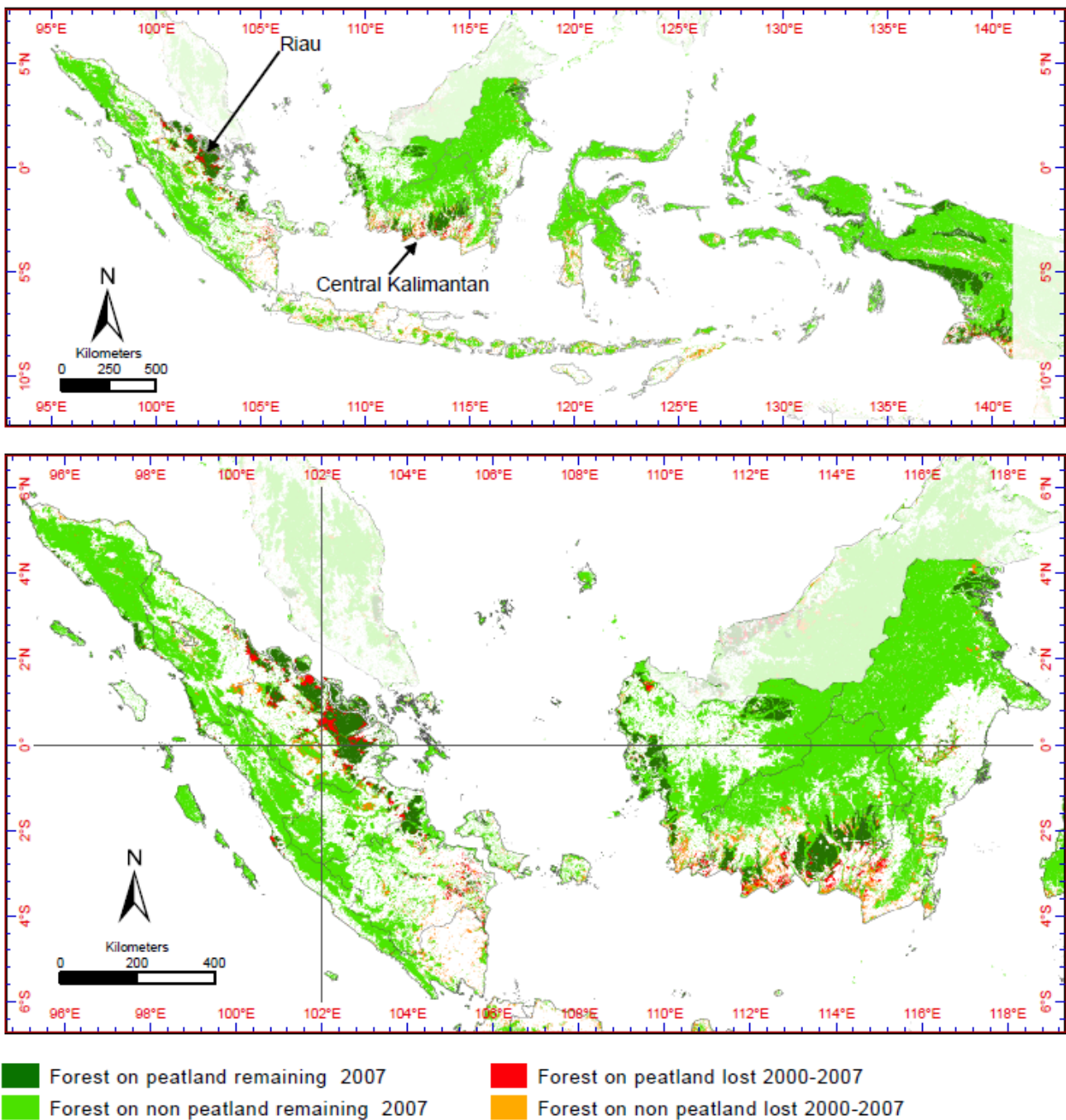
Table 1.—Comparison of Riau's average annual emissions from deforestation, degradation, peat decomposition and peat fires between 1990 and 2007 with CO₂ emissions of selected other countries^{5, 6, 7}.

	Annual CO ₂ Emissions (Gt)	Riau's Annual Emissions Relative to Others
Riau: all emissions from deforestation, forest degradation, peat decomposition & peat fire: 3.66 Gt CO ₂ (1990 – 2007)	0.22	100%
Indonesia: energy sector emissions (2004)	0.28	79%
Australia: total CO ₂ emissions including emissions/removals from LULUCF (2005)	0.38	58%
Germany: total CO ₂ emissions including emissions/removals from LULUCF (2005)	0.84	26%
Netherlands: total CO ₂ emissions including emissions/removals from LULUCF (2005)	0.18	122%
United Kingdom: total CO ₂ emissions including emissions/removals from LULUCF (2005)	0.56	39%
European Community: total CO ₂ emissions including emissions/removals from LULUCF (2005)	3.16	7%
Kyoto Protocol Annex I countries: collective annual GHG emissions reduction target in the first commitment period (2008-2012) (5% from 1990 levels in CO ₂).	0.93	24%

* LULUCF = Land Use, Land-Use Change and Forestry.

The Riau Pulp & Paper Industry's Contribution to Global Climate Change

About 20% of the world's greenhouse gas emissions are caused by deforestation globally, often in the most biodiverse regions of the world, such as Indonesia and Brazil⁸. They together account for 54% of these emissions⁷. If current rates of deforestation in Indonesia remained the same through 2012, the emissions from this deforestation would offset nearly 40% of the global emission reductions target set by the Kyoto Protocol for its first commitment period⁹. This study shows that CO₂ emissions due to deforestation, forest degradation and associated peat decomposition and burning in Riau alone would account for more than half of the 40% offset (*Table 1, Map 4*).



Map 4 a & b.— Riau has been one of the top deforestation provinces in Indonesia. Can we avoid further deforestation? Deforestation in Indonesia on peat (red) and non peat soil (orange) between 2000 and 2007, and forest remaining on peat (dark green) and non peat (light green) in June 2007. Map 4b is an enlargement with Indonesia's islands of Sumatra and Borneo. Maps were provided by SarVision.

Since 1982, there was only two periods when Riau's deforestation rate dramatically dropped: 2000-2002 and 2006-2007. These were also the years when both APP and APRIL got in trouble. In the early 2000s, both companies defaulted on their national and international debt payments and in 2007, police investigations into illegal logging by the industry prompted a de facto province-wide moratorium on forest clearance¹⁰ (Figure 4).

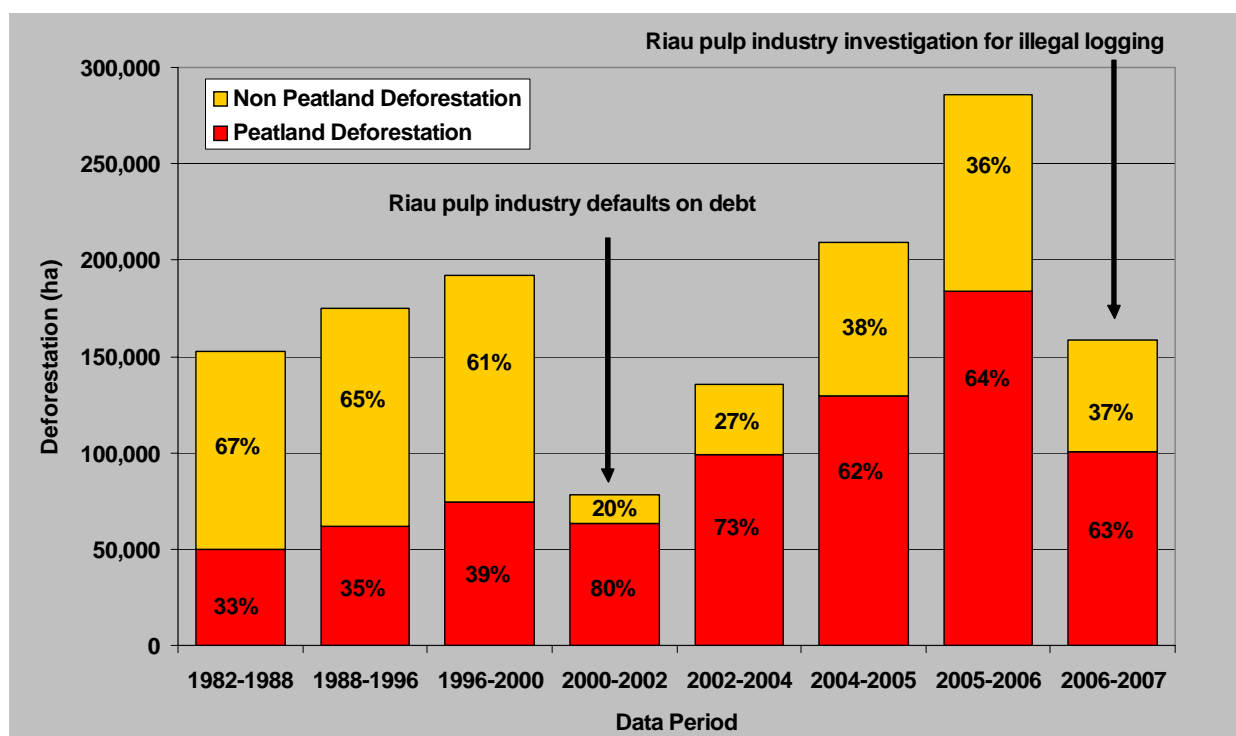


Figure 4.—Average annual deforestation on peat and non peat soils in Riau's mainland 1982 to 2007.

Riau leads Southeast Asia in terms of total peat soil volume and the carbon it harbors. Riau's peat soils – sometimes over 10 meters deep – are estimated to store the largest amount of carbon in Indonesia: 14.6 gigatons¹¹. Most of APP and APRIL's future forest clearance would happen in areas with deep peat (Map 3). Unless they reform their forestry operations to no longer destroy peatland forests and their soil, their contribution to global climate change would increase. To date, APRIL has shown changes in corporate philosophy, although the company needs to prove that with actions in the field. In contrast, APP has not shown any change in either corporate philosophy or actions¹².

Riau's Globally Significant Biodiversity Headed for Extinction

Riau Province boasts some of the most biodiverse ecosystems and rarest wildlife on Earth, including the critically endangered Sumatran tiger and the endangered Sumatran elephant. A comparative study found central Riau's dry lowland Tesso Nilo forest to have a higher vascular plant species diversity than any other tropical forest around the world included in the study¹³. No published records were found that indicate similar levels of plant species richness anywhere else in the world's lowland forests.

Yet Riau's elephants are going extinct. Their death is directly related to deforestation. Elephants die as their habitat is replaced by plantations and becomes so fragmented that they get into ever-increasing conflict with people. Four mass poisonings of elephants have been recorded since 2002 alone. Hundreds more elephants may have died or "disappeared" after being captured by the local authority, operations that are often financed by oil palm plantation owners eager to be rid of "problem animals".

Tigers are disappearing as fast as elephants. Both species' population estimates are dropping faster than even the forest cover, likely an effect of the extreme fragmentation of their habitats. Riau's forests have become so

fragmented that today only two forests remain that may offer enough habitat for elephant populations, Tesso Nilo and the rolling hills south and west of Bukit Tigapuluh National Park. The latter is also a global priority tiger habitat and now has an introduced orang utan population that is spreading fast. All of Riau's peatland forests are critical habitats for Sumatran tigers.

Using logging highways built by the pulp industry, Tesso Nilo is being heavily encroached by immigrants from other provinces without landowners or government enforcing the law and stopping the encroachment. The area surrounding Bukit Tigapuluh National Park in the neighbouring province of Jambi was just given to Riau's pulp & paper industry for clearcutting; major logging highways are being built right up to the national park boundary by APP¹⁴. Elephants, tigers, orang utans and the indigenous Orang Rimba people will all lose their forests in the large-scale clearcutting about to begin. NGOs have long asked Government to protect many of these areas. Government has not done so.

The Future of Riau's Forests



Canal opened in the middle of dense canopy peatland forest in Riau, first to drain the soil and later to transport natural forest timber cleared for acacia plantation development. © WWF Indonesia

By 2007, Riau's pulp & paper industry had cleared 950,000 hectare of forests for acacia planting; 730,000 hectares had already been planted. Enough forest has been converted for pulpwood production to run Riau's two pulp mills' combined "installed capacity" of 4 million tons. But WWF data show that the industry already "controls" about 25% of Riau's mainland, almost triple the area planted today. Saving the natural forest surviving in this area would have no negative impact on the profitability of Riau's pulp mills.

Yet, the report's two future scenarios of deforestation up to the year 2015 show that "business as usual" will clear most forest in Riau outside of nationally controlled protected areas (ca. 2 million hectares) and that implementation of the 2007 draft Riau land use plan would see the pulp industry continue driving deforestation – mostly of forests with high canopy closures on peatlands. Those models support the persistent rumours of major expansion plans of the industry likely to drive the deforestation of many new areas, not only in Riau but also in neighboring Jambi Province, in Kalimantan and Papua.

And yet, the time is right for the very market forces driving this devastation to help stop it.

Indonesia has a new economic incentive to protect Riau's forests, as global demand grows for carbon trading from protection of natural forests. If the profits from marketing environmental services of forests, such as avoided deforestation, soil and water protection, or biodiversity conservation are comparable to those of marketing their timber, more natural forest would likely be protected by concession holders. This might be the case with Riau's carbon-rich peatland forests. The potential value of trading protected carbon stocks of these forests may be comparable or even better to other, conventional uses of natural forests.

Recommendations to the Industries Driving Deforestation in Riau, Their Business Partners and the Indonesian Government

- Global consumption of palm oil and paper has been driving Riau's deforestation. It appears to also drive global climate change.
➔ **Companies should not do business with drivers of deforestation in Riau.**
- Both natural forests and peat soils are important long-term, or even permanent, storages of carbon on Earth, with peat soils able to store 30 times more carbon than the tropical forests above them. However, the stability of the peat soil and the long-term storage of its carbon depend on the health of the natural forests covering them. Peat soil fires are the most dramatic visible symptoms of rapid CO₂ emissions from these carbon stores – and the root cause of these emissions is deforestation.
➔ **Industry and government should prevent all further deforestation and forest degradation of peatlands.**
➔ **Industry and government should rehabilitate of already deforested or disturbed peatlands through professional hydrological management.**
- There are almost 900,000 hectares of “waste” lands in Riau.
➔ **Government should limit new plantation establishment exclusively to the remaining “waste” lands (Some wasteland may need to be set aside for restoration for wildlife corridors or watershed protection).**
➔ **Industry should sustainably manage their forests and plantations according to the standards of the most stringent certification schemes (for example, adopting Forest Stewardship Council or Roundtable on Sustainable Palm Oil principles and criteria).**
- Nationally controlled protected areas such as national parks, wildlife sanctuaries and game reserves were found to be much more effective in maintaining forest cover and preventing fires than any other land use zones.
➔ **Government should declare remaining unprotected High Conservation Value Forests including elephant, tiger and orang utan habitat as nationally controlled protected areas.**
- Further deforestation and forest degradation and associated peat decomposition and burning in Riau alone could lessen global efforts of reducing industrial greenhouse gas emissions.
➔ **Governments and industry should allocate climate change and other conservation funds to effectively manage the above-mentioned protected areas and avoid further deforestation in Riau before the last forests are gone, the peatlands are destroyed and all their stored carbon is released.**
- In places like Riau, waiting for Post-Kyoto REDD implementation after 2012 is no longer an option.
➔ **Governments and industry should establish voluntarily financed “REDD-like” programs for avoiding emissions from deforestation, forest degradation, peat decomposition and burning – which benefit local economies – as soon as possible.**



Large area of dense peatland forest scheduled to be cleared in Kampar Peninsula, Riau. © WWF Indonesia



Orang Rimba children, an indigenous people who live solely in natural forest, encounter a logging road near Bukit Tigapuluh National Park. © WWF Indonesia

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² See for example, Tempo Magazine (11-17 September 2007) Road to Ruin. There are many news articles on the case. Some of them are collected at Eyes on the Forest website: <http://www.eyesontheforest.or.id>

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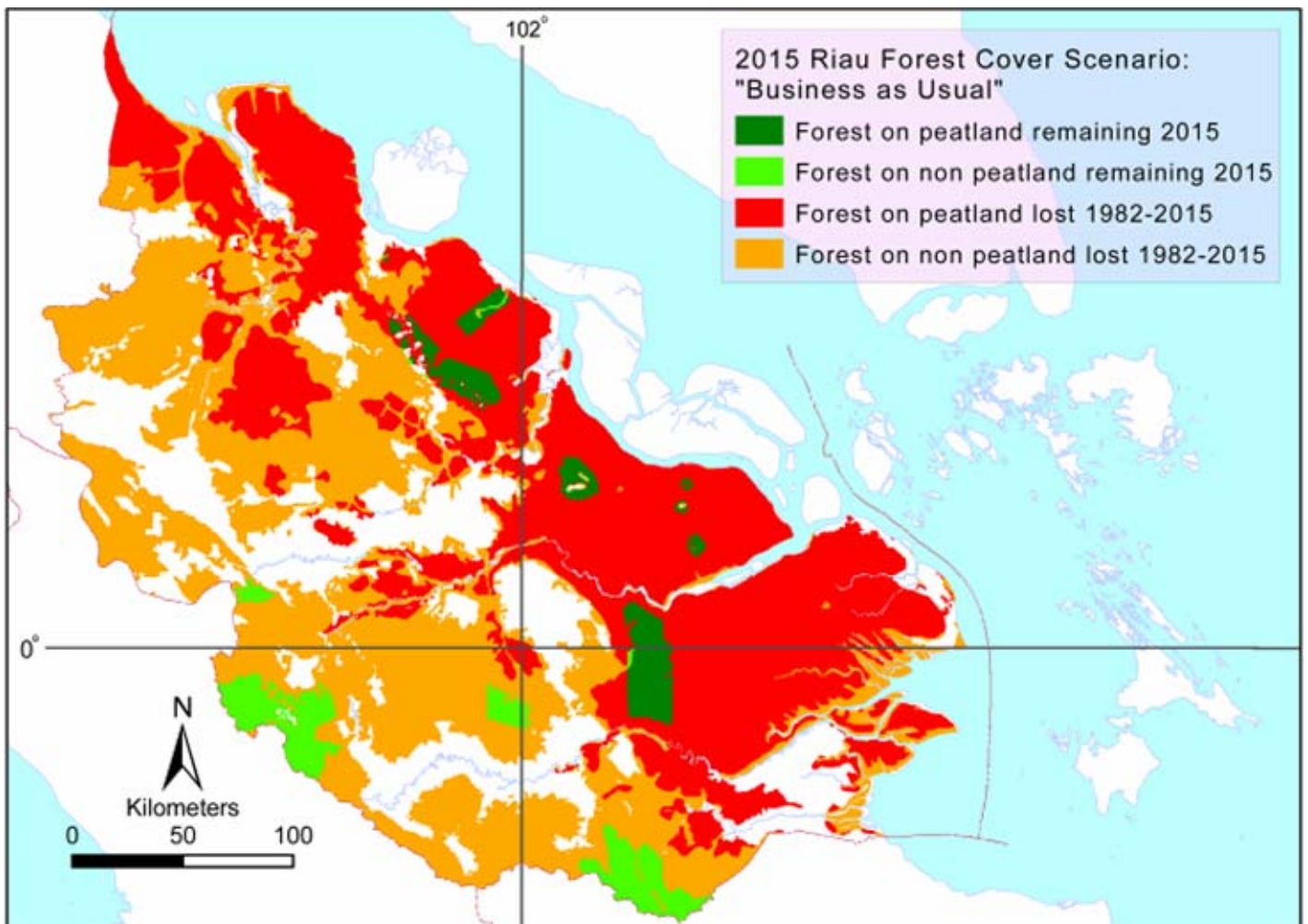
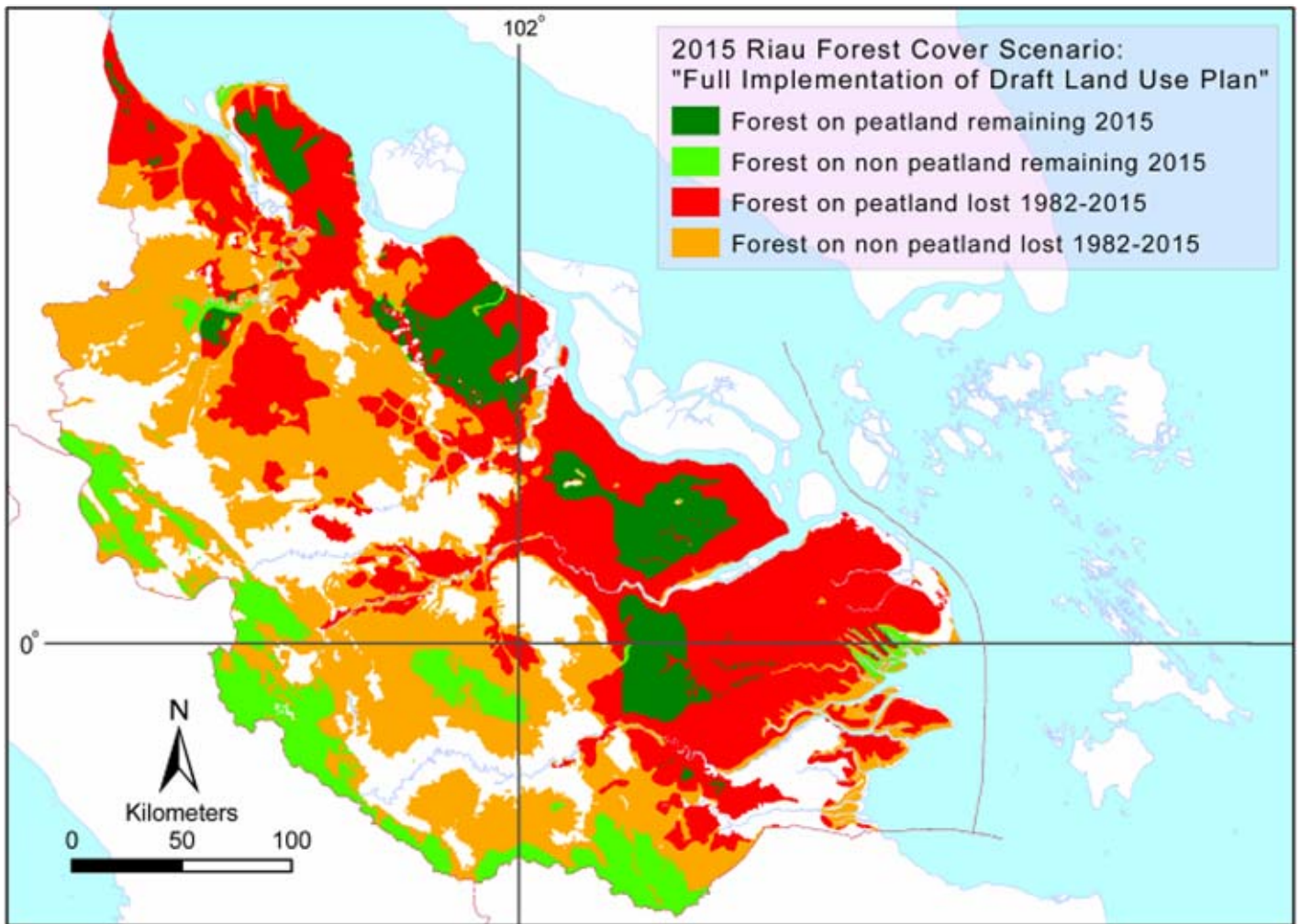
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¹² WWF-Indonesia reports on APP and APRIL are available at:

<http://www.wwf.or.id/index.php?fuseaction=news.detail&language=e&id=NWS1151055588>. See also reports posted at Eyes on the Forest website: <http://www.eyesontheforest.or.id>

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Riau's forests are disappearing. Where will Riau's elephants go?

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