OPTIMIZING LAND USE IN EAST KALIMANTAN

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TECHNICAL WORKING PAPER

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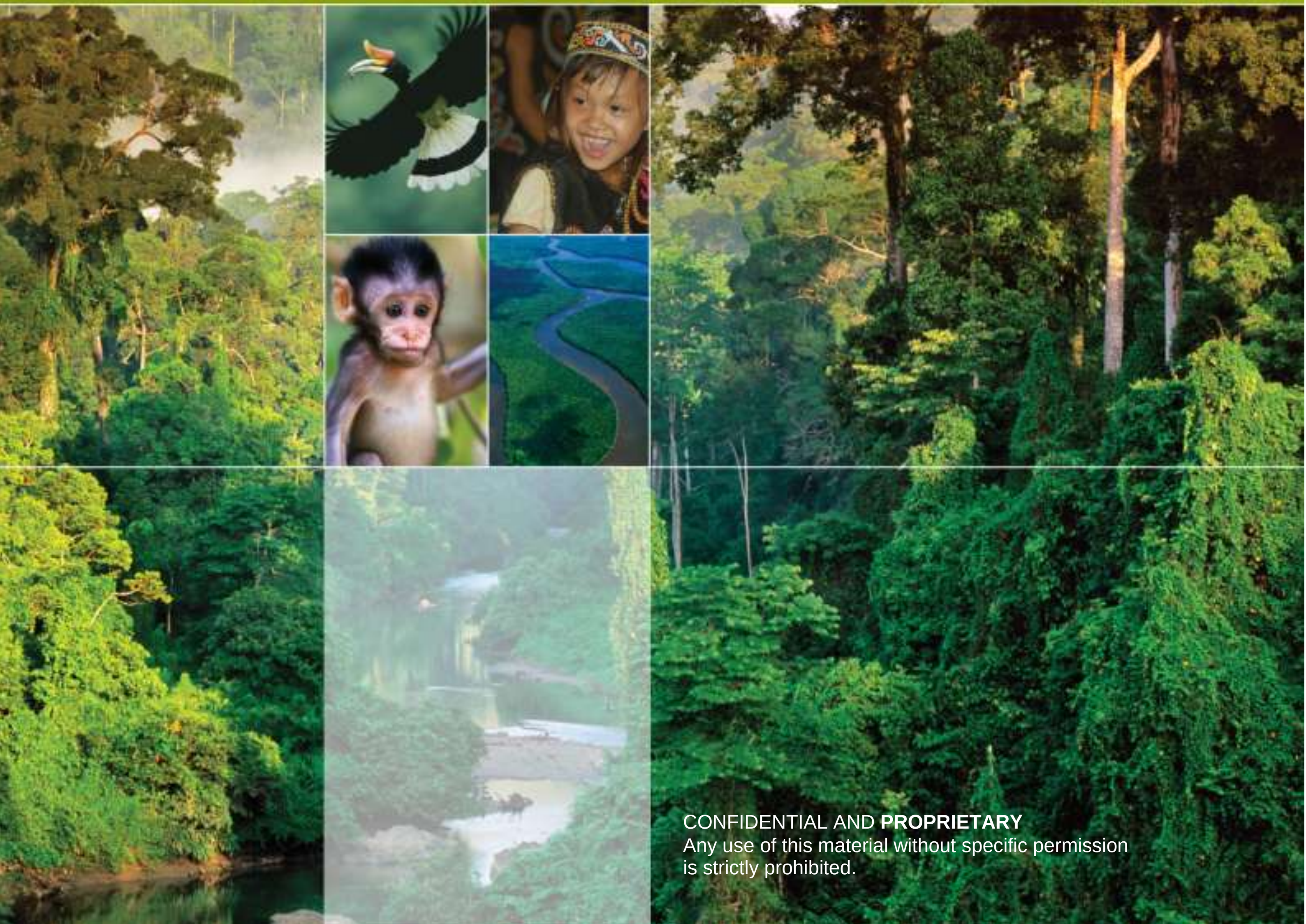

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Acknowledgements

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Introduction

In light of recent developments in Indonesia regarding climate change, there has been rising concern amongst government officials and civil society alike as to how provincial level spatial plans are positioned to assist the provinces in contributing towards the national greenhouse gas emission reduction target of 26 percent by 2020.

The process of updating the provincial spatial plans for the period 2010–2030 was initiated more than five years ago, well in advance of recent climate-change-related policy announcements. The plans therefore may not fully capture their implications, such as the stated commitment to a 26 percent reduction of emissions by 2020 that was publicly announced by Presiden Susilo Bambang Yudhoyono in 2009, the Letter of Intent (LoI) agreement signed with Norway in 2010, and the subsequent moratorium on new concessions expected to commence in the first quarter of 2011.

By zoning land into a legal status – categorized into **forest estate (kawasan hutan)**, or **non-forest estate (kawasan budidaya non-kehutanan, KBNK)** – the spatial plan gives the formal and binding agreement of the local authority to planned future developments. Once approved through provincial regulation, the spatial plan also serves as a key reference for the long term development plan (RPJP) and medium term development plan (RPJM) respectively. At time of writing (February 2011), a number of provinces including East Kalimantan have not yet approved their new spatial plans for the period 2010–2030 into provincial regulation (Perda). In fact, only 7 out of 33 provinces have formally approved their spatial plans into provincial regulation.

If we assume the full implementation and continuation of partially and fully licensed concessions in the forestry, palm oil and mining sectors in East Kalimantan, there could be a potential loss of 730 million tons of carbon stock from deforestation and forest and peat degradation over the next 20 years – 310 Mt from forestry, 250 Mt from palm oil, and 70 Mt from mining. Correspondingly, the annual emissions are estimated to rise from 115 to 130 MtCO2e by 2030, mainly from expansion of palm oil plantations onto forested land.

Under current practices, the process of spatial planning does not adequately root zoning decisions on actual land cover conditions. Instead, negotiation of land status conversions between non-forest estate and forest estate specifically focus on the size (hectares) of the area in question. As a result, converting land from forest estate to non-forest estate may place standing forest areas under unnecessary risk of deforestation. Improved zoning to better reflect actual land cover is therefore crucial to ensure development is designated in areas that place the least amount of carbon at risk.

In fact, of the 3 million hectares of non-forest estate for which palm oil licenses have been granted, 1 million hectares is still forested land and planted palm oil totals only 600,000 hectares – far below the size of the licensed area. Therefore, converting yet more forest estate to non-forest estate is likely not required due to the large expanse of land available for development, and may instead place additional forest at risk.

Given the extent of degraded land available in East Kalimantan, we see an opportunity for the province to shift development activities from land with high carbon reserves to already degraded land and thus preserve carbon reserves. Successfully expanding utilization of already degraded land for expansion of palm oil will require overcoming a number of key barriers: 1) agreeing on a clear definition of degraded land, 2) providing access to degraded land in forest estate, 3) developing an inter-district compensation mechanism to ensure equitable impact for each district, 4) improving the financial attractiveness of using degraded land to operators, and 5) creating a rapid process to resolve disputes on land tenure that provides equitable outcomes for operators and displaced communities.

Legal status alone is of course not the only means to safeguard forest assets. Despite forest existing in non-forest estate, local district authorities have the ability to preserve forest under their own initiative. Establishing conservation areas, enforcing sustainable forest management practices, and undertaking reforestation activities on lands within non-forest estate are but a few initiatives that can and have been employed at the district level. This however relies on the good intentions of district governments to carefully balance resource preservation over exploitation in the name of development, which can often be difficult.

Aim of this paper

This paper aims to stimulate a discussion around how a rationalization of land status via the spatial plan can be a useful tool to optimize land use in East Kalimantan. This paper includes:

- A description of land use emissions in Indonesia and East Kalimantan with specific reference to peat and a discussion on legal land status and spatial planning.
- A fact base around the projected carbon impact of East Kalimantan's current land use plans out to 2030 within major sectors – mining, palm oil, and forestry – disaggregated by district. From the analysis of future sources of carbon loss, we gain a perspective on major opportunities for emission reduction using spatial optimization of land use.
- A discussion on one important way to slow emissions: optimizing the use of already degraded land, particularly for palm oil expansion. We focus on regulatory and socio-economic issues that will need to be overcome and share early results of analysis for identifying degraded land. Finally, we outline priorities for East Kalimantan to find a workable way forward.
- A description of methodologies for analyzing the emissions impact of land use plans and for determining the availability of degraded land suitable for palm oil.

Current land use emissions, land status, and spatial planning

Significant emissions resulting from land use and land use changes, particularly over peatland directed our attention to considering how land is zoned for use, contradictions between the zoning (called land status) and the actual condition of the land (especially with respect to forest cover), and further to examine discrepancies between land status and development.

Land use emissions in Indonesia

The land use, land use change, and forestry sector (LULUCF) is Indonesia's largest source of greenhouse gas (GHG) emissions at an estimated 840 MtCO2e annually, or 41 percent of total Indonesian emissions.[1] Emissions from peat degradation come a close second at 770 MtCO2e, distantly followed by oil and gas at 130 MtCO2e, and all other sectors that total 315 MtCO2e.

Deforestation, forest degradation, and forest fires straddle the LULUCF and peat sectors and account for gross emissions of approximately 1.1 GtCO2e per annum. These particular sources of emissions are expected to remain a significant contributor to Indonesia's emission profile over the next 20 years, albeit with a steady reduction from LULUCF, due to the continued depletion of forest vegetation.[2] Under a business-as-usual scenario, by 2030 combined emissions from the LULUCF and peat sectors are expected to remain relatively stagnant and growth will be overtaken by emissions from the non-LULUCF sectors, e.g., power and transportation.

Legal land status in Indonesia

Land in Indonesia is divided between forest status area or **forest estate**, which comes under the purview of the national Ministry of Forestry (70 percent of total), and **non-forest estate**[3], under the purview of the head of the district government, or Bupati (30 percent of total).

Forest estate includes natural forest logging, production, protection, and conservation forests where the right to grant, renew, and revoke concession permits for operation of timber harvesting falls under the direct control of the Ministry of Forestry. Similar rights over estate crop concessions within non-forest estate (including palm oil) fall squarely under the authority of the district government – mainly the District Head. At times, the demarcation of ownership between the two levels of government creates tension over development

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[1] DNPI, Indonesia Greenhouse Gas Abatement Cost Curve, 2010

[2] Refers to primary, secondary, and plantation forest; Source: Ministry of Forestry 2008

[3] Equally, non-forest estate (KBNK) is also known as areal penggunaan lain (APL)

decisions at the district level, with possible competing and conflicting interests between the central and district governments obstructing streamlined planning.

One issue is the often-cited difficulty of converting land status between forest estate and non-forest estate. Today, 30 percent of the land area within forest estate is no longer forested, and 15 percent of the land area within non-forest estate is still covered by standing forest (Exhibit 1). While it would reduce carbon emissions if new agriculture developments were directed onto land without forest cover, often such lands exist in forest estate and thus beyond the power of the local authority.

From conversations with many individuals involved in the spatial planning process, there have been multiple instances of location and operating licenses for palm oil having been approved within the forest estate. In fact, some plantations are known to have already begun operating. Whereas the correct procedure is to first convert the land from forest estate to non-forest estate, requiring approval by the Ministry of Forestry, it is clear that some district authorities ignore standard procedures in order to accelerate development.

In reality, neither status is better able to adequately protect standing forest. Between 2003 and 2006, the annual level of deforestation across Indonesia was 760,000 ha within forest estate, close to double that of deforestation within non-forest estate at 410,000 ha.[4] This level of deforestation in forest estate is alarming, given that sustainable forestry practices should be able to moderate deforestation to a more acceptable level compared with that in non-forest estate where land is clearly slated for future development.

Currently, the demarcation of legal status offers one limited advantage: requests for conversion of land from forest estate to non-forest estate by the districts generally make a good barometer to monitor potential abuse of land use changes by local authorities. Whenever the spatial plan is changed, NGOs and civil society at large closely monitor requested conversions to non-forest estate and cry foul if the relevant acreage exceeds what they deem reasonable.[5]

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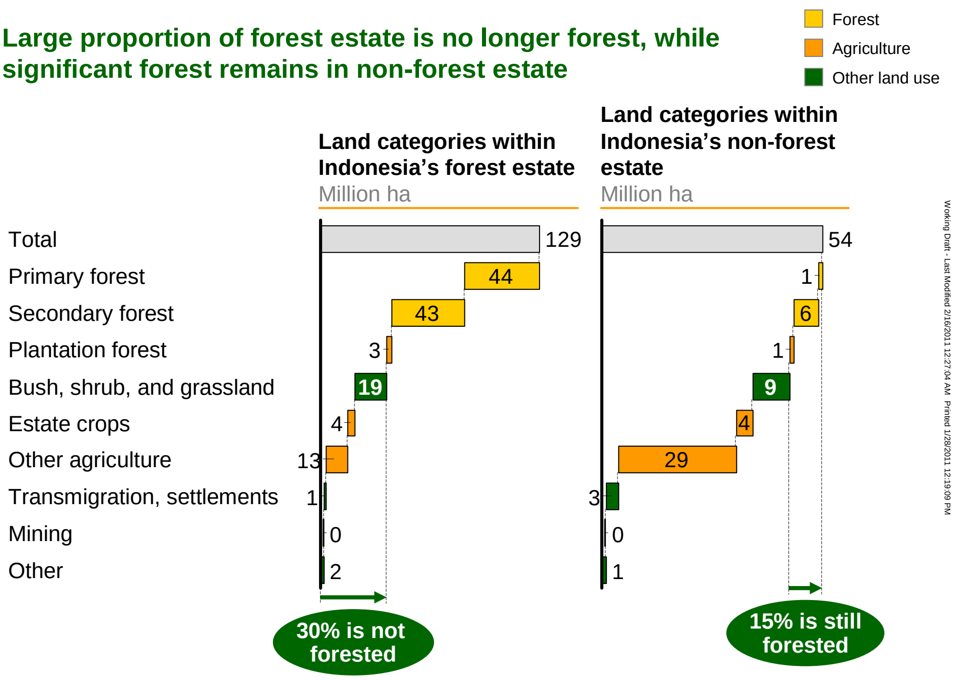
4 Ministry of Forestry forest statistics, 2008

5 In mid-2009, the East Kalimantan government proposed a land area conversion of 1.3 million ha from forest status land (forest estate) to non-forest status (non-forest estate). Pressure from NGOs (e.g., Walhi) and the public prodded the government to form a team of technical experts to review the plans with the objective to reduce the extent of the proposed conversion

EXHIBIT 1

Large proportion of forest estate is no longer forest, while significant forest remains in non-forest estate



SOURCE: Ministry of Forestry, 2008 – Rekalkulasi Penutupan Lahan Indonesia, 2006

Spatial planning in Indonesia

The spatial plan is a formal agreement by provincial and district governments to allocate land zoning based on economic or social demands, balanced against an implicit need to maintain long term sustainability of resources. The process of creating the spatial plan entails a range of activities, namely surveying, mapping, planning, and negotiating to establish future uses of land, water, minerals, and other resources within a geographic area. Current knowledge of what resources an area has, how those resources are distributed, what condition they are in, what potential they offer, and ultimately how they will be managed becomes crucial questions for district governments to address in the planning process. Instituting a good process for spatial planning is key to answering these questions in a systematic manner, which then results in a plan that is accepted by decision makers and implementers.

Broadly speaking, the spatial planning process begins with bottom-up aggregation of plans from the district level to form the provincial spatial plan, or RTRWP.[6] Following a technical review,[7] the RTRWP is approved centrally by the Ministry of Forestry (Kehutanan) and Ministry of Public Works (Perkerjaan Umum) before it is passed into legislation in the form of Provincial Regulation (Perda) through the local parliament (Dewan Perwakilan Rakyat Daerah, DPRD).

[6] RTRWP: Rencana Tata Ruang Wilayah Provinsi

[7] Hooijr et al., 2006 – PEAT-CO2: Assessment of CO2 emissions from drained peatlands in SE Asia

Once approved, the plan is then cascaded back down to the districts so each can create a more detailed district level spatial plan (RTRWK[8]) for the planning period.

A major focus in formulating the provincial spatial plan is to reconcile requests from the district to release more land from forest estate into non-forest estate, with the need to safeguard and preserve forest in forest estate. This involves multiple negotiations between district governments and the Ministry of Forestry, represented at the provincial level over the course of the spatial planning process by an elected team of technical experts – the Integrated Team (Tim Terpadu).

The East Kalimantan Integrated Team consists of forestry experts and academics from the Universitas Mulawarman, Institut Pertanian Bogor, the national development planning agency (Bappenas), the central Ministry of Forestry (Kemenhut), the Indonesian Institute of Sciences (LIPI), the provincial development planning agency (Bappeda), and the provincial forestry services department (Dishut).

Spatial planning in East Kalimantan

The spatial plan for East Kalimantan for the period 2010–2030 is in its final stage before submission for approval by the parliament (DPR) at time of writing. The draft spatial plan, which was published for public syndication in 2009, proposed an increase of non-forest estate by an additional 1.3 million ha above the existing 5.3 million ha. An initial review in 2009 by the East Kalimantan Integrated Team proposed an adjustment to the requested non-forest estate to 340,000 ha. Throughout 2010, and up to the time of writing, this amount has since been progressively revised upwards as districts have continued to negotiate for more non-forest estate land for development. The final figure for requested additional non-forest estate is approximately 800,000 ha (January 2011). The exact figure is likely to continually evolve until the plan is submitted to the provincial parliament – likely in the second quarter of 2011.

Noted issues with the current spatial planning process

From the standpoint of preserving carbon, we highlight a number of issues with the current spatial plan and planning process.

Decision making in the planning process is not adequately based on actual land cover. This is best illustrated by way of graphic example (Exhibit 2). In aggregate, there is limited correlation between allocation of legal land status in the proposed 2009 spatial plan and actual forest cover; a significant proportion of forested forest estate area is proposed for conversion to non-forest estate, while large areas of degraded land are to be returned from non-forest estate into forest

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[8] RTRWK: Rancangan Tata Ruang Wilayah Kabupaten

estate. During negotiation between the integrated team and district representatives, it is the size of area that becomes the priority focus, and not the actual land cover or corresponding carbon stock[9] value at stake.

Zoning of land within current legal status is not consistent with actual land cover. In many areas, physically degraded land is classified as forest estate (est. 2.4 million ha) and therefore unavailable for agricultural use, while still forested land is classified as non-forest estate (est. 2.1 million ha) and therefore at risk of conversion. The inconsistency of legal status with land cover obscures the actual carbon reserve held by a given plot of land and thus may misinform decision making around its use.

There is a lack of reliable and up-to-date reference data. The absence of up-to-date reference data on land cover and land use, by way of forest cover data and distribution of current licenses (e.g., location permits to operating licenses for palm oil) reduces the ability for policymakers at the national, provincial, and district levels to make informed decisions on new strategies and policies to support an improved planning process. In addition, issues such as boundary disputes and overlapping licenses often arise as different district authorities across multiple sectors – mining, forestry and palm oil – use and update different reference maps during decision making.

Land development today does not adequately adhere to the agreed spatial plan (Exhibit 3). Examination of relevant maps indicates a divergence between how land is currently being used with the spatial plan for the previous period (East Kalimantan RTRW 1999). For example, up to 16 percent of conservation forest areas is in fact now used for other activities, such as mining and timber forest, or is already degraded. While a more participative and transparent process for preparing the plan should lead to more timely and reliable implementation, going forward, provincial and district authorities will need to improve enforcement of activities against these plans.

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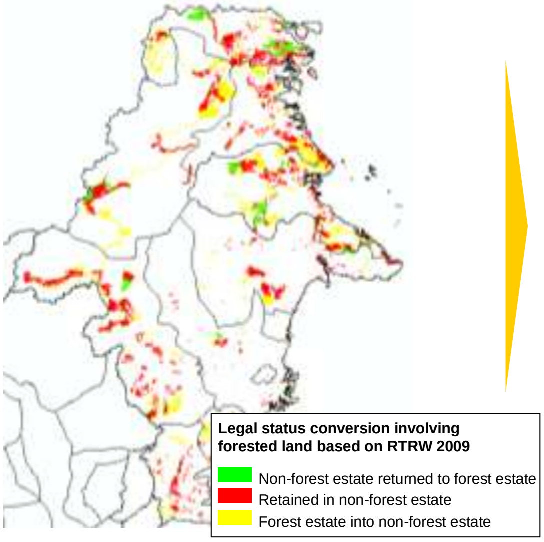
[9] The term carbon stock refers to the amount of carbon contained within a given unit of area, typically expressed in tons of carbon per hectare

EXHIBIT 2

Changes to legal status during the spatial planning process do not appear to consider actual land cover

Legal status evolution of non-forest estate between RTRW 1999 and draft RTRW 2009



- There is **limited correlation** between **legal status** and **actual land cover:**
  - **Legal status changes** (conversion) do **not adequately consider land cover** e.g. some deforested land is returned to forest estate while forested land is converted to non-forest estate
  - There is **more** land **converted into non-forest estate** than there is land returned to forest estate

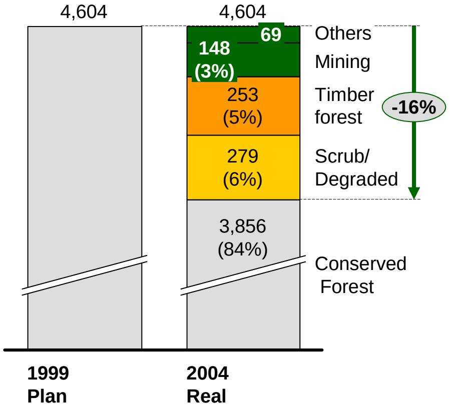
Legal status may need to be rationalized by considering actual land cover

SOURCE: RTRW 2008-2027 (initial draft); Min of Forestry land cover data 2009; forest estate map (MoF); Team analysis

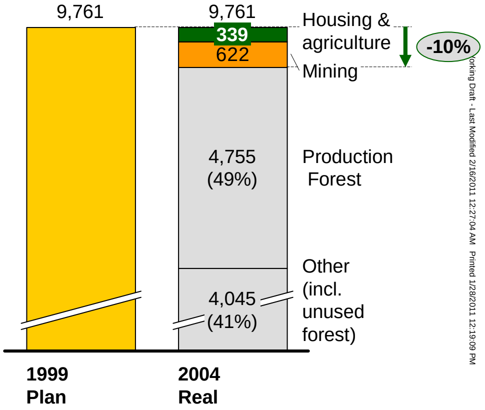
EXHIBIT 3

Land development does not adequately adhere to agreed spatial plan from previous period

Land use in Conservation Forest
000 Ha



Land use in Production Forest
000 Ha



Potential discrepancies due to
- Illegal activity e.g. by settlers and non-concession holders
- Errors in data records between central and kabupaten
- Pressure to local authority to grant development despite not having originally planned for it

SOURCE: Draft RTRWP 2009

Implications of current land use plans on carbon emissions in East Kalimantan

This section describes the results of a set of spatial analyses of current land use plans in East Kalimantan. We begin with a look at the current geographical distribution of carbon reserves and move on to the implications of current land use plans on carbon emissions by 2030. The key purpose of this analysis is to provide a reference emission level based on the assumption that future land use activities indicated by existing licenses commence and come into full operation during the 2010–2030 period. The licenses considered for analysis include the full range of licenses, from the initial location permits through to the final operating licenses. As land use decisions (e.g., granting of licenses) are highly dependent on the legal status of the land, the reference emission level can also be treated as a proxy estimate of the emissions as a result from the current spatial plan.

Current distribution of carbon reserves

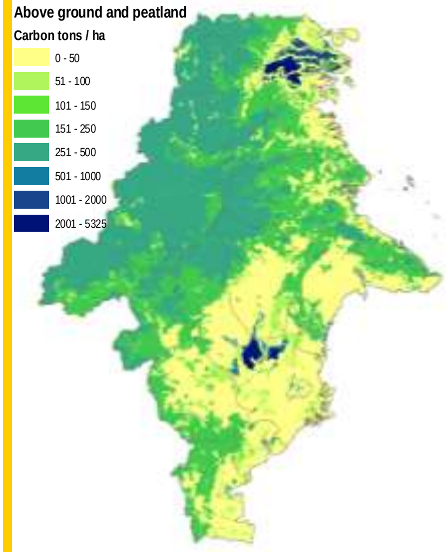
Analyses of current land cover and peat distribution indicate there is an estimated 4.7 million tons of carbon reserves remaining in East Kalimantan – 3.6 million tons in the form of vegetation and 1.1 million tons of peat. Primary and secondary forest cover averages 64 percent, which is equivalent to a standing forest area of 12.8 million hectares. Deep peat is present within the Nunukan and Kutai Kartanegara districts and is fairly concentrated within relatively small land areas (Exhibit 4).

EXHIBIT 4

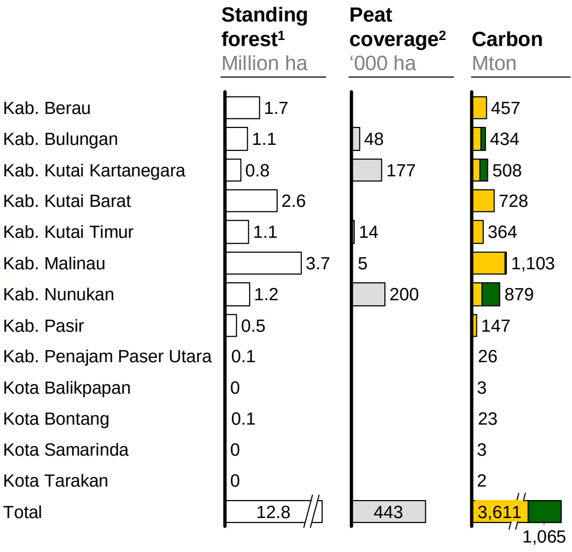
East Kalimantan estimated carbon stock distribution above and below ground

🟩 Carbon from Peat
🟨 Carbon from Vegetation

Carbon from vegetation and peat, 2009
Carbon tons per ha



Carbon stock by district, 2009



	Standing forest[1] Million ha	Peat coverage[2] '000 ha	Carbon Mton
Kab. Berau	1.7		457
Kab. Bulungan	1.1	48	434
Kab. Kutai Kartanegara	0.8	177	508
Kab. Kutai Barat	2.6		728
Kab. Kutai Timur	1.1	14	364
Kab. Malinau	3.7	5	1,103
Kab. Nunukan	1.2	200	879
Kab. Pasir	0.5		147
Kab. Penajam Paser Utara	0.1		26
Kota Balikpapan	0		3
Kota Bontang	0.1		23
Kota Samarinda	0		3
Kota Tarakan	0		2
Total	12.8	443	3,611 1,065

1 Primary and secondary forest on dryland, mangrove and swamp
2 Includes peat of depth of 1 meter or more
SOURCE: ESRI, Ministry of Forestry – Rep. of Indonesia, Wetlands International; team analysis

Peat – a major carbon reserve

Only very recently has there been recognition of the intensity of emissions from disrupted peatland, and while scientific research is still at a relatively early stage, it has advanced significantly in recent years. For example, research now indicates that moderate to deep peatlands can emit up to 20 times the emissions of an equally sized area of forest.

The prominence of peat as a source of carbon emissions has now gained greater recognition, and as a result, there have been direct initiatives by the Indonesian government to improve regulations to better protect the carbon reserves in peat. For example, peat areas deeper than 3 meters are now legally protected by national environmental regulation. Active research and on-the-ground observations, e.g., by Hooijer et al. (2006),[10] have also gone a long way to warn of the potential emissions from the opening up of peatlands for uses such as palm oil plantations, pulpwood forests, and smallholder agriculture (summarized in Exhibit 5).

According to recent statistics, approximately 1.1–1.2 million ha of forests with high carbon stock intensity (primary and secondary forest) are cleared in Indonesia each year, with more than 25 percent of the vegetation loss occurring

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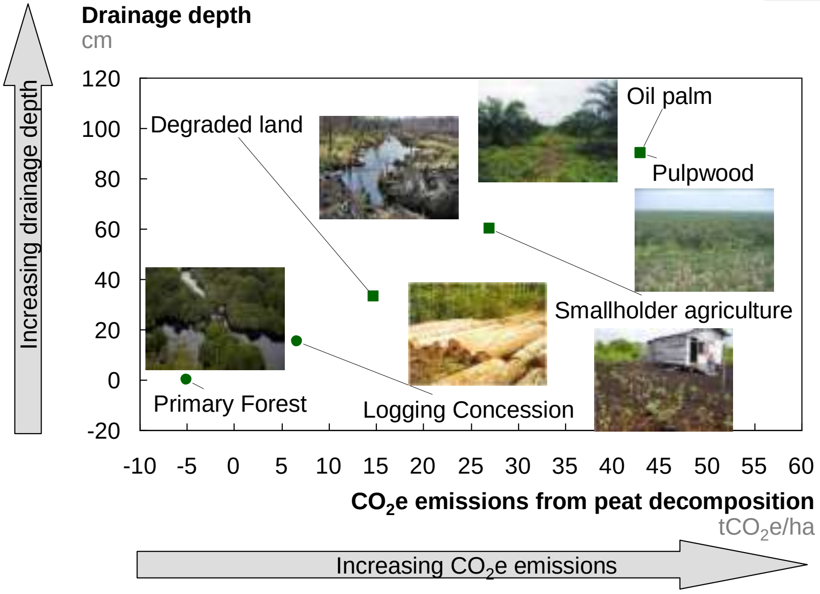
[10] Hooijer et al., 2006 – PEAT-CO2: Assessment of CO2 emissions from drained peatlands in SE Asia

on peatland. This results in unnecessary dewatering of the underlying peat, with a severe impact on emissions. The impact is even greater due to the relatively high cost of rehabilitating the peat once the natural forest cover is removed. It is therefore of extreme importance that local land use planners take great care to protect peat areas that still retain forest cover.

EXHIBIT 5

Emissions through peat decomposition increase with drainage density and are highest in oil palm and pulpwood plantations

PRELIMINARY



1 applying a linear relationship model between drainage and peat decomposition based on Wösten et al 2001

SOURCE: Hooijer et al 2006 – PEAT CO2e; Wetlands International, DNPI – Indonesia Greenhouse Gas Abatement Cost Curve

5

Fortunately for East Kalimantan, distribution of peat in the province is fairly concentrated within specific locations – very deep peat soils (4–8 meters depth) cover 90,000 hectares and are present in the Nunukan and Bulungan districts, with a small proportion in Malinau.

Deep peat soils (2–4 meters depth) cover 80,000 hectares and are present mainly in the Kutai Kartanegara and Nunukan districts. The peatlands in Kutai Kartanegara formed around Mahakam Lake and therefore form in a basin, which is largely maintained by water supplied by the local catchment area. As a result, any development outside the peat area likely has little direct influence on the water level of the peat. On the other hand, in Nunukan, the peat is largely rain fed, but also interacts as a single hydrological unit with the other wetlands surrounding it. Development in areas surrounding these peatlands can thus potentially drain the peat and lead to undesirable impact. Therefore any development that may impact the overall hydrological unit in either Kutai Kartanegara or Nunukan needs to be carefully examined and reviewed.

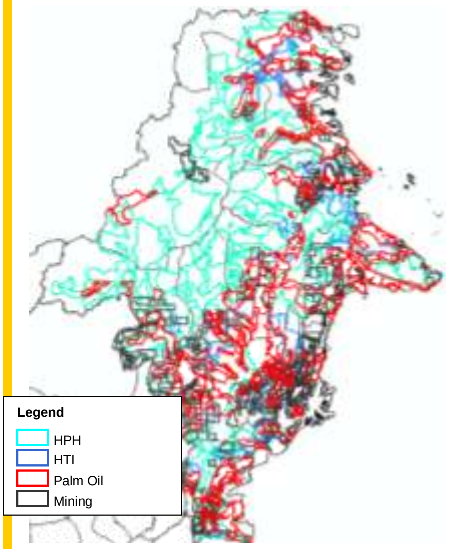
Distribution of current land use plans

A distribution of all current location permits, operating licenses, and concessions within the palm oil, timber, and mining sectors covers a total area of 12.3 million ha of land area – including 7.8 million hectares of primary and secondary forest and 0.4 million hectares of peatland (Exhibit 6). The forestry licenses, HTI and HPH, refer respectively to production forest licenses, and natural forest logging licenses.

EXHIBIT 6

Current licenses in forestry, mining and palm oil sectors cover 7.8 million hectares of forest

Distribution of current licenses, including those not yet in operation, 2009



	Total coverage Mn ha	Carbon at risk Forest area Mn ha	Carbon at risk Peat area Mn ha
Forestry			
HTI	**1.0**	**0.4**	**0.07**
HPH	**5.7**	**4.9**	**0.08**
Mining	**3.0[1]**	**1.4[1]**	**~0**
Palm oil	**2.7**	**1.1**	**0.2**
	12.4	**7.8**	**0.4**

1 Total license area – actual affected area based on operating mines is estimated at 10-15 percent of total

SOURCE: ESRI, Ministry of Forestry – Rep. of Indonesia, Wetlands International; Daemeter Consulting; team analysis

Carbon implications of current land use plans

Overlaying the development activities implied by all of these licenses over current carbon reserves, we are able to estimate the change over time. From our analysis, the carbon impact from licensed development activities totals an estimated loss of 730 million tons of carbon stock over 20 years (Exhibit 8), from forestry (310 Mt of carbon), palm oil (250 Mt of carbon), and mining (70 Mt of carbon).

A few observations surface from this analysis (Exhibits 7, 8, 9):

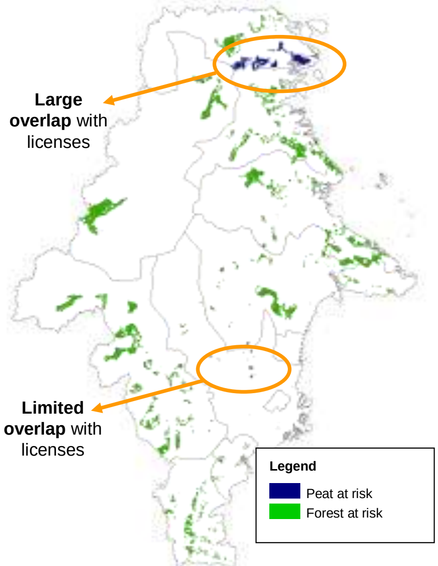
- The **largest aggregate carbon stock loss** derives from allocated HPH and HTI licenses in the forestry sector and planned palm oil development over currently forested areas.

- **Loss of carbon stock is highly concentrated in areas of deep peat.** Across all sectors, roughly 40 percent of total carbon is lost in the form of peat degradation. In the palm oil sector, our preliminary analysis of known palm oil licenses indicates that nine operators in the peatlands straddling Nunukan, Malinau, and Bulungan cover only 80,000 ha but place 30 percent of the carbon at risk.
- Where palm oil is planted on degraded land there is a net increase in carbon stock of up to 50 tons of carbon per ha and therefore a **net sequestration potential**.[11]
- Four districts, **Nunukan, Malinau, Kutai Barat, and Berau disproportionately contribute 70 percent of the lost carbon stock**, mainly in the form of peat degradation.

EXHIBIT 7

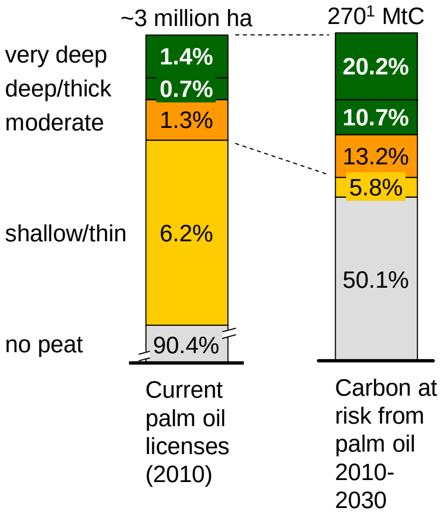
There is a high concentration of carbon stock at risk within small area of allocated palm oil licenses on deep peatlands

Forest and peat at risk from existing palm oil licenses



Three percent of existing license area contains 45 percent of carbon stock at risk

Area covered by existing palm oil licenses, by peat depth



1 Gross carbon loss only (excludes carbon stock increase / sequestration effect)

SOURCE: Ministry of Forestry Land Cover (2009); Wetlands International; Daemeter Consulting; team analysis

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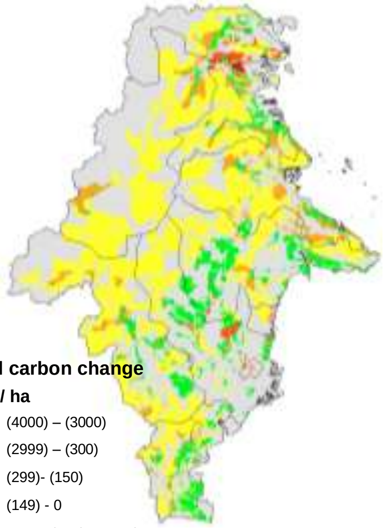
[11] Sequestration refers to the process by which carbon is absorbed from the atmosphere.

EXHIBIT 8

Under current planned licenses, East Kalimantan could potentially lose up to almost 730 million tons of carbon by 2030

Change in vegetation and peat carbon under allocated licenses
tons of carbon / ha



Total carbon change
tons / ha
🟥 (4000) – (3000)
🟥 (2999) – (300)
🟧 (299)- (150)
🟨 (149) - 0
🟩 1 – 70 (net increase)

		Per hectare carbon stock loss by 2030 Low: <150 tC per ha Average: 150-300 tC per ha High: >300 tC per ha	**Total carbon loss by 2030** Million ton
Timber	**HTI**	▪ **Average** on vegetation ▪ **High** on peat	**186**
	HPH	▪ **Low** carbon stock loss	**226**
Mining		▪ **Low** carbon stock loss[1]	**69**
Palm oil	**Forested**	▪ **Average** on vegetation ▪ **High** on peat	**251**
	Degraded	▪ **Small net increase** in carbon stock (up to 70 tC per ha)	**(13)**
			732

1 Refers to aggregate loss over total license area – does not reflect impact of specific affected areas
SOURCE: ESRI, Ministry of Forestry – Rep. of Indonesia, Wetlands International

Emissions impact

By distributing the estimated carbon stock loss linearly over the timeframe of development (assumed 20 years), we were able to estimate the emissions impact from the change of carbon (Exhibit 9). Due to the large reserve of carbon stock, the highest emission is expected from expanding palm oil onto forested areas, as well as onto areas with existing peat soils, at a total of 46 MtCO2e per annum. This is followed by expansion of timber operations in the form of HPH[12] and HTI licenses, at 41 MtCO2e and 34 MtCO2e respectively.

Over 20 years (2010–2030), the overall loss of carbon stock yields an annual emissions estimate of 132 MtCO2e per annum for East Kalimantan from LULUCF within the mining, palm oil and forestry sectors. This estimate is 15 percent higher than the business-as-usual estimate reported in the “East Kalimantan Environmentally Sustainable Development Strategy” (Exhibit 9).

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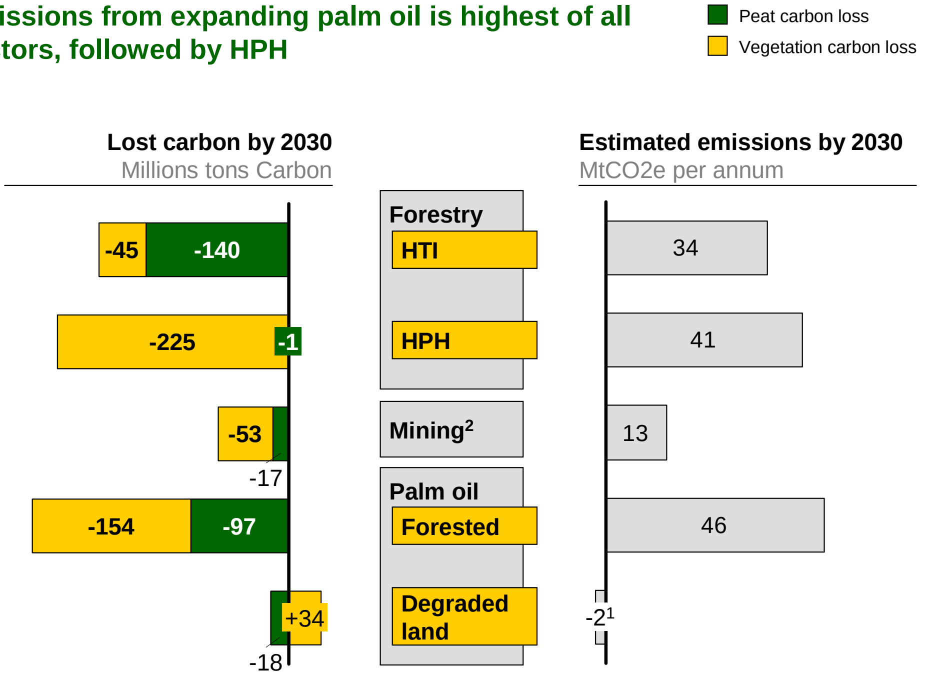
[12] Although HPH concession are meant to be carbon neutral, a 17 percent degradation is assumed over the 2010–2030 period, based on historic deforestation rates in Indonesia

EXHIBIT 9

Emissions from expanding palm oil is highest of all sectors, followed by HPH



[1] Net reduction in CO2e emissions due to sequestration of carbon by new palm oil plantations on previously degraded lands

[2] Refers to aggregate loss over total license area – does not reflect impact of specific affected areas

SOURCE: ESRI, Ministry of Forestry – Rep. of Indonesia, Wetlands International

How Indonesia and East Kalimantan can optimize land use and preserve carbon reserves

Given the extent of degraded land potentially available, there may be a large opportunity for Indonesian policy and decision makers to encourage the transfer of future development activity away from land with high carbon reserves and onto degraded land. Such a move does not need to come at the expense of development. This paradigm shift from the norm will take time and will require the careful and coordinated effort of many stakeholders – public, private, and communities.

The central and provincial governments can proceed to support use of degraded lands by aligning relevant agencies on the definition of degraded land, improving the economics of using degraded land to the operator, defining a process for rapid resolution of tenure issues, developing a way to ensure equitable developmental paths among districts, and engaging with local communities on these issues to create early awareness.

What is degraded land?

Degraded land generally refers to areas that were cleared of forest long ago and now contain low levels of biodiversity, e.g., alang alang grasslands, other forms of bush, and shrub, all which share a common trait of a relatively low carbon stock density (less than 40 ton of carbon per ha). Expanding the use of degraded land for future development represents a major opportunity for preserving carbon stocks. Making full use of such land not only prevents loss of forest vegetation by deferring the threat to forested lands, but also improves sequestration of carbon from the atmosphere.

There are an estimated 7**–**14 million ha of degraded lands in Indonesia, mostly on the islands of Sumatra and Borneo.[13] There is currently however no single internationally approved definition of degraded land, nor one approved by definition in Indonesian law or policy, and hence the exact amount of degraded land is unclear. The lack of clarity is in part due to the existence of other closely related terms and an unclear purpose of why a definition is required.

Several related terms exist, each for a different purpose, but none exactly serves the intended purpose of defining land with 1) a legal status that qualifies it for development activities (non-forest estate), 2) a state of low carbon (or degradedness), and 3) a potential for viable agricultural operation:

- **Degraded forest (kekritisan hutan)** indicates the loss of ecological function of a forest area. It is commonly used as a measure to determine how feasible it is to reforest a given area (Ministry of Forestry)

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[13] There are 7–14 million ha of degraded, abandoned land available for agricultural development according to WWF-Indonesia, (Jakarta Post, January 2010).

- **Idle land (lahan tidur)** indicates land with low agricultural productivity that may be unprofitable to develop (Ministry of Agriculture)
- **Abandoned land (tanah terlantar)** indicates land that has an existing estate crop license (e.g., for palm oil), but is not currently used productively, e.g., land that is currently used for smallholder farming or subsistence agriculture by local communities

From the point of view of carbon preservation, the term degraded land should signify low carbon stock density, no more. However, due to the need to assuredly direct development activities onto such areas, several other considerations are necessary:

- **Forest criticality (kekritisan):** A measure of the ability of a land area to support ecological function and therefore an indication of the likelihood for successful reforestation
- **Suitability (for palm oil):** A measure of the suitability of a land area for the planting of a given crop. This is a crucial indicator for economic viability and is therefore an important requirement for most companies. Equally, proximity to infrastructure such as a road network, seaport, and palm oil mill is also important
- **Distribution of indigenous population and ownership rights:** A measure of the potential barriers arising from the need to compensate communities displaced from degraded lands. As such compensation can be significant, it is necessary to establish a clear sense of distribution of ownership rights early on.

Key issues inhibiting the use of degraded land

From conversations with representatives of government agencies, operators, industry associations, and civil society, we cite three major issues that hinder the expanded use of degraded lands **–** economics, land tenure, and legal barriers.

One concern for companies about using degraded land is the **less favorable project economics in comparison to that of forested land**. Our early analysis indicates a marked reduction in net present value (NPV) of around 45 percent from operating a palm oil plantation on degraded land compared to a similar scaled plantation on forested land. This is mainly due to loss of revenues from initial timber sale following deforestation to clear the land for planting, the need to compensate displaced communities, and the slight reduction of yield due to lower soil fertility.

To address this issue, policy makers could make efforts to encourage use of degraded land either by direct incentive, e.g., in the form of subsidy or lower cost financing, or provide greater disincentive to use forested lands, e.g., increasing the stumpage fee or limiting the number of new licenses on such areas (Exhibit 10). In the meantime, major palm oil operators and interest groups such as the RSPO (Roundtable on Sustainable Palm Oil) will need to be engaged to determine whether palm oil expansion onto degraded lands could warrant a higher price for the CPO (crude palm oil) produced, and thus improve economics to the operator. Equally, banks and other sources of funds could contribute by offering more attractive financing terms, e.g., lower interest rate loans and more lenient credit terms, as a means to support the shift to degraded land.

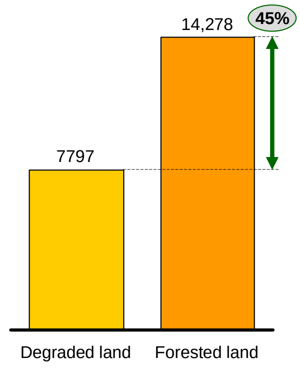
EXHIBIT 10

Incentives could be provided to compensate the economic loss to the operator from using degraded land

Potential policies to incentivize use of degraded land

- **Premium price** on sustainable oil palm produce
- **Attractive financing** for cultivators on degraded land
  - Lower interest rates
  - Longer tenor loans
- **Subsidize payment** of compensation for land acquisition on degraded land
- Provide **cheaper fertilizer costs** for plasma scheme participants

NPV of palm oil cultivation
USD/ha



Potential policies to dis-incentive use of forested area

- Raise **stumpage fees** for timber harvesting on land intended for oil palm plantation
- **Limit granting of permit** within a forested area (only permit for oil palm plantation, not for timber harvesting)
- **Higher taxes** for oil palm revenues for plantations on forested land

Working Draft - Last Modified 2/16/2011 12:27:04 AM Printed 1/28/2011 12:19:09 PM

SOURCE: East Kalimantan Environmentally Sustainable Development Strategy; Interviews; Team analysis

Based on our initial interviews with plantation operators, economics is not their main concern to using degraded land. Instead, they cite **issues around land tenure** as a key bottleneck. Inconsistent land regulations, overlapping land claims, contradictory maps and boundaries, overlapping powers of legislative bodies that issue licenses, and lengthy dispute resolution and negotiation processes all contribute to driving up the operator's indirect cost of degraded land acquisition (Exhibit 11). And of course, there is much less human resistance to taking up operations on forested lands due to the sparse population of existing communities. These issues indirectly shift responsibility and related costs of land tenure from government to the private sector, providing a disincentive for the oil palm industry to utilize degraded land for expansion.

To negate this disincentive, a key step is for decision makers to define a process for rapid, enforceable, and agreeable resolution of tenure conflicts. The process must replace the current ad hoc resolution of disputes between companies and communities and be able to be scaled if degraded land is to be extensively used to preserve forest carbon reserves. Relevant laws and regulations will likely need to be enacted at the national and provincial levels. As a first step, a full inventory of these regulations could be done to more clearly understand where opportunities for improvement are.

EXHIBIT 11

Issues in land titling inhibit the use of degraded land

A wide range of stakeholders have been engaged regarding the use of degraded land

Private sector

Government

Civil society

Three land titling issues are identified as challenges to using the degraded land

Certificate

- **Absence of land ownership certificate** in inhabited lands
- **Conflict of land ownership** between local communities
- **No rapid and replicable** resolution **process**

Compensation

- Land acquisition becomes expensive due to **lack of standardization in compensating** landholders

Regulation

- Existing land registration laws are geared to businesses and **not ‘friendly’ to individuals**
- **Conflicting laws & regulations** on land acquisition

SOURCE: Interviews, press search

From a **legal and regulatory** perspective, there are two barriers that inhibit use of degraded land specifically in forest estate: 1) current forestry regulations do not allow palm oil to be planted within areas designated as forest estate, irrespective of existing land cover, and 2) although there is a procedure to convert forest estate into non-forest estate if requested, often such land has existing timber licenses (both HPH and HTI), which prevent the Ministry of Forestry from approving the conversion.

From spatial analysis of known HTI and HPH licenses covering 6.7 million ha of land area in East Kalimantan, approximately 1.4 million ha of non-forested land already exists within current license areas. These areas could be investigated to verify which operations are no longer active, or equally, if the licensees are not fully utilizing the total area licensed to them. Some of these lands could potentially be ‘unlocked’ for agricultural production. As the legal intricacies of executing such actions are significant, there will be a need to tread carefully to navigate a path of least resistance from authorities, forestry industry agencies, and private holders of HPH and HTI licenses.

Carbon impact from growing palm oil on degraded land: East Kalimantan example

East Kalimantan has ample land area that has been degraded through deforestation and forest degradation, in large part due to the extensive El Nino fires of the 1990s. Large areas of degraded land are now covered with Imperata cylindrical (alang alang) and other weed species or bush as the main vegetation, all of which generally have very low carbon value (0–30 tons of carbon per hectare).

The use of degraded land as a substitute for still-forested areas can dramatically reduce the carbon impact of planned development without foregoing the economic benefit of development. In this section we present three scenarios that analyze the availability of degraded land and how its potential utilization for future palm oil expansion could reduce the carbon impact of East Kalimantan's economic development. Although the focus of the analysis has been on the palm oil sector, it can be applied to other crops that could viably be planted on degraded land, such as cassava, rubber, and rice, or even to production forests (HTIs). Although there is a large opportunity for avoiding carbon loss by using degraded land for palm oil expansion, two policy barriers will first need to be overcome – ensuring equitable development among districts and opening up degraded land in forest estate.

Degraded land in East Kalimantan

Today, there are some 2.6 million hectares of degraded land available across the province.[14] This is a significant amount, and considering an estimated 1 million hectares of forest is at present under threat from already existing palm oil licenses, redirecting these licenses onto degraded land offers a way to sustain development and reduce emissions at the same time (Exhibit 12).

There are however many obstacles that first need to be overcome, not least to identify where the lands is, determine how suitable it could be for growing oil palm, develop a workable compensation mechanism for districts to trade off development among themselves, and resolve potential land tenure conflicts that may arise as operators begin to develop the land.

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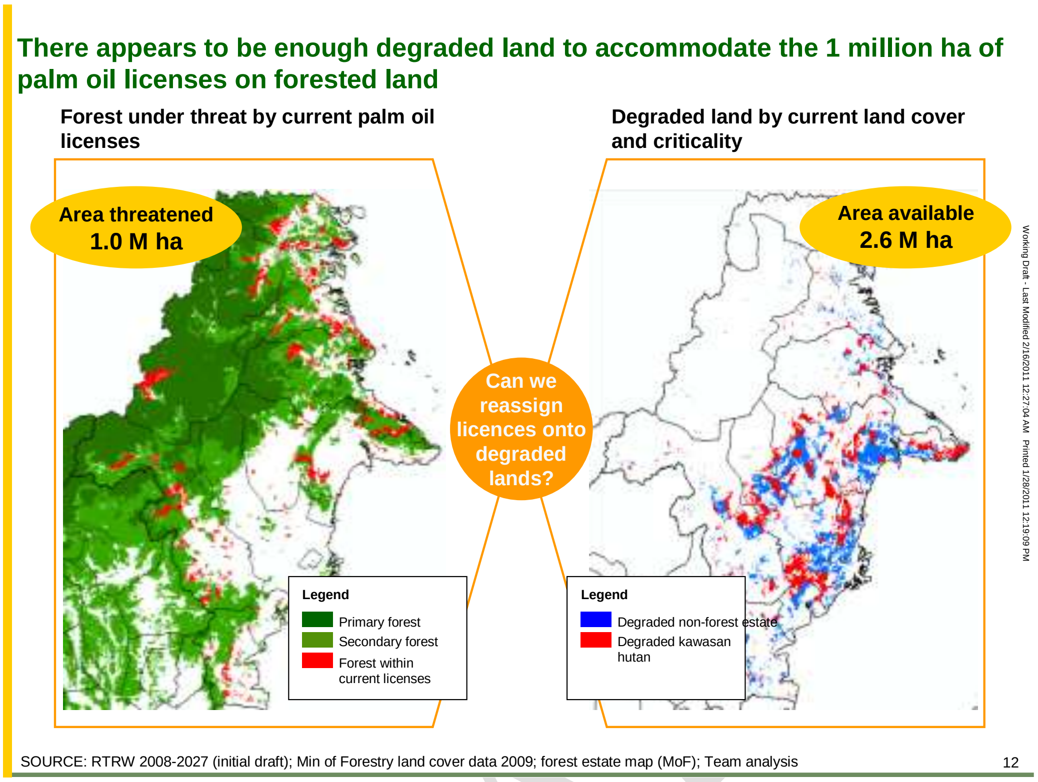
[14] Initial estimate was determined using a carbon stock density cut-off of 40 tons of carbon per ha and a criticality level of slightly critical to very critical

EXHIBIT 12



There appears to be enough degraded land to accommodate the 1 million ha of palm oil licenses on forested land

Forest under threat by current palm oil licenses

Area threatened 1.0 M ha

Legend
🟩 Primary forest
🟩 Secondary forest
🟥 Forest within current licenses

Can we reassign licences onto degraded lands?

Degraded land by current land cover and criticality

Area available 2.6 M ha

Legend
🟦 Degraded non-forest estate
🟥 Degraded kawasan hutan

SOURCE: RTRW 2008-2027 (initial draft); Min of Forestry land cover data 2009; forest estate map (MoF); Team analysis

12

As a starting point, East Kalimantan is currently in the process of identifying such land to form a baseline map of available degraded land. While the mapping exercise is still in an early stage, it offers some major insights to expanding use of degraded land:

- **There is a need for a clear and agreed definition of degraded land.** Although a total of 2.6 million ha of land in East Kalimantan fulfills the minimum criteria of degradedness,[15] the total amount of degraded land is highly dependent on the exact definition used (Exhibit 13). The degraded land in non-forest estate only makes up half of the total available degraded land, while further excluding land covered by existing licenses leaves only 560,000 ha. Including a measure of suitability for palm oil agriculture further cuts down this amount to 300,000 ha. It is therefore key for provincial agencies, such as Bappeda, Dinas Kehutanan, and Dinas Perkebunan as well as private operators, industry interest groups, and associations to agree on a definition of degraded land, so that the exact amount of land area can be determined.

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[15] Criteria used to define degraded land: Low carbon stock (below 40 tC per ha), forest criticality of slightly critical (agak kritis), critical (kritis), and very critical (sangat kritis)

EXHIBIT 13

Amount of degraded land available will strongly depend on definition used

PRELIMINARY

All degraded land

All degraded land

2.6 million ha

- Low carbon stock
- Medium to high criticality

All degraded land in non-forest estate

Non-forest estate

1.3 million ha

- **Legal status: non-forest estate**
- Low carbon stock
- Medium to high criticality

All unassigned degraded land in non-forest estate

No existing license

560,000 ha

- **No existing license**
- Low carbon stock
- Medium to high criticality
- Legal status: non-forest estate

Different definition yields different availability of degraded land

SOURCE: Ministry of Forestry; Ministry of Agriculture; draft RTRW 2009; Bappeda; team analysis

- **There is a large amount of degraded land in forest estate that may be suitable for growing oil palm. Releasing this land could vastly improve the amount and suitability of land parcels[16] available.** The total area of non-forest land cover in forest estate is approximately 18 percent, or 2.2 million ha. Accounting for potential reforestation activities using the criticality[17] criteria leaves approximately 1.3 million ha of land that can potentially be used. Exhibit 14 compares the amount of degraded land that is potentially suitable for palm oil within non-forest estate with the degraded land available collectively within non-forest estate and forest estate. Not only does the area double in size when considering both land statuses, but importantly the number of land parcels above 5,000 ha increases by close to three times. Palm oil plantations benefit from economies of scale – as a general rule the optimum size for a self-sustaining estate is at least 5,000 hectares. The average plantation size in Indonesia is 3,500–4,000 hectares (USDA, 2009).

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[16] Refers to a single contiguous plot of land that could be converted into a palm oil plantation.

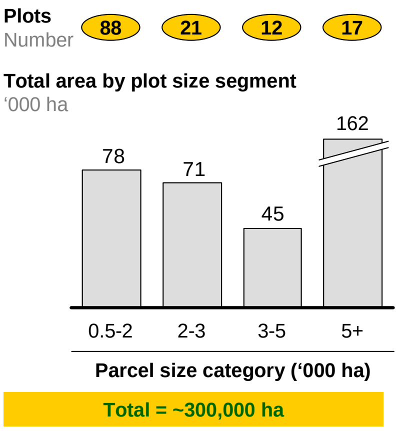
[17] Forest criticality of slightly critical (agak kritis), critical (kritis), and very critical (sangat kritis) [Ministry of Forestry]

EXHIBIT 14

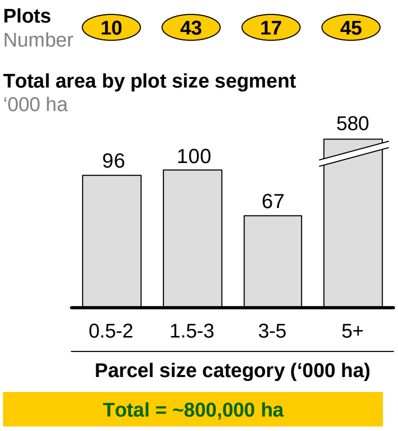
Including degraded land in forest estate improves amount and plot size of available land

Land that is degraded and suitable for palm oil above 500 ha only

Non-forest estate status only[2]
Distribution by parcel size



Non-forest estate and forest estate status[3]
Distribution by parcel size



1 Based on criteria from Ministry of Agriculture for Kesesuaian lahan untuk penananman sawit (2005)'
2 Includes criteria i) degraded land cover, ii) forest criticality, iii) palm oil suitability, iv) excluding current known palm oil licenses
3 Includes criteria i) degraded land cover, ii) forest criticality, iii) palm oil suitability

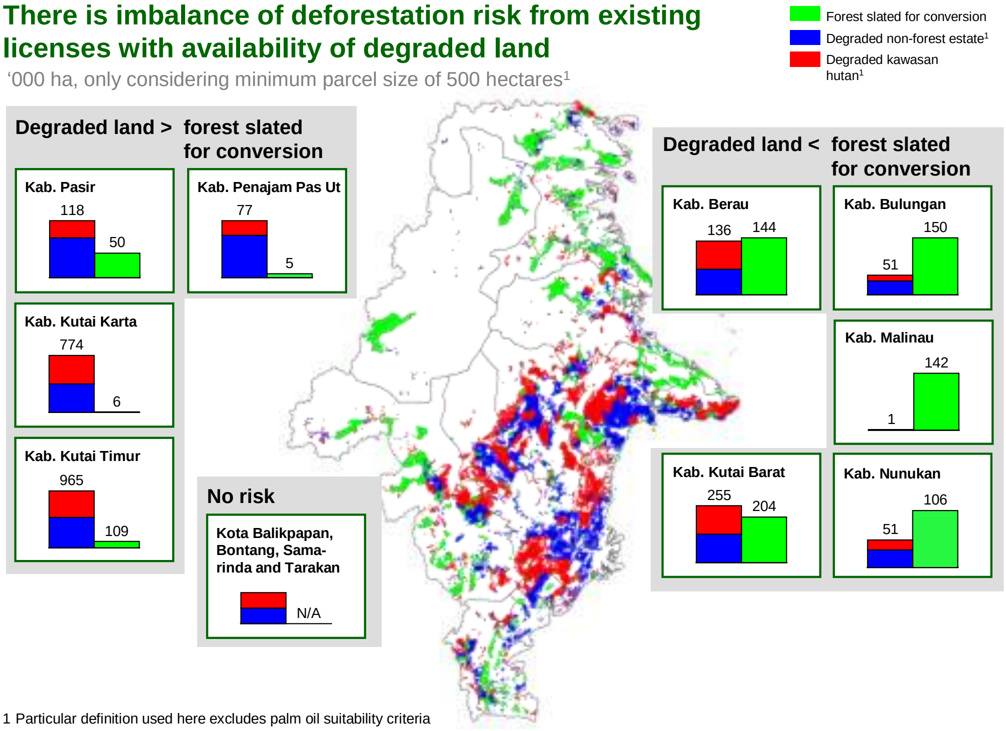
SOURCE: Ministry of Forestry; Ministry of Agriculture; draft RTRW Kaltim 2009; team analysis

- **There is need for an inter-district compensation mechanism to ensure equitable impact.** There is a marked imbalance between districts with available degraded lands and those with the latent threat of deforestation implied by current licenses not yet in operation (Exhibit 15). Despite there being a reasonably large amount of degraded land available, it is concentrated in the south-eastern region of the province while the forests under threat from existing licenses are concentrated in the north-east and south-west regions. Under a scenario where development of licenses on currently forested lands is halted and degraded land is substituted for otherwise lost development, there may be a need for the provincial government to assist districts that lose development opportunities. Such assistance could be disbursed in the form of inter-district payments or as offsets through the taxation system. Such a mechanism will enable the province to pursue overall development in a manner that would achieve significant emissions reduction, while treating the impact on each district in an equitable manner.

EXHIBIT 15

There is imbalance of deforestation risk from existing licenses with availability of degraded land

‘000 ha, only considering minimum parcel size of 500 hectares[1]



1 Particular definition used here excludes palm oil suitability criteria

SOURCE: Ministry of Forestry; Ministry of Agriculture; draft RTRW 2009; Bappeda; team analysis

Potential carbon savings

In order to translate the idea of using degraded land into an emissions figure, we analyzed the amount of carbon loss that could be avoided if planned development on forest land (primary forest, secondary forest, peatland) was shifted to degraded land – what we call optimization. See Exhibit 16 for detail.

Two major constraints are treated as variables: 1) exclusion or inclusion of degraded land in forest estate and 2) optimization at either the district level or the provincial level – terms defined to respectively indicate an intra- or inter-district trade of forested land under current licenses with available degraded land. The constraints were chosen as they are crucial determinants of whether or not a major take up of degraded land is worth pursuing. This yields four scenarios for investigation.

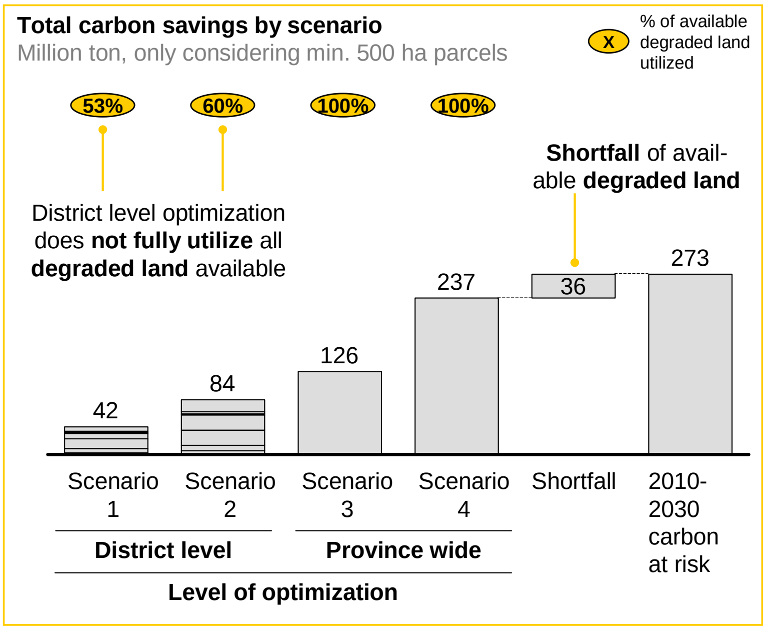
EXHIBIT 16

Addressing district imbalance is key to optimizing long-term carbon savings from degraded land

EXCLUDES SEQUESTRATION

All scenarios:

- Degraded land cover (0-40 tC per ha)
- Suitable for palm oil
- Slightly to very critical
- Minimum parcel size = 500 ha



Total carbon savings by scenario

Million ton, only considering min. 500 ha parcels

SOURCE: Ministry of Forestry; Ministry of Agriculture; draft RTRW 2009; Bappeda; Daemeter Consulting; team analysis

Emissions reduction

The avoided carbon stock loss is translated into an equivalent emissions figure by linearly apportioning the loss over 20 years (Exhibit 17). These figures represent only the LULUCF emissions from the palm oil sector and assume that all available degraded land that fulfills the requirements[18] is used for expansion of palm oil. The reference level shown is based on a projection of emissions given potential deforestation and peat degradation as suggested by existing issued licenses in the palm oil sector.

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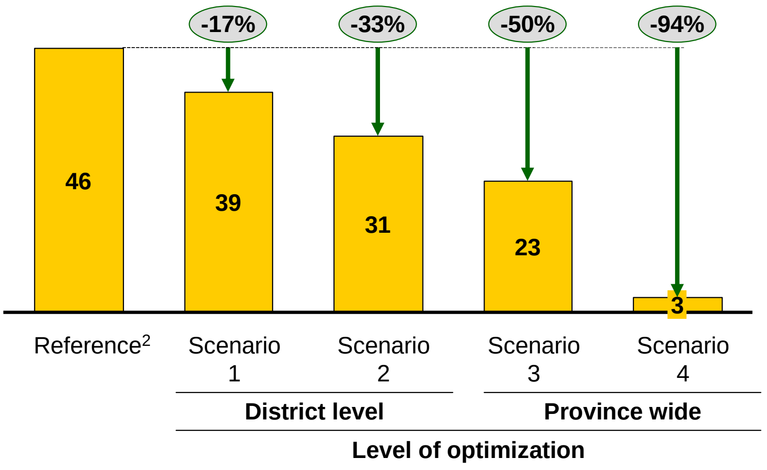
[18] Requirements include i) degraded land cover, ii) forest criticality of slightly to very critical, iii) suitability for palm oil, iv) minimum contiguous size of 500 ha

EXHIBIT 17

Emissions from palm oil can be reduced by up to 90% of the reference level

PRELIMINARY

Emissions from land use changes in palm oil
MtCOe per annum in 2030[1]



1 From palm oil sector only; includes deforestation and peat degradation only (excludes forest degradation and peat fire). Carbon to CO2e conversion factor = 3.67 and linear carbon stock loss for 2010-2030
2 Reference scenario here is based on the assumption that all planned developments given by current existing licenses are in operation by 2030
SOURCE: Team analysis

Scenario 1: Use only degraded non-forest estate land. Licenses are only swapped for degraded land within the same district, i.e., districts do not trade development opportunities. This affords a potential to reduce emissions by 17 percent below the reference level.

Scenario 2: Use degraded forest estate land in addition to that in non-forest estate. This releases more degraded land for utilization with a potential to reduce emissions by 33 percent below the reference level.

Scenario 3: Use only degraded non-forest estate land, but allow for inter-district trade; licenses granted in one district are swapped for licenses on degraded land in another district. This gives the potential to reduce emissions by 50 percent below the reference level. The large leap between Scenario 1 and Scenario 3 highlights the need for the province to assist districts in providing a mechanism for inter-district trades to take place. A working mechanism for such a trade would allow districts such as Bulungan, Berau, Kutai Barat, Malinau, and Nunukan – which have a large amount of standing forest and/or deep peatlands but little remaining degraded land – to transfer development opportunities (represented by existing licenses) to districts with excess amounts of degraded land such as Kutai Kartanegara, Kutai Timur, and Paser.

Scenario 4: Use degraded forest estate across the province in addition to degraded land in non-forest estate. This greatly improves the availability of degraded land, particularly in those districts constrained by a lack of available degraded non-forest estate land. This yields an emission reduction of 94 percent below the reference level. The Berau, Kutai Barat, Bulungan, and Paser districts avoid a carbon loss close to three times greater than that of Scenario 3, while the major proportion of degraded land comes from the Kutai Kartanegara and Kutai Timur districts, which each contribute more than 200,000 ha of degraded land.

The way forward

In the near future, optimizing land use in East Kalimantan via the expanded use of degraded land, in particular for palm oil, will be critical to contribute to the national emission reduction target. Not only would the initiative offer significant abatement potential, if correctly and carefully implemented, it would come at little or no expense to development.

It is however an extremely cross-cutting initiative – involving participation not only from policy and decision makers at the provincial level, but also at the district and community levels, in addition to private sector stakeholders. All parties will have to make trade-offs and hard decisions to overcome the many barriers that inhibit progress before we can achieve a development pathway built on principles of low carbon growth.

Practical steps to support this initiative need to be taken urgently:

- **Define and identify available degraded lands.** The provincial and district authorities will need to agree on a single definition of degraded land. The agreed definition will provide clarity to stakeholders as a reference for locating and determining availability of degraded lands for use in development planning. The provincial authorities would do well to recommend that the Ministry of Forestry include degraded land in forest estate for consideration to increase the total area available.
- **Instruct use of degraded land for development where possible.** There needs to be top-down guidelines from the provincial government to push expansion of sectors that drive LULUCF emissions out of forested areas and onto degraded lands, e.g., the palm oil and HTI sectors. What this could look like is a revision of current land use plans to reflect expanded use of degraded lands as well as a permanent moratorium on licenses that place deep peat and primary and secondary forest under threat. A suitable entity (e.g., Provincial or District Bappeda) will need to be tasked to manage a clear, coordinated, and streamlined process to plan development based on principles of carbon preservation that directly avoid development over such areas unless necessary.
- **Engage communities to create awareness, and assist an accelerated process to resolve land ownership disputes.** Unclear land tenure status and competing claims from communities and villages deter developers from moving onto degraded lands. As a way forward, local and indigenous communities, NGOs, and the private sector will need to be engaged early to create awareness around the long-term objective and define an equitable process for resolution of land tenure issues as they arise.
- **Commence a pilot to test and refine land tenure resolution mechanisms.** Finding an equitable yet efficient mechanism for tenure resolution for displaced communities is a key requirement to move future development onto degraded land. As there is not yet a codified practice or precedent that can be used as reference, it is suggested that a pilot program is carried out to take stock of issues, define a workable resolution process, and build capabilities in this area.

- **Provide incentives to operators for use of degraded land.** There is a possible need for incentives to compensate operators for economic loss as they use degraded land, mainly due to the need for compensation payments to displaced communities and the loss of revenue that would otherwise be generated from clearing the forest and selling the timber. An early start should be made to test the willingness of donors to contribute to these payments in the near term and how REDD+ funds could be channeled in the longer term through pay-for-performance mechanisms.
- **Create an inter-district compensation mechanism.** As degraded lands are not equally distributed across the many districts in East Kalimantan, an inter-district compensation mechanism is necessary to account for the varied impact. That way, districts with more degraded land can offer development opportunities to those with large areas of still-forested land.
- **Make the case to utilize degraded land in forest estate.** Legal restrictions against: 1) planting of certain crops in forest estate, and 2) recovering degraded land that has existing HPH and HTI licenses – will need to be overcome if degraded land in forest estate is to be made available for use. Aligning stakeholders on the competing priority of development between land use sectors (e.g., HTI and palm oil) could be an invaluable first step. This would then help make the case to the Ministry of Forestry to revoke or revise the restrictions, and clear the way for review or rationalization of current timber licenses based on land cover.
- **Begin early awareness towards a longer term revision of the spatial plan.** Piecemeal revision of land use plans and licenses to divert development onto degraded land is but an interim step towards low carbon development. What will be necessary as a means to ensure that forest and peat carbon assets are safeguarded over the longer term is to revise land zoning to ensure that such areas are excluded from future use unless justifiably necessary. This can be achieved by more rationalized land zoning based on land cover through a revision to the spatial plan: for example, zoning degraded land into non-forest estate and high carbon value forest into forest estate. As this will formalize the agreement and commitment of related stakeholders in a legally binding manner, long term accountability can be better assured.

The way forward is clear, yet requires a concerted effort from all of the stakeholders in East Kalimantan and the Ministry of Forestry.

Appendix: Spatial analysis approach and methodology

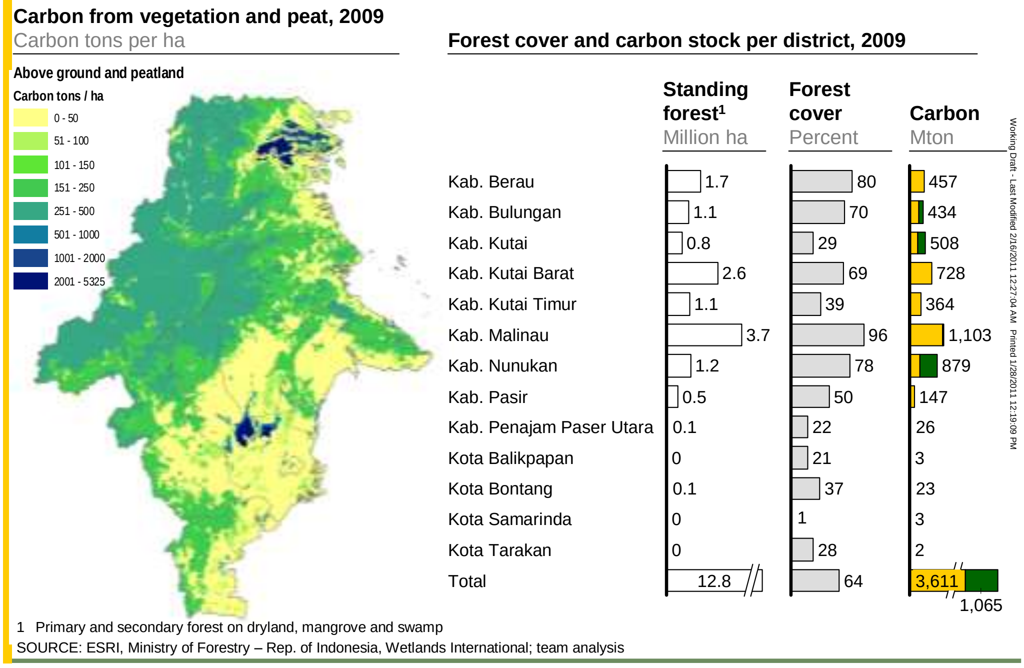
The maps used for purpose of analysis in this study were generated based on publicly available datasets. At a minimum, all ArcGIS shape-file maps are based on a resolution of 1:250,000 or better. All analysis was conducted on an ArcMap platform, whereas data calculation was carried out using Microsoft Excel.

i. Carbon stock map for East Kalimantan

The land cover data was based on the ArcGIS shape files sourced from Ministry of Forestry Land Cover (2009), the most recently published available dataset. Conversion factors for converting land cover types into carbon stock values (in tons of carbon per hectare) were sourced from World Agroforestry Centre (ICRAF). The carbon stock map, including above and below ground carbon was recreated for Exhibit 18 for reference. Provincial and district boundaries are based on Ministry of Forestry data.[19] As further reference, the conversion table of land cover to carbon stock is included in Exhibit 19.

EXHIBIT 18

Carbon stock distribution above and below ground for East Kalimantan



1 Primary and secondary forest on dryland, mangrove and swamp

SOURCE: ESRI, Ministry of Forestry – Rep. of Indonesia, Wetlands International; team analysis

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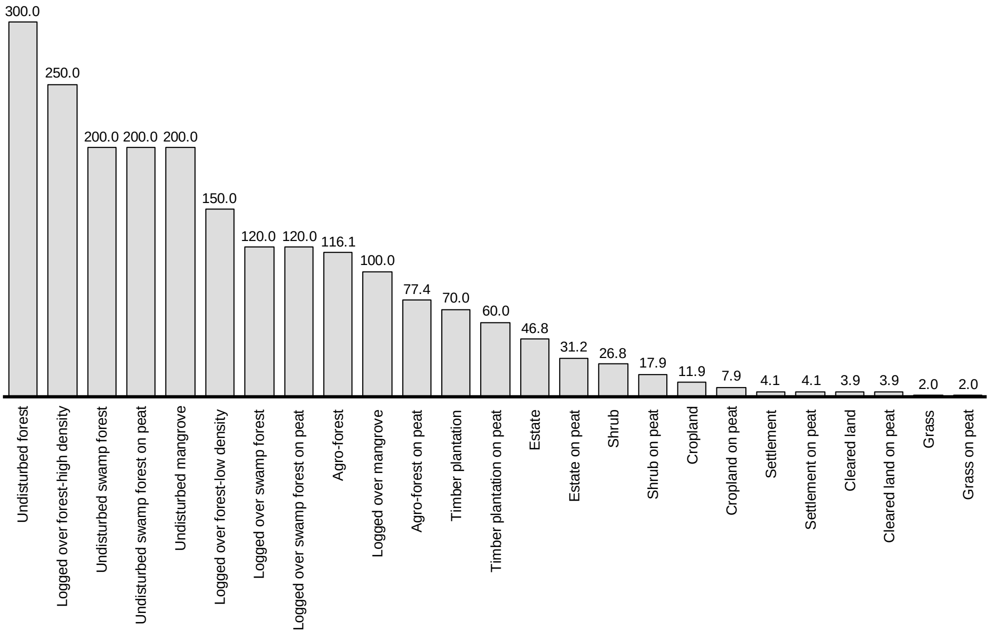
[19] The data set used for district boundaries (Ministry of Forestry, 2008) does not include Tana Tidung as a separate district from Bulungan. Therefore all reported figures refer to the two as the district of Bulungan.

EXHIBIT 19

Carbon stock (ton per ha) by land cover type



SOURCE: ICRAF ALLREDDI, 2010

ii. Methodology for identifying degraded land

The methodology used for identifying degraded land centers around locating plots of lands that have degraded land cover and would be suitable for planting oil palm. Equally, the methodology can be replicated for other economic activities such as production timber forest (HTI) or crops such as rubber, cassava, and rice. Oil palm is the immediate focus for East Kalimantan, as the recent rapid expansion of this crop is expected to place a significant area of forest under threat and in comparison to those crops, palm oil offers a substantial carbon sequestration potential due to its high carbon stock when fully matured of 50 tC per ha.

With the single objective to preserve carbon, the term degraded land would refer specifically to land covered with relatively low carbon stock density, e.g., bush, shrub, or open land. However, as there is a need to convince investors and operators to utilize these lands from the vast selection of land plots available, the definition needs to also provide an indication of how well it can sustain a viable operation. This necessitates several criteria, which include:

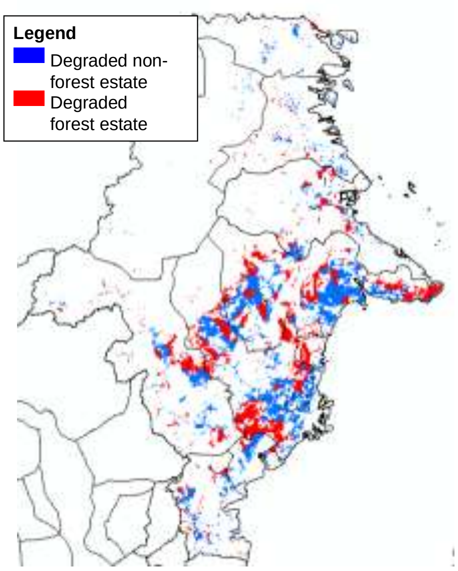
- **Minimum contiguous plot size.** Palm oil plantations benefit from economies of scale as an estate or multiple estates within an area would serve to provide a single mill with fruit bunches. As a general rule the optimum size for a self-sustaining estate is at least 5,000 hectares. The average plantation size in Indonesia is 3,500–4,000 hectares (USDA, 2009).
- **Suitability for palm oil plantation.** Criteria such as soil type, soil erosion, rainfall, altitude, and temperature determine whether the ambient conditions in a given area are suitable for a specific crop. The Ministry of Agriculture and the provincial Dinas for estate crops maintain such data for all major crops, including palm oil.
- **Existing communities and smallholder economic activity.** Due to the adat laws that exist in Indonesia, indigenous communities occupying land can claim ownership rights and subsequently are able to demand compensation if displaced. The higher likelihood of communities living on degraded land versus an equal area of forested land creates direct and indirect costs to operators to use degraded land – in the form of compensation payments and the need to resolve land tenure disputes.

A summary of the findings from the preliminary analysis to identify degraded land is included in Exhibits 20 and 21. The exhibits should to give the reader a graphic sense of the location and amount of degraded land available. The specific criteria used for categorizing these land parcels are included in the table below.

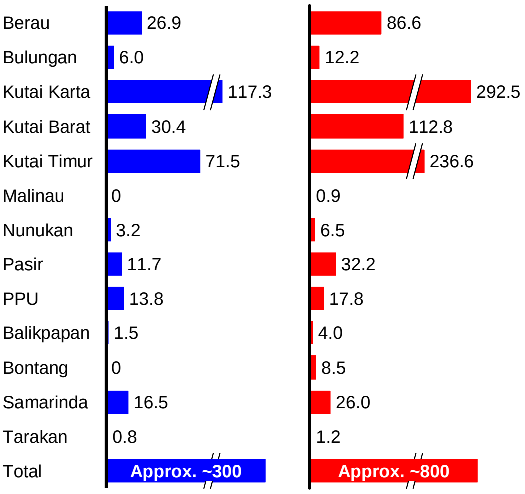
EXHIBIT 20

Degraded land by district

Distribution of degraded land[1]



Degraded land [2]
Includes suitability criteria



	Non-forest estate only '000 Ha	Non-forest estate and forest estate '000 Ha
Berau	26.9	86.6
Bulungan	6.0	12.2
Kutai Karta	117.3	292.5
Kutai Barat	30.4	112.8
Kutai Timur	71.5	236.6
Malinau	0	0.9
Nunukan	3.2	6.5
Pasir	11.7	32.2
PPU	13.8	17.8
Balikpapan	1.5	4.0
Bontang	0	8.5
Samarinda	16.5	26.0
Tarakan	0.8	1.2
Total	Approx. ~300	Approx. ~800

1 Based on degraded land cover (forest) and criticality only
2 Based on degraded land cover (forest); criticality and suitability for palm oil
SOURCE: Team analysis

EXHIBIT 21

Degraded land by contiguous parcel size

🟩 10,000+ ha
🟨 0-10,000 ha
🟥 No land available

	Degraded land[1] in non-forest estate only '000 Ha				Degraded land[1] in non-forest estate and forest estate '000 Ha			
Parcel size ('000 Ha)	500-1500	1500-3000	3000-5000	5000+	500-1500	1500-3000	3000-5000	5000+
Berau	10.83	4.52	11.60	-	13.43	8.75	3.54	60.93
Bulungan	1.34	4.68	-	-	6.61	5.55	-	-
Kutai Karta	32.77	24.27	33.17	27.10	23.42	20.79	31.04	217.29
Kutai Barat	5.65	4.06	14.32	6.33	9.40	14.25	9.74	79.37
Kutai Timur	18.63	21.63	8.63	22.58	23.05	31.68	24.46	157.46
Malinau	-	-	-	-	0.88	-	-	-
Nunukan	1.53	1.69	-	-	4.13	2.32	-	-
Pasir	6.20	5.46	-	-	4.75	7.54	6.48	13.44
PPU	2.61	3.66	-	7.49	2.44	-	4.92	10.46
Balikpapan	1.50	-	-	-	-	3.99	-	-
Bontang	-	-	-	-	3.12	5.34	-	-
Samarinda	3.83	2.40	4.85	5.42	3.32	-	-	22.65
Tarakan	0.84	-	-	-	1.17	-	-	-

1 Based on degraded land cover (forest); criticality and suitability for palm oil
SOURCE: Team analysis

iii. Methodology for calculating carbon impact from land use plans given existing licenses

Estimating the carbon impact of land use requires a mathematical model linking the probability of a unit of land to change from current state to an eventual state over a period of time. Important variables of such a relationship are multiple and include amongst other things the existence of operating licenses, proximity to infrastructure, historical trajectory of development, legal status of the land, population density, prevailing market prices of commodities, access to carbon markets, estimated capital inflow, and so on. The spatial plan, which provides the legal status of a given piece of land, is but one of these variables and by no means gives a comprehensive enough description to predict the evolution of land cover or the emission of below ground carbon.

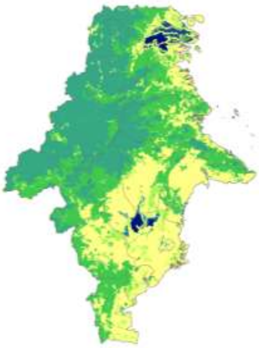
A quick and efficient means of estimating carbon impact is offered by considering land use changes due to development activities implied by existing operating permits. By assuming that all permits have commenced operations after a sufficiently long period of time, we are able to estimate the evolution of carbon stock over a relevant area. For example, a palm oil permit for a forest would result in total loss of the forest carbon and replace it with the carbon stock density of palm oil. The net carbon stock loss is linearly distributed over the period of development to arrive at an estimate of annual emissions.

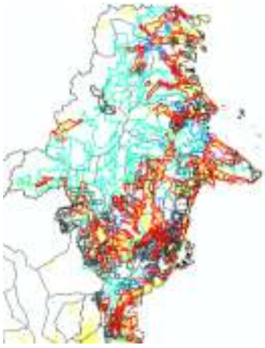
EXHIBIT 22

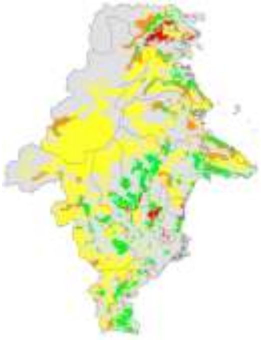
Methodology for carbon-calculation based on current land use plans

Present day carbon stock distribution + **Development plans given by current concessions** = **Evolution of carbon stock over timeframe**

Illustrative maps







Data used / key assumptions

- Ministry of Forestry land cover 2009
- Carbon stock conversion tables from ICRAF
- Ministry of Forestry peat map 2006

- Manually collected concession/permit data (2009) from each district by Daemeter Consulting
- All status' included – Ijin Lokasi to HGU / HPH

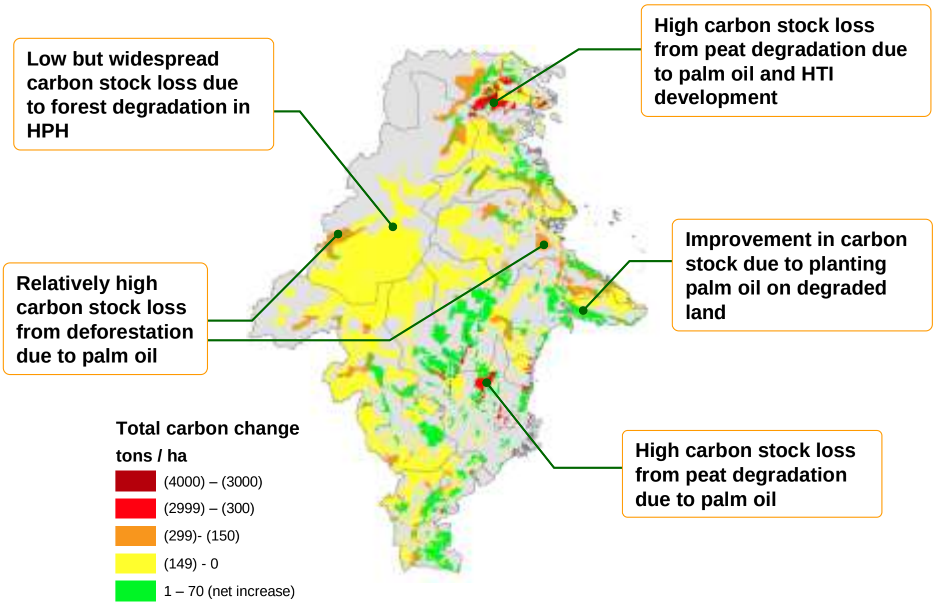
- Above and below ground carbon stock considered
- Emissions derived by linearly apportioning carbon stock loss over 20 year period

Focus is on emissions solely from the forestry, mining and oil palm sectors

SOURCE: East Kalimantan team

EXHIBIT 23

Impact on carbon stock due to development is overall negative, except for palm oil and HTI on degraded land



Low but widespread carbon stock loss due to forest degradation in HPH

High carbon stock loss from peat degradation due to palm oil and HTI development

Relatively high carbon stock loss from deforestation due to palm oil

Improvement in carbon stock due to planting palm oil on degraded land

High carbon stock loss from peat degradation due to palm oil

Total carbon change

tons / ha

🟥	(4000) – (3000)
🟥	(2999) – (300)
🟧	(299)- (150)
🟨	(149) - 0
🟩	1 – 70 (net increase)

SOURCE: ESRI, Ministry of Forestry – Rep. of Indonesia, Wetlands International