



Indonesia's Legal Timber Supply Gap and Implications for Expansion of Milling Capacity:

*A Review of the Road Map for the
Revitalization of the Forest Industry, Phase 1*



With support from



Cover image: Riau NGO Alliance

Indonesia's Legal Timber Supply Gap and Implications for Expansion of Milling Capacity:

A Review of the Road Map for the Revitalization of the Forest Industry, Phase 1

February 2015



ACKNOWLEDGMENTS

This report was prepared by Forest Trends and the Anti-Forest Mafia Coalition (Eyes on the Forest; GAPETA Borneo; Indonesia Corruption Watch; Indonesia Working Group on Forest Finance; Jikalahari; RPHK; Silvagama; Transparency International Indonesia; WALHI; and WWF-Indonesia). Sam Lawson commissioned and contributed to the analysis. James Hewitt provided the analysis of export data collected from Badan Pusat Statistik (Government of Indonesia) and UN Comtrade.

The primary purpose of this report is to provide input on the management of the forest sector to the new administration of President Joko Widodo. We hope that the Ministry of Environment and Forestry will find the results of this report useful in their review of forestry policy, particularly in building a sustainable industry.

We thank Vinda Apriani for her assistance in Indonesia and the Ministry of Forestry and *APKI* for their cooperation. We thank our reviewers all of whom improved the manuscript.

We thank CLUA and the UK Department for International Development for their support.

The authors also thank Forest Trends for their assistance in preparing the manuscript, especially Kerstin Canby, Naomi Basik, Eve Richer, Lina Scott, and Anne Thiel.

ACRONYMS

ADT	Air-Dry Tonnes
AFMC	Anti-Forest Mafia Coalition
APKI	Asosiasi Pulp dan Kertas Indonesia (Indonesia Pulp and Paper Association)
APKINDO	Asosiasi Panel Kayu Indonesia (Indonesian Plywood Sector Association)
APP	Asia Pulp and Paper
ARs	Annual Reports
BAPPENAS	State Ministry of National Development Planning
CIFOR	Centre for International Forestry Research
DfID	UK Department for International Development
DR	Dana Reboisasi (Reforestation Fund)
EU	European Union
FFA4	The Forest Future Scenario Analysis
FAO	Food and Agriculture Organization of the United Nations
FAO-ForeSTAT	Database of the Food and Agriculture Organization of the United Nations' Statistics Division
FLEGT	The EU's Forest Law Enforcement, Governance, and Trade Action Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ha	Hectares
HCS	High Carbon Stock
HCV	High Conservation Value
HPH	Hak Pengusahaan Hutan (Industrial Logging Concessions)
HTI	Hutan Tanaman Industri (Industrial Forestry Plantation)
HTR	Hutan Tanaman Rakyat (Community Plantation Forestry)
IPK	Izin Pemanfaatan Kayu (Land Clearing Permit)
ITTO	International Tropical Timber Organization

IUPHHK	Izin Usaha Permanfaatan Hasil Hutan Kayu (Forest Timber Product Exploitation Permit)
KPK	Komisi Pemberantasan Korupsi (Corruption Eradication Commission)
Mha	Million Hectares
Mm³	Million Cubic Meters
MoAg	Ministry of Agriculture
MoF	Ministry of Forestry
MtCO₂e	Million Metric Tonnes of Carbon Dioxide Equivalent
MTH	Mixed Tropical Hardwoods
PP	Perum Perhutani (State Plantations)
RKT	Rencana Kerja Tahunan (Annual Work Plan)
RPBBI	Rencana Pemenuhan Bahan Baku Industri (Review of Industrial Wood Harvested)
RWE	Roundwood Equivalent
SVLK	Sistem Verifikasi Legalitas Kayu (Timber Legality Assurance System)
TLAS	Timber Legality Assurance System
UNEP	United Nations Environment Programme
USAID	US Agency for International Development
VPA	Voluntary Partnership Agreement



EXECUTIVE SUMMARY

In 2007, the Indonesian Ministry of Forestry (MoF) developed a *Road Map for the Revitalization of the Forest Industry* that aimed, in part, to tackle the sector's two major problems: 1) an insufficient supply of raw material; and, 2) an over-capacity in processing. As the first phase (2007-2014) of the *Road Map* draws to a close, **this paper evaluates whether the Indonesian forestry sector has a sufficient supply of legal timber to meet its growing demand for wood.**

Reports published by the MoF indicate that since 1978, large processors (those consuming more than 6,000 m³ of wood per year) have used the equivalent of more than a billion cubic meters (m³) of wood as value-added plywood processing began dominating the industry in the 1980s, followed by pulp and paper in the 2000s. The pulp and paper sector reportedly now uses about 80 percent of the raw material consumed by large industry in Indonesia. To feed the pulp sector, the MoF reports an increase in both the area planted and the wood used from industrial forestry plantations (*Hutan Tanaman Industri*, or *HTI* in bahasa Indonesia). Most (62 percent) of the *HTI* area is reportedly planted on the island of Sumatra. Given that more than 90 percent of pulp mill capacity is located on Sumatra it is not surprising that 91 percent of the *HTI*-grown wood was reportedly used in pulp mills in Sumatra. However, **the analyses in this paper — which rely on government and forest-industry data only — indicate that large operators are consuming more wood than the MoF reported as being legally produced (in 2014, there was a gap of more than 30 percent).** Presumably this gap continues to be met by an unregulated, and therefore illegal, wood supply.

The analyses also suggest, however, that the **MoF underestimates the scale of the problem. For example, the pulp industry itself** (Indonesian Pulp and Paper Association [Asosiasi Pulp dan Kertas Indonesia (*APKI*)]) **consistently reported almost twice the production levels as the MoF.** Moreover, **timber use by small operators is not reported fully by the MoF, nor does the MoF estimate losses due to smuggling — both of which are likely substantial.**

Further, **there are serious concerns about the plausibility of the MoF data.** While *HTI* use reportedly increased more than tenfold in the decade between 1999 and 2008, the area reported as planted in the previous decade was actually declining. To compound this problem, the plantation sector, more broadly, has failed to achieve the target for production set in the MoF's *Road Map*. In the first phase of the *Road Map*, **the plantation sector has under-performed; the MoF expected HTIs to have produced 46 percent more than industry reportedly used.**

The situation in natural forests is as alarming as the status of plantations. The analyses in this paper indicate that **the majority of timber reportedly harvested from natural forests now comes from clear-cuts** as opposed to selectively harvested forestry concessions. According to MoF data, for every cubic meter harvested from forestry concessions at least two cubic meters are produced from deforestation during land clearing. This ratio, however, is likely an underestimate. Given the total area that the government claims has been planted for oil palm and *HTIs* over the past 25 years, the actual volumes of timber coming from land clearing is undoubtedly dramatically higher — perhaps more than ten times higher. Indeed, this unreported production is likely a major source of the unregulated timber filling the gap in the legal supply.

The discrepancy between the amount of wood consumed by large operators and the amount reported by the MoF as having been legally produced has profound implications for progressive reforms in the Indonesian forest sector. In 2013, both the dominant oil palm company (Wilmar International, the world's largest oil palm trader) and the largest pulp company in Indonesia (Asia Pulp & Paper [APP]) committed to halt deforestation of high-carbon stock (HCS) and high conservation value (HCV) forests and peatlands. While the analyses here make no evaluation of individual companies' ability to meet such commitments, it is clear that **the forest industry as a whole does not have a sufficient legal supply to meet a goal like that of APP or Wilmar. Indeed, if the pulp sector was to operate at full capacity and if the proposed new mills are built in Sumatra, Kalimantan and Papua, then the gap in the legal supply would grow to more than 59 percent of the total wood used.**

This gap in supply also has implications for Indonesia's ability to meet its legal commitments under the newly signed trade agreement with the European Union, the Voluntary Partnership Agreement (VPA), as well as its own Timber Legality Assurance system (*SVLK*, in the Indonesian acronym). Indonesia's *SVLK* requires all timber to be legally produced, and the VPA requires all exports to Europe to carry a license verifying that the shipment is indeed of legal provenance. The analyses herein suggest that **due diligence will be crucial to ensure that all *SVLK* and VPA shipments are genuine and not merely a veneer of legality to what is otherwise illegal wood.**

The conclusions in this report reinforce analyses (and the related conclusions and recommendations) made by the World Bank and the Forest Future Scenario Analysis (FFA4), among others. The sector has failed to resolve either of the major problems — insufficient supply and over-capacity — identified by the MoF in 2007. **At the end of the first phase of implementation of the MoF's *Road Map*, the sector still relies on illegal wood for more than 30 percent of its supply.**

The sustainable management of the forestry sector is critical. Though it remains a relatively small part of the national economy, the forest sector nevertheless plays an outsized role in Indonesia. Its footprint is disproportionately large; forestry-related concessions now cover more than a fifth of the entire country (more than 40 million hectares), which is a major cause of conflict because much of the area is claimed by Indigenous Peoples and other local communities. Moreover, widespread corruption and mismanagement undermines economic and environmental sustainability, robbing the government of billions of dollars annually in lost royalties and undercutting Indonesia's ability to reduce its greenhouse gas emissions (half of which arise from forestry-related activities, such as forest clearing, especially on peat). Combined, the unsustainability of *HTI* production and the reliance on land clearing for timber supply undermines the long-term availability of legal timber. **Until this gap in the legal supply is addressed, the MoF must revise its *Road Map* to include one important addition: Indonesia should not allow for any further expansion in industrial processing capacity.**

TABLE OF CONTENTS

INTRODUCTION	1
BACKGROUND: INDONESIA'S FORESTRY AT A CROSSROADS	2
METHODOLOGY	7
MoF Biases	7
Impacts of Harvesters Not Reporting	9
Reported Use of Raw Materials is Unrealistically Low	9
Reporting on the Provenance of Wood	10
Corroborating Data	10
Confidentiality	10
RESULTS & IMPLICATIONS	14
Use by Industry	14
Timber Supply	16
Consumption Exceeds Supply	17
The Gap Was Reportedly Closing	18
The Role of Plantations in Supply	18
Plantation Supply is Concentrated on Pulp-Producing Species in Sumatra	18
HTI Use	22
Patterns of HTI Use Over Time	23
Conclusions About the Credibility of the HTI Data	25
The Role of "Other" and IPK in Supply	25
Elucidating the "Other" Category	25
What if the Average MTH Logged during Land Clearing Is Not 88 m ³ /ha?	28
Implications of the Large Harvest Associated with Land Clearing	29
Review of Phase 1 of the MoF's <i>Road Map for the Revitalization of Indonesia's Forest Industry</i>	31
CONCLUSION	32
REFERENCES	34

LIST OF TABLES

TABLE 1	Number of Large Companies that Reported in the MoF <i>RPBBI</i> between 2008 and 2014.....	8
TABLE 2	Conversion Rates to Obtain the RWE Content for Forest Products.....	9
TABLE 3	Reported Production of Processed Wood Products by Large Industry	11
TABLE 4	Reported Source of Timber Consumed by Large Industry.....	12-13
TABLE 5	Yield of Mixed Tropical Hardwoods Harvested during Land Clearing for <i>HTIs</i> in Sumatra.....	27

LIST OF FIGURES

FIGURE 1	Licensed Area Reported Under Forest-Related Activities	2
FIGURE 2	Major Sources of Indonesian Greenhouse Gas (GHG) Emissions.....	4
FIGURE 3	Reported Use (in Roundwood Equivalent) by Large Industry between 1978 and 2014.....	14
FIGURE 4	Production of Pulp Reported by the MoF and by Industry (<i>APKI</i>) and the Reported Use of Wood from Plantations.....	15
FIGURE 5	Reported Source of Timber Consumed by Large Industry between 1991 and 2014.....	16
FIGURE 6	A Comparison of Reported Timber Use vs. Supply	17
FIGURE 7	Cumulative Area Licensed for <i>HTIs</i> and Reported as Planted between 1990 and 2013.....	19
FIGURE 8	Area of <i>HTIs</i> Reported Planted by Use between 1989 and 2006	20
FIGURE 9	Area of <i>HTIs</i> Reported Planted between 1989 and 2011	21
FIGURE 10	Area of <i>HTIs</i> Reported as Planted by Province between 1989 and 2011	22
FIGURE 11	Pattern of <i>HTI</i> Use over Time between 1994 and 2014	23
FIGURE 12	Reported Supply of Timber from Land Clearing (<i>IPK</i>) Consumed by Large Industry by Province from 1994 to 2014	25
FIGURE 13	Reported Timber Supply Consumed by Large Industry between 2008 and 2014	26
FIGURE 14	Potential Timber Harvest Associated with Land Clearing for Plantations	28
FIGURE 15	Potential Harvest Associated with Land Clearing for Plantations at the Lowest FFA4 Yields.....	29
FIGURE 16	The Origin of Timber Logged from Natural Forests.....	30



INTRODUCTION

This paper examines the status of forestry in Indonesia, including whether the sector has a sufficient supply of legally produced wood from plantations to feed an expansion in milling capacity. It reviews progress towards the objectives of the first phase (2007-2014) of the Indonesian Ministry of Forestry's (MoF) *Road Map for the Revitalization of Indonesia's Forest Industry* (Ministry of Forestry 2007). The paper concludes that if government and industry data are correct then there remains a large gap in the supply of legal timber. Indeed, the supply from plantations is dramatically under-performing. Unfortunately the MoF's conclusions from 2007 remain valid: the two "major problems" facing Indonesia's timber supply are "1) Insufficient supply of raw material; [and] 2) Over capacity." Given these assumptions, **there should be no expansion in milling capacity until 1) a verifiable, sustainable supply from plantations exists; and 2) timely, independent, public reporting of accurate data is available for monitoring and evaluation.**

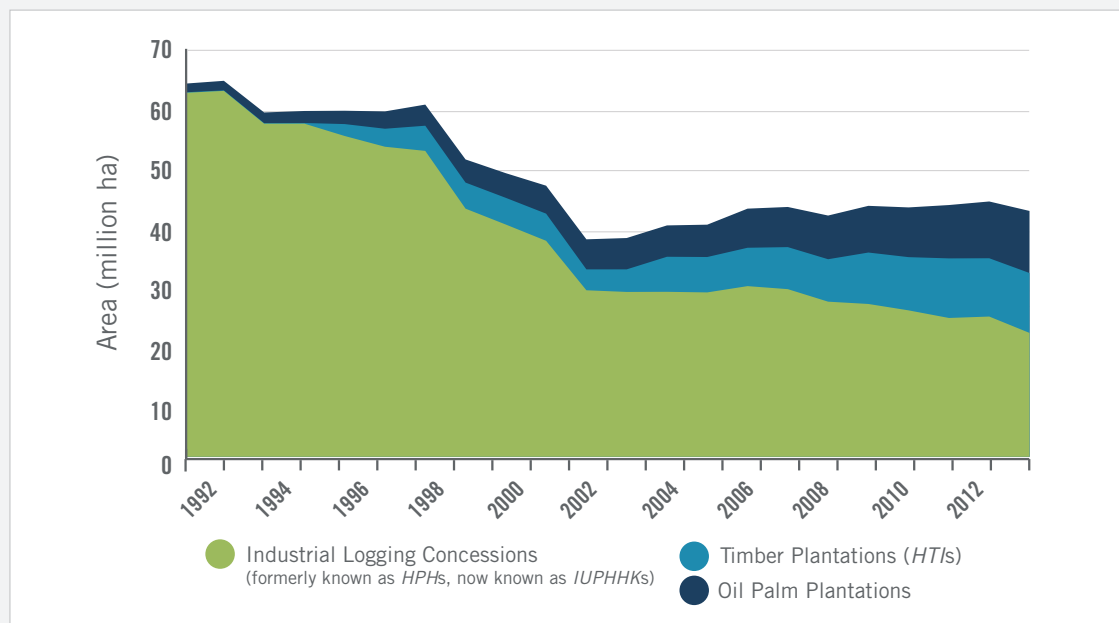
BACKGROUND

Indonesia's Forestry at a Crossroads

According to the Indonesian MoF, the forest sector has steadily declined over the last decade from 1.03 percent of GDP in 2001 to 0.63 percent in 2013 (Ministry of Forestry 2013). **Though it remains a relatively small part of the national economy, the forest sector nevertheless plays an outsized role in Indonesia.** First, forestry is important because **its footprint is disproportionately large** compared to any other industry. In the early 1990s, logging concessions alone covered more than a third of the entire country (more than 60 million hectares [Mha]). Albeit reduced in area, more than 40 Mha remain under forest sector activity, almost half of which are now plantations (**Figure 1**)

FIGURE 1

Licensed Area Reported under Forest-Related Activities



Note: Not all this area is in production, nor has all the area licensed to plantations been planted.

Source: Logging & HTI (Ministry of Forestry 2013); Oil palm (Ministry of Agriculture 2014).

Second, across this footprint, **widespread corruption and mismanagement undermine economic and environmental sustainability, drive policies that disempower local communities, and rob Indonesia of forestry taxes** needed for development (the losses are estimated to be at least US\$ 2 billion/year; Human Rights Watch 2013).

Third, change in the sector is causing substantial economic repercussions. The industry is moving from the selective logging of natural forests under an industrial concession model to a plantation-based model that focuses on clearing natural forests for oil palm and forestry plantations (the latter known by the Indonesian acronym *HTI* [*hutan tanaman industri*; industrial plantation forests operated by the private sector] and *perum perhutani* [state plantations]). The move to plantations is driven in part by a declining timber supply which “can be traced back to poorly designed policies that prioritized industrial capacity expansion and did not ensure a sustainable supply of timber” (Obidzinski and Chaudhury 2009). The subsidized promotion of pulp and paper has furthered “the supply-demand imbalance that has plagued Indonesia’s forestry sector for decades [and] is the key underlying structural problem that drives illegal logging. According to the MoF, in 2006 the supply shortage of about 40 million m³ was met with illegally harvested logs” (Obidzinski and Chaudhury 2009).

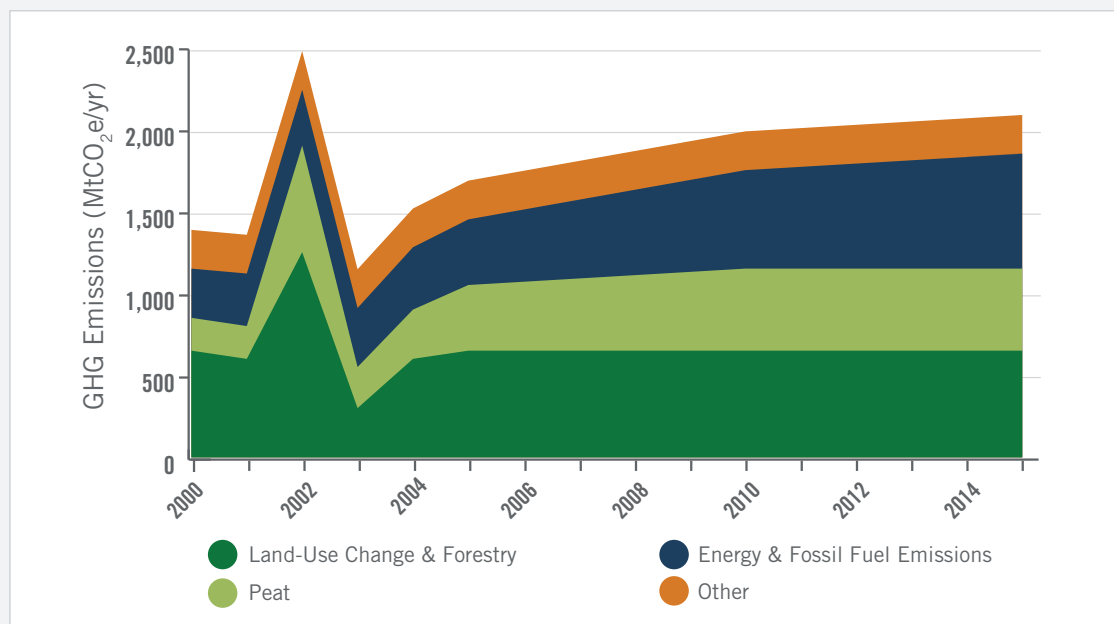
This changing forestry model has led to social upheaval. In the early 2000s, **nearly one-third of Indonesia’s three million forestry workers lost their jobs** (primarily as plywood manufacturing declined), and now “all too often migrant workers dominate work... in the plantation sector, thus leading to social conflict” (Obidzinski and Chaudhury 2009).

Fourth, the sector has had a **profound and deleterious effect on the nation’s forest cover**. Between 2000 and 2012 Indonesia lost more than 6 Mha of primary forest; most troubling is that the annual rate of loss is increasing (Margono et al. 2014). “Of all countries globally, Indonesia exhibited the largest increase in forest loss” (Hansen et al. 2013). This forest loss contributes to massive carbon emissions as clearing is often accomplished by fire. In addition, the pulp and paper industry, one of the main drivers of deforestation in Indonesia, has relied heavily on developing pulp plantations on peat soil, which contributes further to massive carbon emissions (Hooijer et al. 2012).

These emissions dominate Indonesia’s contribution to climate change. At present, **over half of Indonesia’s greenhouse gas (GHG) emissions are from the forest sector (Figure 2)**. More than a third of these forest-related emissions are from peatlands, which cover 22.5 Mha (80 percent of Southeast Asia’s peatlands). GHG emissions generated by the draining and clearing of peat are exacerbated when fires burn the deep, organic matter. In 1997, fires in Indonesia’s peatlands emitted between 800 and 2,600 million metric tons of carbon dioxide equivalent (MtCO₂e), which equaled between 13 and 40 percent of that year’s fossil fuel emissions worldwide (Page et al. 2012). Siting plantations on peatlands makes it even harder for the Indonesian government to meet its stated intention to reduce GHG emissions by 26 percent by 2020.

FIGURE 2

Major Sources of Indonesian Greenhouse Gas (GHG) Emissions



Note: The spike is a result of land clearing and forest burning during an El Niño drought.

Source: Ministry of Finance. 2009. "Ministry of Finance Green Paper: Economic and fiscal policy strategies for climate change mitigation in Indonesia." Ministry of Finance and Australia Indonesia Partnership, Jakarta. <http://www.illegal-logging.info/sites/default/files/uploads/IndonesiasiaranpdfGreenPaperFinal.pdf>

All of these factors interact to further increase the impact of forestry in Indonesia. For example, **as the plantation sector grows, social conflicts increase**,¹ often sparking violence between communities, forestry operators, and their security forces (which sometimes include both the police and military; Government of Indonesia Joint Fact-Finding Team 2012). In 2012, President Susilo Bambang Yudhoyono's office received reports of 8,495 agrarian conflicts, of which 2,002 were "likely to erupt into violence" (Human Rights Watch 2013).

In order for the forest sector to face all the challenges identified above — or even just to address one — good information is critical. **Without accurate data, Indonesia is crippled in its approach to improving governance and implementing sound management of its forest estate.** In the past there have been serious attempts to provide such an analysis; perhaps the most important quantitative examination of long-term timber policy options was the *Forest Future Scenario Analysis* (FFA4, a joint program in the early 2000s of the MoF and BAPPENAS [the national planning agency], the US Agency for International Development (USAID) and UK Department for International Development (DfID), and the Multistakeholder Forestry Programme).² FFA4 was prompted by analyses from the late 1990s that found the total consumption of raw material (domestic demand

¹ Just as Forest Watch Indonesia predicted in 2002: "Since Suharto's fall, conflicts have multiplied in both number and intensity... such conflicts are likely to spread as HTI areas expand" (Forest Watch Indonesia and Global Forest Watch 2002). And see, Huma, Forest Peoples Programme, Wahana Bumi Hijau, Scale Up, Rainforest Action Network, Jaringan Masyarakat Gambut Riau, Jaringan Masyarakat Gambut Jambi, Link-AR Borneo, Persatuan Petani Jambi, KPA Hijau and Pusaka. 2015. APP's Performance in Meeting Its Social Responsibility Commitments. http://www.ran.org/app_performance_2015

² For a description of FFA4's work see: http://forest-trends.org/documents/files/doc_1112.pdf.

plus exports) exceeded the legal timber supply (licensed production plus imports) nearly fourfold, implying that at least 70-80 percent of logging in Indonesia was illegal (Lawson and MacFaul 2010). **The MoF's 2007 Road Map for the Revitalization of Indonesia's Forest Industry and the FAO's 2009 Indonesia Forestry Outlook Study largely reflected FFA4 analyses (FAO 2009).**

More recently, the results of similar “wood balance” calculations have been met with skepticism, in part because of the rapid increase in the “legal” supply reported by the MoF; that is, the reported volume of wood grown on plantations³ more than doubled in use from 1999 to 2000, then more than doubled again from 2002 to 2005, and almost doubled a third time from 2005 to 2008 (jumping from 2 million m³ [Mm³]/year to 5 Mm³/year to 14 Mm³/year to 22 Mm³/year). Many researchers consider such a rapid jump in legal supply from plantation-grown timber to lack credibility.⁴ Further, reported volumes sourced from licensed land clearing (known by the Indonesian acronym *IPK*) fell precipitously in 2011 (from 14.3 Mm³ to just 600,000 m³), while reported production from “other” sources grew just as rapidly. Such anomalies raise questions about the validity of the MoF reports.

A number of scenarios may explain the sudden changes in the official statistics. A recent United Nations Environment Programme (UNEP) and Interpol report suggested that elevated plantation production may be the result of illegal timber from elsewhere (especially from land clearing) being laundered into the legal supply and claimed as plantation wood (UNEP and INTERPOL 2012).

The development of Indonesia's *Legality Verification Systems for Timber*, (*Sistem Verifikasi Legalitas Kayu*; [SVLK] in the Indonesian acronym), which anchors the Voluntary Partnership Agreement (VPA)⁵ with the European Union (EU), should make it harder to sell illegally produced wood and should thus encourage companies to “legalize” their logging. But the SVLK was not required until 2013, so the SVLK would have had little impact on the timber production analyzed in this paper.

In order to elucidate these trends, therefore, **this paper examines the veracity of the plantation and land-clearing data and evaluates the likelihood that Indonesia has sufficient legal timber supply to meet its growing demand for wood.** This is especially relevant given that the world's largest oil palm trader, Wilmar International, committed to halting clearing of high carbon stock and high conservation value forests as well as peat lands (Wilmar International 2013), and Indonesia's largest pulp and paper company, Asia Pulp and Paper (APP), declared it would no longer log the tropical rainforests of Indonesia.⁶ Despite having one of the world's largest systems of plantations (covering more than two Mha), until 2013, APP had been unable to find an adequate supply for its mills without resorting to wood harvested from natural forests. If Indonesia's legal timber supply is insufficient, then **exports of forest products (reportedly worth more than US\$10 billion in 2013) may be curtailed** as suspect production would fail the SVLK. If the SVLK does not catch illegal timber, it will undermine the success of the VPA (Ministry of Finance 2012).

The findings of this paper highlight the persistent weakness in several areas of reporting in the sector with significant implications for forest management and the monitoring of the dynamics described above. This is not a new problem, nor a new observation (World Bank 2007); the MoF itself noted that the lack of reliable data

³ This assumes that all the reported wood used from *Hutan Tanaman* (i.e., *Perum Perhutani* & *IUPHHK-HT*) is plantation-grown. If this assumption is invalid, and MTH from natural forests is included in the HT volumes, then MoF data exaggerate the timber yield from forestry plantations.

⁴ See Figure 4 in: <http://cifor.org/online-library/browse/view-publication/publication/3142.html>.

⁵ The VPA is a binding trade agreement in which Indonesia agrees to license all timber exports as being legal and the EU agrees to prevent the import of unlicensed shipments, thus reinforcing rule of law in Indonesia. The VPA is a major plank in the EU's Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan.

⁶ APP claims it will only log forest classified as “old scrub/regenerating forest” or younger: <http://clients.squareeye.net/uploads/tft/APP-Forest-Conservation-Policy.pdf>.

was a key hindrance to forest management and law enforcement in Indonesia. However, the analyses contained in this paper demonstrate that significant concerns remain after the completion of the first phase of the MoF's *Road Map*. The paper concludes by reviewing the implications of the analyses and suggests enhanced due diligence to reinforce the reforms aimed at improving forest governance. Moreover, it argues that **no increase in milling capacity should be allowed until a sustainable supply from plantations is proven to exist.**



METHODOLOGY

This paper compares domestic production of timber (and imports) to consumption. **Data were obtained from Annual Reports (ARs) published by the MoF** from 1990 to 2013 and the **MoF Reviews of Industrial Wood Harvested** (*Rencana Pemenuhan Bahan Baku Industri; RPBBIs*) for 2008 to 2014 that were available online (Ministry of Forestry 2008-2014).⁷ In collating the data, the latest report published by the MoF was used — on the assumption that the most recent report provides the most time for the MoF to correct any errors.

Before describing the methodology further, there are a number of underlying issues that must be discussed.

Ministry of Forestry Biases

MoF data are biased toward underestimating production because smuggling and small producers are ignored. While the MoF publishes two *RPBBI* reports each year — one based on the consumption of large processing companies (i.e., those consuming more than 6,000 m³ of wood that year) and another for the smaller operators — **the ARs only include data for the approximately 250 large companies** (see **Table 1**). This is presumably because the MoF considers the more than 500 “small” companies to be inconsequential; indeed, MoF *RPBBIs* for small operators report less than one Mm³ of raw material used per year (or approximately five percent of the consumption of the larger companies).

This assumed insignificance may not be valid if the majority of small operators are simply not reporting to the MoF. The problem is that it is difficult to ascertain the actual number of small operators in Indonesia, much less their combined consumption of raw materials. One indication that they may, in fact, be substantial is that the FAO-ForeSTAT estimated total roundwood production for Indonesia in 2011 (the most recent data available) to be 118 Mm³, whereas the MoF 2011 *RPBBI* reported use of industrial roundwood by the large operators at only 43 Mm³. This suggests that large companies may account for less than 37 percent of timber used in Indonesia, rather than the 95 percent that the *RPBBI* data suggest.

Moreover, the MoF fails to estimate the amount of timber that is smuggled out of Indonesia. This unreported production may be substantial, too. For example, for 2009 (the most recent data available), the FAO-ForeSTAT trade flow database indicated that countries reported importing \$153 million of roundwood from Indonesia, *none* of which had been reported by Indonesia on export. While this discrepancy may be a result of tax evasion within Indonesia, it likely represents only a fraction of the timber that is smuggled out of Indonesia and that goes unreported by any authority (in Indonesia or the importing country).

⁷ The ARs from 2001 to 2013 are available online (<http://www.dephut.go.id>, under Publikasi Kehutanan; Statistik Kehutanan); the ARs for 1990-2000 were obtained from MoF headquarters (Manggala Wanabakti) in Jakarta. The *RPBBIs* are available online (<http://rpbbi.dephut.go.id>)

TABLE 1Number of Large Companies that Reported in the MoF *RPBBI* between 2008 and 2014

Province	Number of Large Companies Reporting						
	2008	2009	2010	2011	2012	2013	2014
Sumatera Utara	10	13	19	18	16	20	21
Riau	11	10	11	12	12	13	13
Jambi	8	9	10	12	12	13	12
Sumatera Selatan	4	7	6	8	7	7	8
Lampung	4	4	4	4	2	3	3
Bengkulu	1	1	1	1	1	1	1
Kepulauan Riau	1	1	0	0	0	0	0
Sumatera Barat	1	1	0	0	0	0	0
Nanggroe Aceh Darussalam	0	0	1	0	0	0	0
Kalimantan Timur	32	34	31	29	28	26	25
Kalimantan Selatan	16	19	16	13	13	13	13
Kalimantan Barat	8	9	9	7	5	5	5
Kalimantan Tengah	6	7	7	7	7	6	6
Jawa Timur	22	35	55	60	63	73	80
Jawa Tengah	21	27	32	33	38	45	52
Jawa Barat	1	2	5	5	5	8	9
DKI Jakarta	1	1	1	1	1	1	1
Sulawesi Selatan	8	8	8	8	8	7	5
Sulawesi Tengah	1	1	1	0	0	0	0
Papua Barat	4	5	6	7	7	7	8
Papua	4	5	5	6	5	7	7
Banten	3	3	3	3	4	4	4
Maluku	1	1	1	1	1	1	1
Bali	0	0	1	1	1	1	1
TOTAL	168	203	233	236	236	261	275

Note: Only companies that consumed more than 6,000 m³ of wood per year are included. Provinces not listed did not report any processing by large companies.

Impacts of Harvesters Not Reporting

MoF data are further biased toward under-reporting because harvesters do not report. Instead, MoF data are based on the reports made by the wood-processing companies themselves. Relying solely on this self-reporting means that **any harvest that does not enter these processing mills will not be reported and is thus unaccounted for by the MoF**. (Moreover, the companies themselves may have incentives to underestimate production in their self-reporting, e.g., to evade taxes/royalties.)

This system should change **with the new SVLK**, if implemented properly. **Timber producers, not just processing mills, will have to report** and track the harvest of raw material, including production from *HTIs* and land clearing. However, the *SVLK* has been heavily criticized by civil society (Anti-Forest Mafia Coalition 2014), including its own “self-reporting” aspect, and it remains to be seen whether or not the MoF will publish producer reports.

Reported Use of Raw Materials Is Unrealistically Low

Additional evidence of under-reporting is that raw material use appears to be low. For the ARs and *RPBBIs*, the large processors report both the amount of products they manufactured and the amount of raw material they used (*kayu bulat*; see **Table 3**). However, the reported use of raw material is less than expected given standard conversion rates used by industry for determining the amount of roundwood equivalent (RWE) contained in processed products (see **Table 2**). For the years that MoF has published reports online (2000-2014), the reported use of raw material was on average 35 percent lower each year than the likely RWE use. To correct for this under-reporting, consumption in the forestry sector is based on the calculated RWE for the reported production for each of the various processed products using the conversion rates in Table 2.

TABLE 2

Conversion Rates to Obtain the RWE Content for Forest Products

Product	Conversion Rate
Sawnwood	1.8 m ³ RWE/m ³
Plywood	2.3 m ³ RWE/m ³
Veneer	1.9 m ³ RWE/m ³
Wood Chips	1 m ³ RWE/m ³
Particle Board	1.4 m ³ RWE/m ³
Processed Products	4 m ³ RWE/m ³
Semi-Processed Products	1.3 m ³ RWE/m ³
Pulp	4.9 m ³ RWE/ADT*

Note: Conversion factors for Indonesia are drawn from the ITTO, United Nations Economic Commission for Europe (UNECE), the Centre for International Forestry Research (CIFOR), and the world's largest forestry consulting firm, Jaako Poyry.

*Air-dry tonnes

Reporting on the Provenance of Wood

Another problem with the MoF reports is that the processing **companies do not report the origin of their raw material**. For example, if a pulp mill in Riau province, Sumatra, produces 300,000 air-dry tonnes (ADT) of pulp from *HTIs* in Riau and 100,000 ADT from *HTIs* in East Kalimantan (KalTim), the MoF *RPBBIs* and ARs would report all this *HTI* use in the Riau data (and the fact that one quarter of the harvest was from KalTim would go unreported). This lack of information on the provenance of production makes it impossible, for example, to calculate the productivity of plantations in a given province.⁸

Corroborating Data

In addition to the inability to cross-check consumption against harvests, there is little ability to corroborate MoF reporting with other sources. For example, the International Tropical Timber Organization (ITTO) has been simply repeating data on production for Indonesia since 2008 in their annual reviews,⁹ presumably because reporting by the MoF to ITTO is incomplete. The only industry reports available to corroborate the MoF data are from the Indonesia Pulp & Paper Association (*APKI* in the Indonesia acronym), which unfortunately ceased reporting in 2010.¹⁰

Confidentiality

An Indonesian assistant requested information from the MoF and *APKI*, but before releasing anything, both insisted on a letter explaining the basis for the request. In the end both provided information, although the MoF has not yet released information disaggregated by company — they only provided material that was otherwise already public (although not all available online). Civil society sources report that **the MoF considers company-level plans** such as Annual Work Plans (*RKT* in the Indonesian acronym) **to be “confidential business information” and not subject to public disclosure**. This is problematic and would seem to be contrary to the Law on Public Information (*Undang-Undang Keterbukaan Informasi Publik*; Human Rights Watch 2013). This lack of transparency should change when the recently signed VPA comes into force. The VPA's Appendix on *Information to Reinforce Verification, Monitoring and the Functioning of the TLAS* states that for all timber from forests on state-owned lands (including natural forest timber concessions [*IUPHHK-HA/HPH*], industrial concessions [*IUPHHK-HTI/HPHTI*], and ecosystem restoration concessions [*IUPHHK RE*]) and forests managed by local communities (including community timber plantations [*IUPHHK-HTR*] and community forests [*IUPHHK-HKM*]), “document[s] to be made publicly available” include “Annual Work Plan (*RKT*/Blue Print) including map” (European Union 2013).

Other than matters of transparency and accountability, the lack of access to the underlying company data means that, as mentioned above, it is impossible to determine company-level timber supply or usage.

⁸ Using a real example: in the MoF's 2012 AR, Table V.6.2 entitled: “Log production based on source of log production (*Produksi kayu bulat nasional berdasarkan sumber produksi*)”, the province of Jambi reported 3,227,104 m³ under the column for *HTI*. This estimate was obtained by the MoF as the sum of the volume of wood sourced from *HTIs* that the 12 companies in Jambi reported as using (see Figure 4, line No. 7 and column *IUPHHK Pada Hutan Tanaman Industri atau HTI*). But this self-reporting does not necessarily mean that the 12 companies obtained all the fiber from *HTIs* in Jambi only.

⁹ Available at http://www.itto.int/annual_review/

¹⁰ <http://apki.net> does not publish any data online. In 2013, they charged 300,000 Rp (approximately US\$30) for their 2010 report.

TABLE 3

Reported Production of Processed Wood Products by Large Industry
Realisasi Penggunaan Bahan Baku Dan Produksi Yang Dihasilkan Industri Primer Hasil Hutan Kayu Tahun 2014

No.	Provinsi	Penggunaan Bahan Baku Kayu Bulat (m ³)	Penggunaan Bahan Baku Kayu Olahan Setengah Jadi (eks perolehan dari IPHHK Lain) (m ³)	Penggunaan Bahan Baku Limbah (eks perolehan dari IPHHK lain) (m ³)	Produski Plywood & LVL (m ³)	Produski Veneer (m ³)	Produski Kayu Gergajian (m ³)	Produski Serpih Kayu (m ³)	Produski Pulp (Ton)
1	Bali	32,160.71	–	–	5,494.81	–	11,176.93	–	–
2	Banten	91,083.79	228,926.91	–	218,036.35	1,413.44	14,894.70	–	–
3	Bengkulu	17,165.57	–	–	–	11,593.40	–	–	–
26	Riau	24,325,950.80	12,273.64	–	110,731.56	–	45,782.02	17,598,027.62	4,218,946.73
27	Sulawesi Barat	–	–	–	–	–	–	–	–
28	Sulawesi Selatan	332,180.08	30,446.15	669.19	121,124.25	68,623.38	4,385.75	–	–
29	Sulawesi Tengah	–	–	–	–	–	–	–	–
30	Sulawesi Tenggara	–	–	–	–	–	–	–	–
31	Sulawesi Utara	–	–	–	–	–	–	–	–
32	Sumatera Barat	–	–	–	–	–	–	–	–
33	Sumatera Selatan	2,441,360.71	279,462.42	–	25,416.64	30,825.59	21,349.12	488,624.51	376,345.13
34	Sumatera Utara	1,328,848.41	3,022.16	–	22,681.69	648.51	122,649.47	–	187,609.49
	JUMLAH	45,232,428.29	1,088,544.69	11,102.81	3,422,600.88	939,821.70	1,354,342.98	23,613,824.07	5,635,696.20

Note: Only includes companies that consumed more than 6,000 m³ of wood.

Figure legend: The third column *Penggunaan Bahan Baku Kayu Bulat* is the volume (m³) of raw material that the sector reportedly consumed in 2011 (the same as the second column from the right in Figure 4); the remaining columns capture the volume of production (in m³, except pulp) of: Wood Blocks; Semi-processed Material; Plywood; Veneer; Sawnwood; Wood Chips; and Pulp (in air-dry tonnes [ADT]).

Source: 2014 MoF *RPBBI*.

TABLE 4

Reported Source of Timber Consumed by Large Industry
Daftar Rekapitulasi Pemenuhan Bahan Baku Tahun 2014 Nasional

No.	Provinsi	Jumlah Perusahaan	Sumber Atau Asal Usul Bahan Baku						
			Stock (*) di IPHHK Tanggal 31 Desember Tahun Sebelum nya (m ³)	IUPHHK Hutan Alam (m ³)	IUPHHK Pada Hutan Tanaman Industr atau HTI (m ³)	LC Penyiapan Lahan Penanaman HTI (m ³)	Perum Perhutani (m ³)	Izin Lainnya Yang Sah (ILS) Atau IPK (m ³)	Hutan Rakyat (m ³)
1	Bali	1	8,809.32	20,429.02	–	–	–	1,421.61	4,626.00
2	Banten	4	17,009.47	–	–	–	–	–	61,903.22
3	Bengkulu	1	–	–	–	–	–	–	10,915.05
26	Riau	13	1,593,295.90	47,873.41	19,852,965.95	2,493,235.87	–	24,671.71	1,090,506.65
27	Sulawesi Barat	0	–	–	–	–	–	–	–
28	Sulawesi Selatan	5	33,923.33	134,676.47	–	10,127.82	–	84,045.17	91,100.74
29	Sulawesi Tengah	0	–	–	–	–	–	–	–
30	Sulawesi Tenggara	0	–	–	–	–	–	–	–
31	Sulawesi Utara	0	–	–	–	–	–	–	–
32	Sumatera Barat	0	–	–	–	–	–	–	–
33	Sumatera Selatan	8	64,703.29	–	1,542,060.87	78,787.91	–	–	466,513.76
34	Sumatera Utara	21	178,375.86	63,423.50	513,364.73	498,313.95	–	22,476.31	78,550.01
	JUMLAH	275	3,586,338.92	5,003,533.97	29,281,244.39	3,356,096.09	141,804.69	594,601.35	4,959,969.83

Note: Only includes companies that consumed more than 6,000 m³ of wood.

Figure legend: The second column from the right reflects the reported volume (m³) of raw material consumed by industry in each province (and is the same as the third column in Table 3), and the column to the left (*Jumlah*) is the volume of raw material reportedly consumed in 2011 — the difference being the volume remaining over at the start of the next year, which is represented by the fourth column [*Stock* (*)...]. The third column, *Jumlah perusahaan*, is the number of companies reporting. The columns to the right of *Stock* are volumes of timber sourced from: Concessions; HTIs; Land Clearing for HTIs; State Plantations; Other Legal Permits or IPK; Community Forests; Timber Plantations; Imports; Auctions; Private Sources; & Other Licenses.

Source: 2014 MoF RPBBI.

Sumber Atau Asai Usual Bahan Baku						Bahan Baku Telah Dimanfaatkan (m³)	Bahan Baku Belum Di Manfaatkan (m³)
Kayu Perkebunan (m³)	Impor Kayu Bulat (m³)	Hasil Lelang (m³)	Pemilik atau Pedagang Hasil Hutan Kayu Bulat Dan Asal Usul Yang Sah (m³)	IPHHK Lain (m³)	Jumlah (m³)		
–	–	–	–	1,345.49	36,631.44	32,160.71	4,470.73
16,407.17	–	–	–	606.13	95,925.99	91,083.79	4,842.20
6,900.50	–	–	–	–	17,815.55	17,165.57	649.98
43,399.50	128,419.13	–	–	–	25,274,368.12	24,325,950.80	948,417.32
–	–	–	–	–	–	–	–
9,514.72	–	–	–	–	363,388.25	332,180.08	31,208.17
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–
257,388.15	256,057.14	–	–	–	2,665,511.12	2,441,360.71	224,150.41
127,837.89	2,037.95	–	–	12,304.80	1,496,684.99	1,328,848.41	167,836.58
642,125.13	405,408.23	–	67,935.49	789,743.48	48,828,801.56	45,318,656.51	3,510,145.04

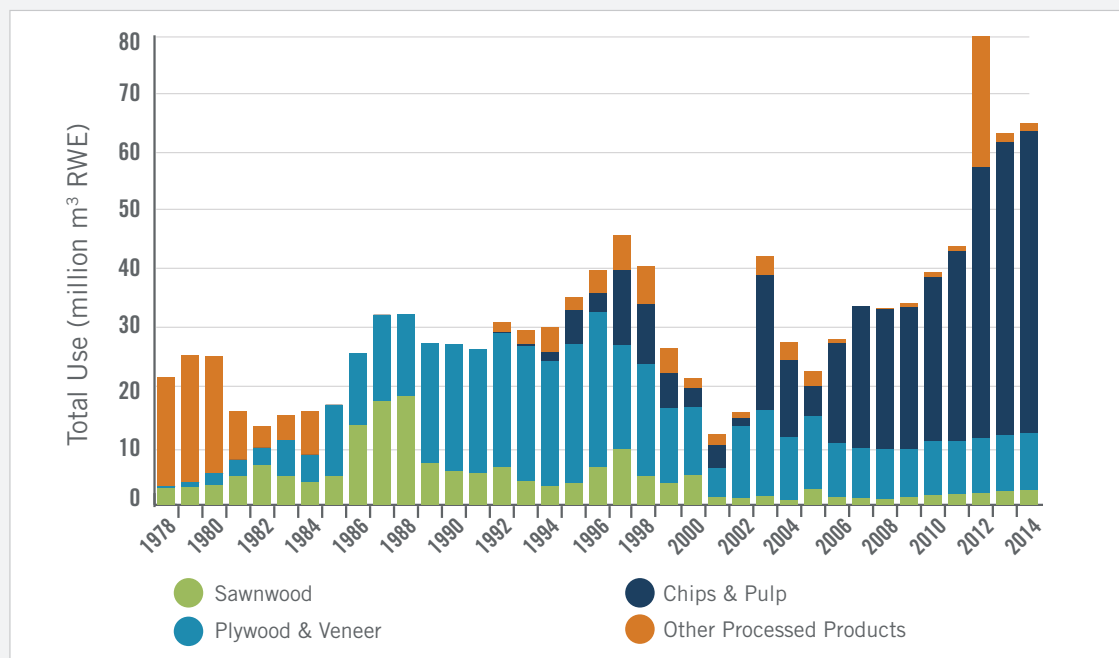
RESULTS & IMPLICATIONS

Use by Industry

Figure 3 portrays the development of the Indonesian forestry sector over the past four decades. According to the MoF ARs and *RPBBIs*, the sector became dominated by plywood manufacturing in the late 1980s and then by pulp and paper in the early 2000s. Given standard conversion rates, the roundwood equivalent needed for this reported production of forest products by large industry is more than one billion m³ (Figure 3).

FIGURE 3

Reported Use (in Roundwood Equivalent) by Large Industry between 1978 and 2014



Note: The figure only includes companies that consumed more than 6,000 m³ of wood per year.

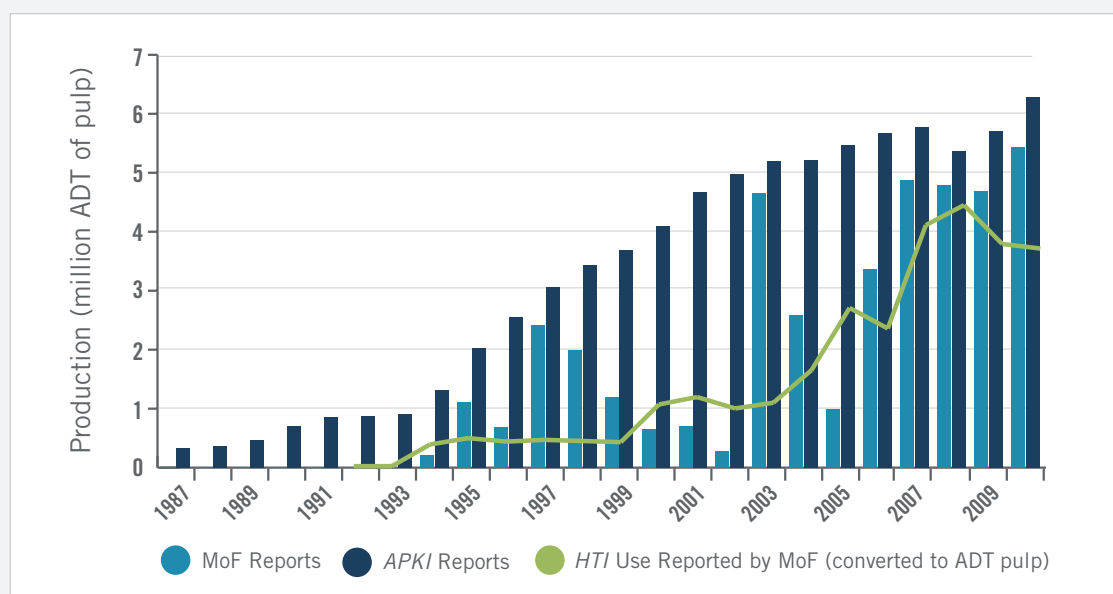
Source: MoF ARs from 1978 (the earliest data available) to 2013, from then *RPBBIs*.

There is, however, a major concern regarding the accuracy of **Figure 3**. *APKI* has reported 1.9 times more pulp production (by 38 million ADT) than the MoF reported (**Figure 4**). Moreover, *APKI* reported greater pulp production than could have been met by the plantation wood reportedly used by industry (the green line in **Figure 4**).

In its last published report in 2010, *APKI* recorded an industrial pulp-processing capacity of 7.9 million ADT. However, the mills were not operating at full capacity. They were reportedly only producing 6.3 million ADT of pulp. In contrast, MoF reported production of only 5.4 million ADT of pulp.¹¹ The difference in production in 2010 (900,000 ADT) is equivalent to 4.2 Mm³ of roundwood, or 23 percent more than the entire volume of plantation-grown wood reportedly used that year.

FIGURE 4

Production of Pulp Reported by the MoF and by Industry (*APKI*) and the Reported Use of Wood from Plantations



Note: MoF reporting is for companies that consumed more than 6,000 m³ of wood per year. The MoF does not report any pulp or plantation production before 1994. *APKI* stopped reporting in 2010.

Source: *APKI* ARs; MoF ARs to 2007, from then *RPBBIs*.

Production data is not available directly from *APKINDO* (the Indonesian plywood association), but Fenton (1996) cites *APKINDO* data for 1989-1993. Similar to the *APKI* trends, during these five years, the *APKINDO* plywood production data was consistently 10 to 16 percent greater than that reported by the MoF, thus reinforcing the conclusion that the MoF is underestimating domestic timber consumption.

The next section compares the timber supply available to meet the above demands. It concludes that the legal supply was dramatically less than that predicted in the *Road Map*. A major contributor to this shortfall was the underperformance of the *HTI*-plantation sector.

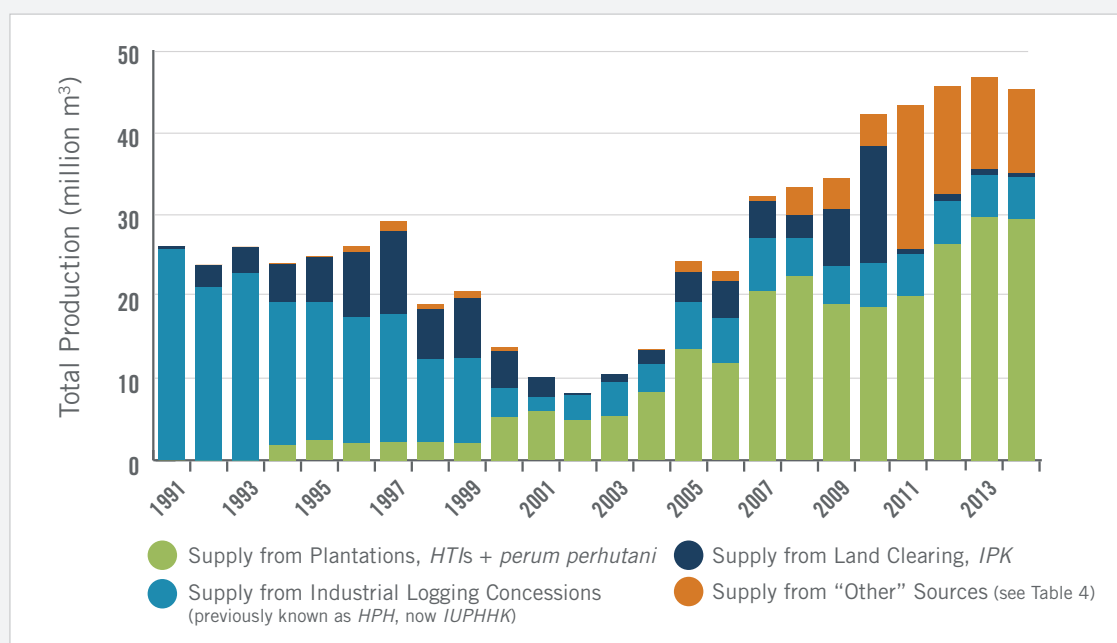
¹¹ *APKI* and MoF also report different volumes of pulp exports: 2.6 million ADT and 2.9 million ADT, respectively. Both report imports of 1.3 million ADT.

Timber Supply

Figure 5 demonstrates two major trends in the source of wood reportedly used by large industry. First, since 2000, **an increase from plantations has reportedly offset a dramatic decline in logging** from industrial concessions. Second, since 2010, there has been a dramatic increase in the use of mixed tropical hardwood (MTH) species felled during **land clearing** (from the deforestation needed to create new plantations, for example), as well as from the “other” categories.

FIGURE 5

Reported Source of Timber Consumed by Large Industry between 1991 and 2014



Note: The figure only includes companies that consumed more than 6,000 m³ of wood per year.

Source: MoF ARs to 2013, then RPBBIs.

For the period 2007 to 2014, the MoF's target for harvest was 630 Mm³. However, the sector only managed to produce about half this volume, missing the MoF's target by 308 Mm³ (49 percent).

Over half of the shortfall (192 Mm³) was due to industry's failure to use any wood from estate crops. In their 2007 *Road Map*, the MoF wrote that the “use [of] rubberwood (*Hevea brasiliensis*), coconut wood (*Cocos nucifera*) [and] oil palm wood (*Elaeis guineensis*) as raw materials [was not occurring] because of the abundant supply of roundwood from natural forests in the past. Ironically, this still remains the case despite the drastic decline in roundwood supplies from natural forests” (Ministry of Forestry 2007). In 2014, according to the MoF data, industry has still failed to shift its supply from MTH to estate crops.

The second **major failure in meeting the MoF's supply-targets is the insufficient production from the HTI-plantation sector**. In their *Road Map* the MoF anticipated producing 46 percent more wood (or 86 Mm³) from HTI-plantations than large industry reported using. Unless the plantation sector increases productively dramatically, the forestry sector is likely to continue its increasing reliance on MTH wood harvested during land clearing (**Figure 5**).

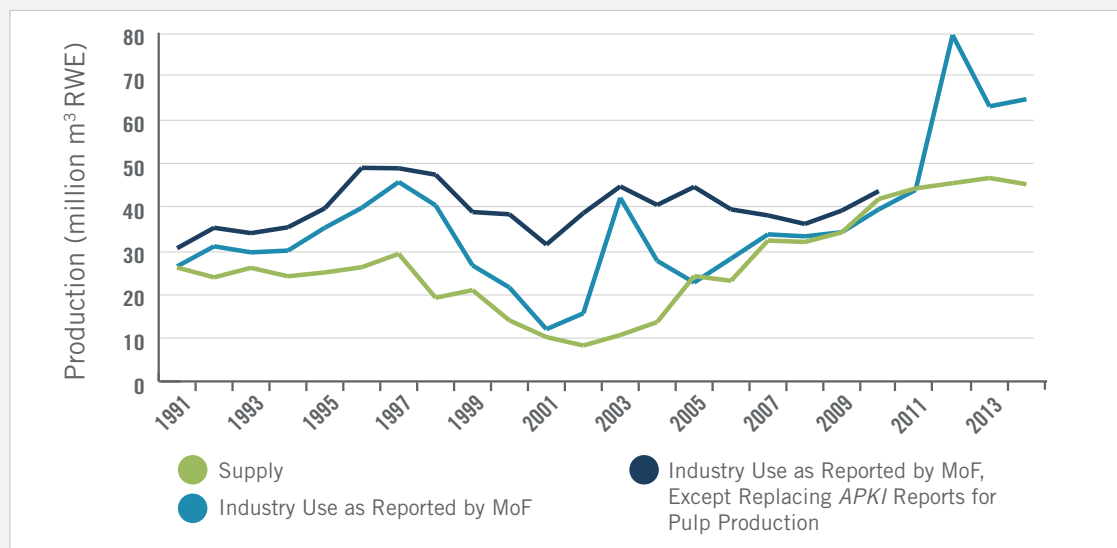
Consumption Exceeds Supply

The implication of **Figures 3 to 5** is that consumption by the large mills has regularly exceeded the legal supply (even when including imports; see **Figure 6**). This is especially true if the *APKI* data on pulp is substituted for the MoF pulp reports.

As was the case in 2007, when the MoF *Road Map* began, the gap is presumably met by unreported and therefore illegal sources (Ministry of Forestry 2007).

FIGURE 6

A Comparison of Reported Timber Use vs. Supply



Note: This figure includes only companies that consumed more than 6,000 m³ of wood per year. *APKI* stopped reporting in 2010.

Source: MoF ARs to 2013, then *RPBBIs*; *APKI* ARs.

The Gap Was Reportedly Closing

A notable trend in **Figure 6** is that the gap between supply and use appeared to be closing up to 2011, although it widened once again in 2012. The closing was mainly due to a rapid rise in the reported use of plantation wood and, since 2010, the increase in timber reported from “other” sources (**Figure 5**). While this is potentially good news, it begs the question as to whether or not the increases in legal supply are real.

Indeed, there is concern regarding the reported supply of wood grown on plantations.¹² First, **community plantation forestry (*Hutan Tanaman Rakyat [HTR]*) schemes have fallen well short of their goal**. By mid-2011, only 127,000 ha have been permitted out of a target of 5.4 Mha allocated and 1.97 Mha planted (Obidzinski and Dermawan 2012). Part of the reluctance in planting *HTRs* may be the poor productivity of the sites offered to communities or that other uses of forested areas are more profitable (e.g., rubber, oil palm, and/or other commodity agriculture). Part of the failure may also be due to land conflicts. For example, while 350,000 ha were designated for *HTR* in Riau, the Provincial Forestry Office reported “only about 4,000 ha are considered [to have] clean and clear [title] while the rest... is claimed by local communities or encroached upon by migrants” (Obidzinski and Dermawan 2012).

Second, although the MoF reported an **increasing use of wood from plantations between 2004 and 2008** (**Figure 5**), Human Rights Watch (2009) and CIFOR (Verchot et al. 2010) noted that earlier MoF reports of the **area planted demonstrated the exact opposite trend** — a consistently declining area planted in the late 1990s. To be fair, given the relative chaos around decentralization following the fall of the Suharto “New Order” regime, reporting at the end of the 1990s may have been poor and planting may have been greater than the records indicate. On the other hand, the decline in area planted coincided with the Asian financial crisis, and under these circumstances one may in fact expect a decline in investment and, thus, in planting.

Moreover, recently the *HTI* sector has also missed their targets for planting, by an average of approximately 20 percent; while planting exceeded targets by 2 percent in 2010, since then MoF report a continuing decline: in 2011, the sector only planted 76 percent of the target, in 2012: 73 percent, and in 2013: 64 percent (MoF 2014).

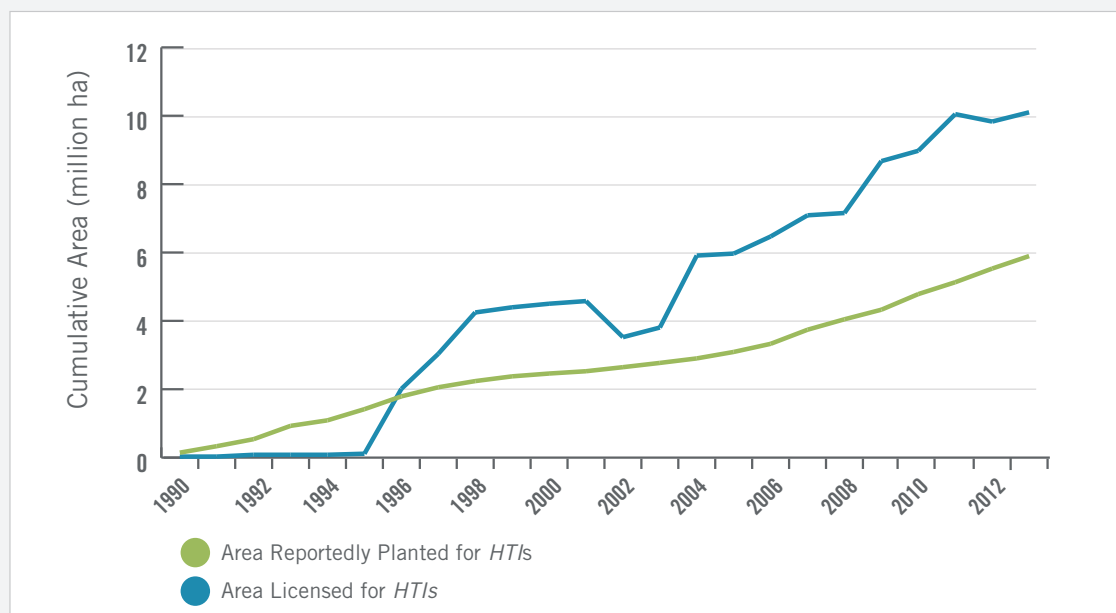
Given the uncertainty regarding plantation production, the next section examines patterns in planting and use. It focuses on private industrial plantations (*HTI*) because state plantations (*perum perhutani*) are reportedly less than one percent of plantation supply.

The Role of Plantations in Supply

Plantation Supply Is Concentrated on Pulp-Producing Species in Sumatra

As noted in **Figure 1**, the area of *HTI* has been reportedly increasing since the mid-1990s. However, the cumulative area reported under planting is less than half of the area licensed to *HTIs* (49 percent; **Figure 7**; note: **Figure 7** implies that *HTI* operators began planting in the 1990s without permits).

¹² For example, *The Straits Times* cites Australian CSIRO scientists as documenting severe animal damage and root rot killing *Acacia* spp. in *HTIs* in Sumatra, leading operators to begin harvesting the dying trees at only 4 years old, dramatically reducing plantation yields. Mcbeth, J. 2014. “Nature Bites Back at Sumatra’s Pulp Plantation Companies.” *The Straits Times*, April 2. straitstimes.com/the-big-story/asia-report/indonesia/story/nature-bites-back-sumatras-pulp-plantation-companies-20140

FIGURE 7Cumulative Area Licensed for *HTIs* and Reported as Planted between 1990 and 2013

Source: Licensed area = MoF 2013, Table IV.2.1; Planted areas = MoF ARs.

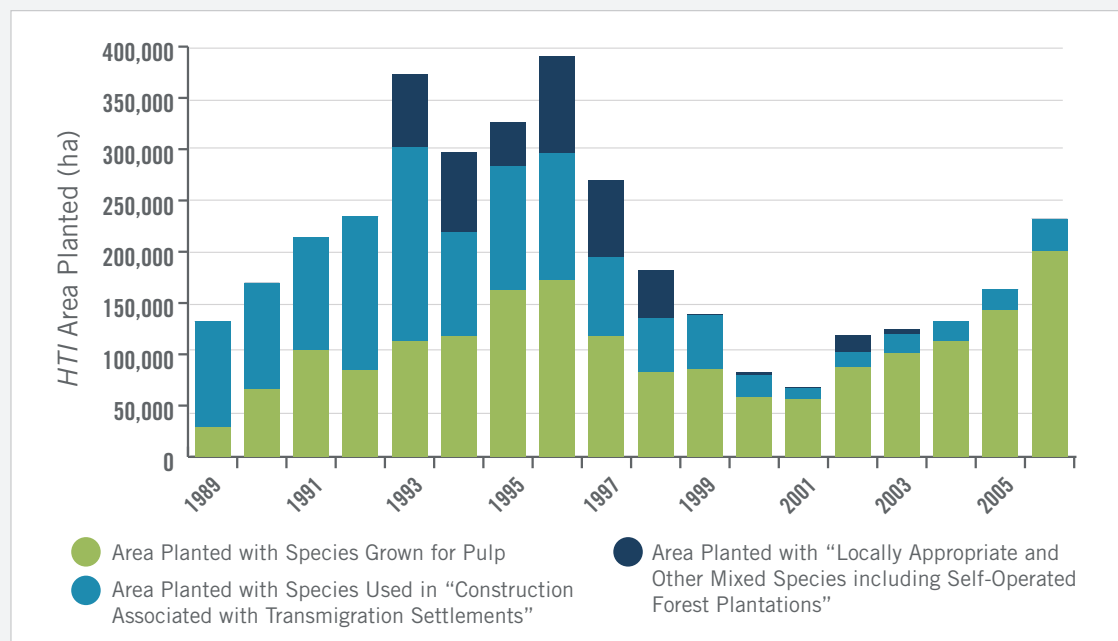
In addition to the reasons for caution noted above, there is further reason to question the reliability of reports of the area planted. Many *HTI* operators were granted reforestation funds (*dana reboisasi* or *DR* in the Indonesian acronym) and other economic incentives for planting, but the government conducted little monitoring to ensure compliance. Unfortunately, it is now impossible to fully investigate the veracity of the planting reports, in part because massive forest fires like those in 1997 associated with El Niño droughts were blamed for destroying many *HTIs*. This gave fraudulent operators a plausible excuse for the subsequent lack of achievements of targets.¹³ Regardless, **there is a clear need for a complete inventory of plantations.**

¹³ For example, PT MHB (whose director, Probosutedjo, was a step-brother of President Suharto) fraudulently reported to the MoF, and charged reforestation funds, for planting 79,452 ha of *HTI* in KalSel during 1996/97. The MoF Inspectorate General found, however, that only 20,000 ha had actually been planted. (PT Data Consult, Inc. 1998. <http://thefreelibrary.com/THE+MERCUBUANA+GROUP%3A+ITS+BUSINESS+PILLARS+STARTING+TO+SHAKE-a050196625>) See also Pirard, R. and C. Cossalter. 2006. "The Revival of Industrial Forest Plantations in Indonesia's Kalimantan Provinces: Will they help eliminate fiber shortfalls at Sumatran pulp mills or feed the China market?" Working Paper No. 37. Bogor: Center for International Forestry Research. <http://cifor.org/online-library/browse/view-publication/publication/2524.html>.

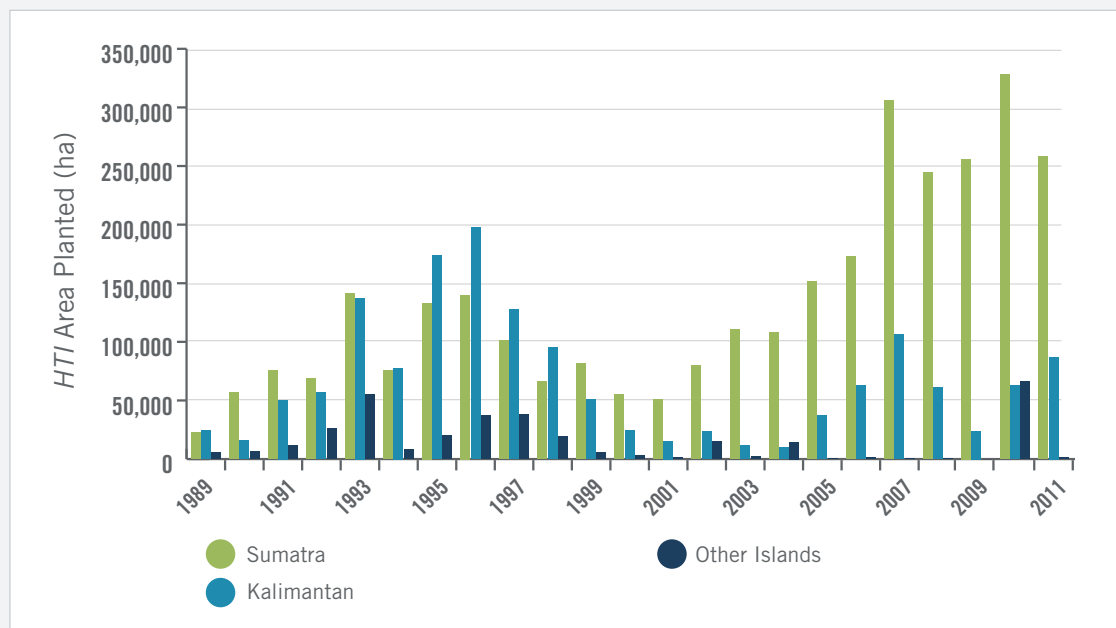
Between 1989 and 2006, more than half (52%) of the HTIs were reportedly planted for pulp. By 2006 — the last year the MoF reported the break-down of HTIs by type — the vast majority **(86%) of the plantations were for pulp species (Figure 8;** it is assumed that this continues to be the case, if not an even greater concentration in pulp species). **The majority of the planting is reported from the island of Sumatra (62%; Figure 9);** followed by Kalimantan (Indonesian Borneo; 31%). The rest of Indonesia comprised only 7% of the planting reported.

FIGURE 8

Area of HTIs Reported Planted by Use between 1989 and 2006

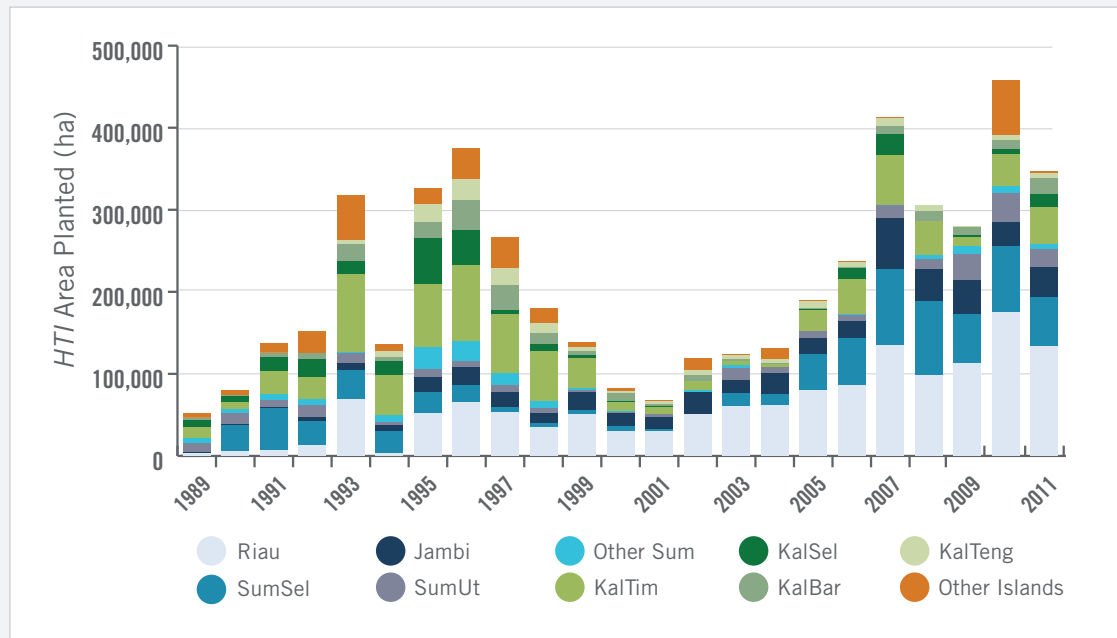


Source: MoF 2006 AR Table IV.1.4.

FIGURE 9Area of *HTIs* Reported Planted between 1989 and 2011

Source: MoF ARs.

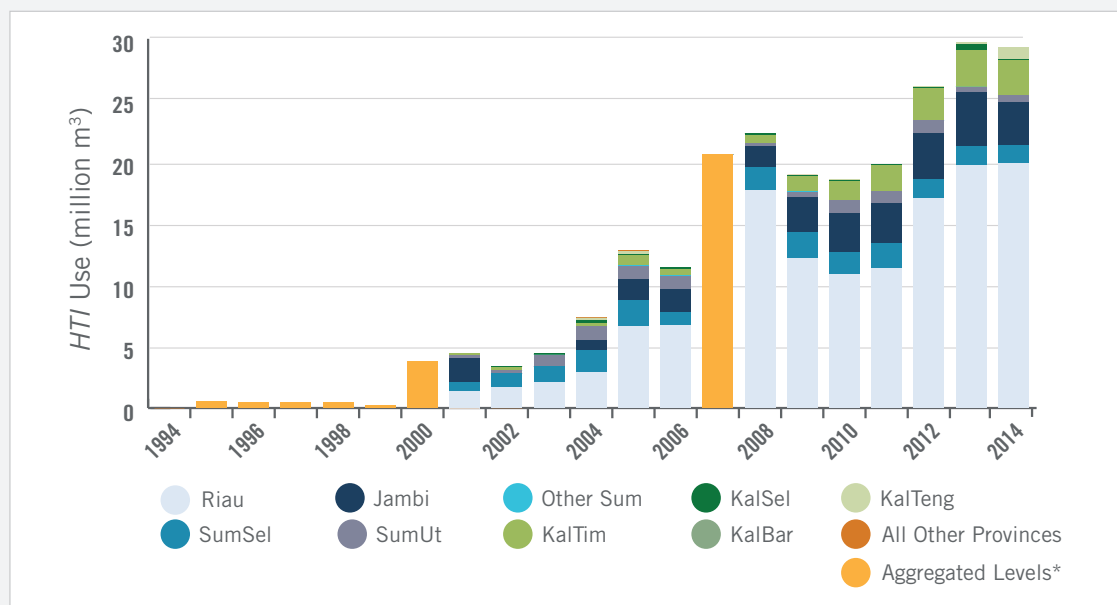
Broken down by province, Riau dominated with 29 percent of all reported planting of *HTIs* across Indonesia (Figure 10). East Kalimantan (KalTim; 17 percent), South Sumatra (SumSel; 15 percent), and Jambi (9 percent) rounded out the top four provinces that together comprised 70 percent of all reported planting. North Sumatra (SumUt), West and South Kalimantan (KalBar and KalSel, respectively) were all at 5 percent each. No other province reported more than 100,000 ha planted between 1989 and 2011. Outside of Kalimantan and Sumatra, only West Java reported more than 50,000 ha planted in any given year (61,000 ha in 2010), and there were only six other reports of even more than 10,000 ha in a given year: Maluku in 1993, 1996, 1997, and 2004, and Irian Jaya (which is now divided between Papua and Papua Barat provinces) in 1996 and 1997.

FIGURE 10Area of *HTIs* Reported as Planted by Province between 1989 and 2011

Source: MoF ARs.

HTI Use

The wood from *HTIs* is mainly used in Sumatra — where **90 percent of Indonesia's pulp mill capacity is located** (Ministry of Finance 2013). **While Sumatra comprised 62 percent of reported planting, it comprised much more of the reported use of *HTI* production — 91 percent of the *HTI* use between 2001 and 2013 was in Sumatra (Figure 11), including 57 percent in Riau, 17 percent in Jambi, and 11 percent in SumSel. KalTim (7 percent) was the only other province with more than 5 percent of the reported use from *HTIs*.**

FIGURE 11Patterns of *HTI* Use over Time

Note: This figure includes only reporting by companies that consumed more than 6,000 m³ of wood per year. The data reflect the province in which the wood was used and not the province in which it was harvested.

* For 1994-2000 & 2007, the MoF reported only aggregated levels of *HTI* use.

Source: MoF ARs to 2013, then *RPBBIs*.

Patterns of *HTI* Use Over Time

The levels of *HTI* use seem unrelated to the prior levels of planting. For example, as mentioned above, while the reported levels of planting declined from 1996 to 2001 (**Figure 10**), five years later, *HTI* use reportedly rose (**Figure 11**). Unless productivity was increasing, this can only be explained by over-reporting of planting levels, uneven rotation lengths and/or laundering of MTH into the plantation supply.

Higher volumes could also be a result of the mills incorrectly self-reporting “MTH harvest during land clearing for plantations” in the *HTI* category. For example, the 2008 *RPBBI* does not include any volume sourced from “Land Clearing for *HTIs*.” If any MTH was in fact harvested while creating new *HTIs* and used by large mills, then this wood was either misclassified or unreported. If misclassified (and included as being sourced from *HTIs*), then this would lead to an over-estimate of plantation yields (as well as an under-estimate of the volume of wood coming from land clearing). This would also likely result in a loss of revenue for the government due to tax evasion if MTH (which has to pay royalties for reforestation [*DR*]) is classified as *HTI* (which does not).

Overall, combining **Figures 10 and 11** indicates an average yield of 53.9 m³/ha five years after planting; that is, between 1990 and 2008, the MoF reported 3,819,301 ha of *HTI* planted, and between 1995 and 2013, 205,834,848 m³ were reportedly used from *HTIs*. (Assuming a ten-year rotation instead suggests an average yield of 80.1 m³/ha planted.¹⁴)

Regardless of assumption (using either 54 or 80 m³/ha), the pattern holds that very little *HTI* was reportedly used prior to 2007 (**Figure 11**) despite the fact that much more should have been available if reported plantings had actually occurred.

The Role of “Other” and *IPK* in Supply

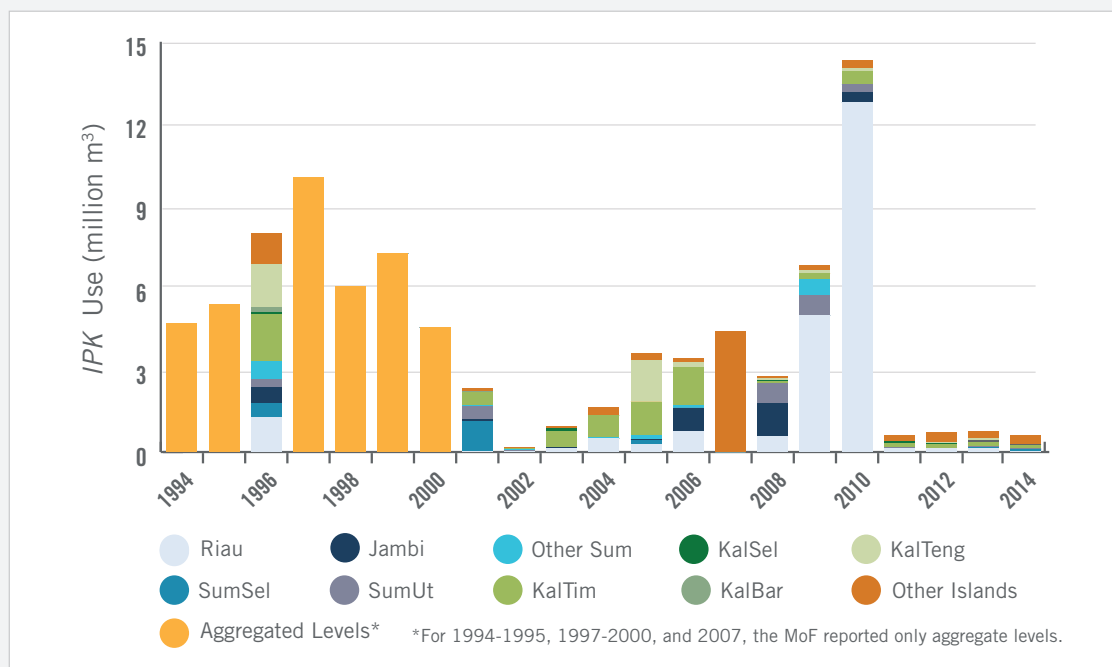
In addition to the shift in supply from logging concessions to plantations, **one of the striking features of Figure 5 is the sudden increase in 2011 in timber from the category “other.”** In comparison to previous years, the reports of timber used from licensed land-clearing (i.e., those with *IPK* licenses) dropped precipitously (from 14,488,152 m³ to only 600,598 m³). At the same time, timber classified as coming from “other” sources increased in use from 3,720,785 m³ to 21,786,505 m³. Thus, in their 2011 *Annual Report*, the MoF reported that **almost half of Indonesia’s entire timber supply (42 percent) came from what were otherwise undescribed “other” sources.**

While President Yudhoyono ordered a moratorium on the issuance of new licenses that permit clearing of primary forests and peatlands (Mundiyarso et al. 2011), **the moratorium could not be responsible for the sudden 96 percent drop because it only came into effect in 2011, and it did not extend to existing *IPK* licenses.** Moreover, Indonesia experienced the highest rate of deforestation the year after the moratorium came into force (Margono et al. 2014).

¹⁴ Note: These are yields of volumes used by the mills per area planted and not just volumes harvested per area planted (or even per area harvested). Using the latter variables overestimates total yields as some planted areas will be subject to loss prior to harvest (due to mortality events such as forest fires and/or pest outbreaks), and some of the area will be unavailable for harvest due to conflict (such as arson and/or blockades), and some of the harvest will be lost in transport.

FIGURE 12

Reported Supply of Timber from Land Clearing (*IPK*) Consumed by Large Industry by Province from 1994 to 2014



Note: This figure includes only reporting by companies that consumed more than 6,000 m³ of wood per year.

Source: MoF ARs to 2013, then *RPBBIs*.

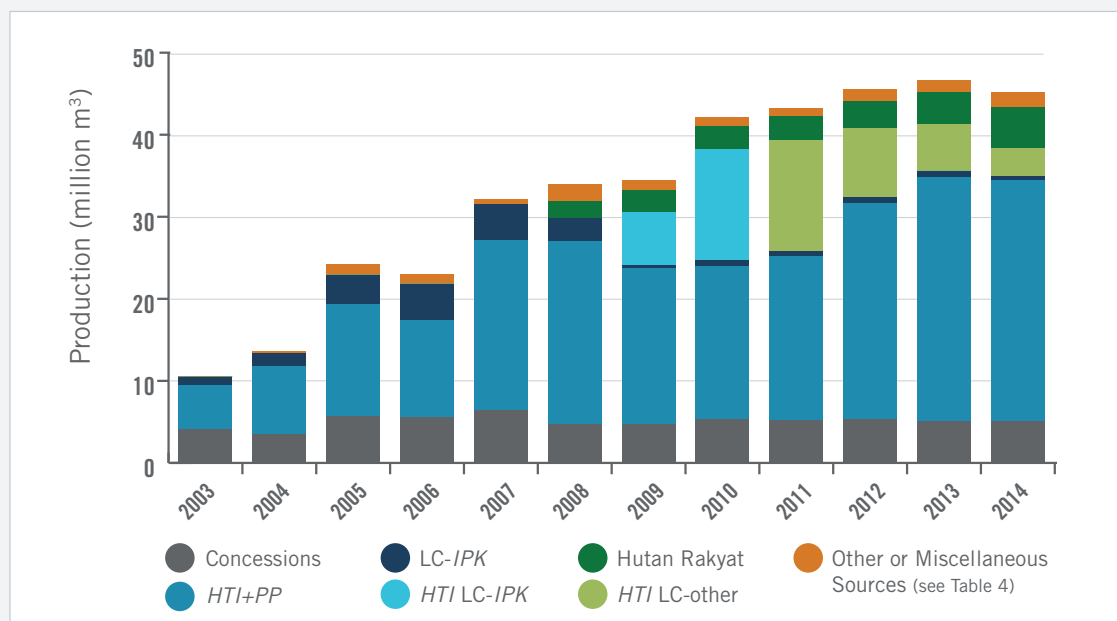
Elucidating the “Other” Category

Instead, the trend — the drop in *IPK* and concomitant rise in supply from “other” sources — appears to be, in part, the result of a reclassification of timber from “land clearing for establishment of pulp plantations (*HTI*).” Apparently a 2009 MoF regulation¹⁵ is being interpreted to allow land clearing for *HTIs* without an *IPK* license, and thus the resulting timber harvest has been recorded as coming from “other” sources and not from *IPKs*. Indeed, the MoF’s reporting is consistent with this: for the 2011 MoF *RPBBI*, the sum of timber volumes from “land clearing from *HTI*”, community forests (*hutan rakyat*), and “miscellaneous” sources (the orange bars in **Figure 13**) was roughly the same as the amount of timber reported in the “other” category in the MoF’s 2011 AR. In comparison, in the 2009 and 2010 MoF *RPBBIs*, the volume of MTH timber used from “land clearing from *HTI*” exceeded the volume in the AR’s “other” category. Instead, this source appears to be included in the AR’s *IPK* category. As noted above, in the 2008 *RPBBI* the MoF does not report any timber sourced from “land clearing from *HTI*.”

¹⁵ P.58/Menhut-II/2009.

FIGURE 13

Reported Timber Supply Consumed by Large Industry between 2008 and 2014



Note: This figure includes only reporting by companies that consumed more than 6,000 m³ of wood per year.

Figure legend:

- Gray bars represent timber supply reportedly used from industrial logging concessions (*HPH/IUPHHK*)
- Medium blue bars represent use from plantations (*HTI* & state plantations [*perum perhutani*])
- Dark blue bars represent timber from land clearing with *IPK* permits (*LC-IPK*)
- Light blue bars represent timber from *IPKs* for *HTIs* (*HTI LC-IPK*) in particular
- Green bars represent timber from land clearing that was not reported as coming from *IPKs* but that appears to be reported as other sources in MoF ARs (including LC for *HTIs* and community forests)
- Orange bars represent other or miscellaneous source (see Table 4)

Source: MoF ARs to 2013, then *RPBBIs*.

As **Figure 13** suggests, clearing forests to make way for plantations is an important source of MTH. However, the reporting of this source of supply has been erratic — the MTH from plantation clearing has been reported as sourced from *IPK*, as well as from “other” sources, if reported by the MoF at all. The 2007 MoF *Road Map* projected that by 2014, land clearing would contribute only 0.1 percent of timber supply; instead, according to the 2014 MoF *RPBBI*, **land clearing (in both the *IPK* and “other” categories) comprised 9 percent of timber used, making its contribution 4,000 percent more important to supply than anticipated.**

Given the sector’s reliance on deforestation in its timber supply and given the erratic reporting of this source, a better estimate of the volume of timber produced during land clearing is needed. Unfortunately, there is no publicly available inventory of the forests cleared for oil palm and timber plantations, nor are there reports of standing timber volumes prior to clearing. Instead, this paper uses empirical values from the literature — in this case the harvest volumes from the *Annual Work Plans (RKTs)* for the 17 *HTIs* cleared for the major pulp mills in Sumatra in 2010 (**Table 5**). Based on these reports, an average harvest of 88 m³ MTHs per hectare cleared was used in calculations of potential MTH harvest during land clearing for plantations.

TABLE 5Yield of Mixed Tropical Hardwoods Harvested during Land Clearing for *HTIs* in Sumatra

<i>HTI</i>	<i>HTI</i> Area (ha)	Area Cleared (ha)	% Cleared	MTH Produced (m³)	MTH Yield (m³/ha)
APP-Affiliated <i>HTIs</i>					
27	22,250	6,104	27%	314,630	51.5
42	28,890	1,844	6%	165,320	89.7
29	50,725	1,182	2%	36,490	30.9
61	5,630	130	2%	15,820	121.7
67	44,330	6,641	15%	540,750	81.4
35	9,300	4,345	47%	713,740	164.3
36	11,830	1,822	15%	132,110	72.5
73	34,792	6,356	18%	782,815	123.2
38	10,740	3,456	32%	378,910	109.6
40	19,870	4,603	23%	472,980	102.8
30	9,570	5,306	55%	408,090	76.9
APRIL-Affiliated <i>HTIs</i>					
44	13,420	2,406	18%	21,400	8.9
46	15,360	4,864	32%	98,610	20.3
10	148,075	20,395	14%	1,934,950	94.9
49	10,390	4,514	43%	457,300	101.3
52	14,800	2,436	16%	349,960	143.7
59	350,185	36,510	10%	3,550,900	97.3
TOTAL	800,157	112,914	14%	10,374,775	Average Yield 87.7 m³/ha

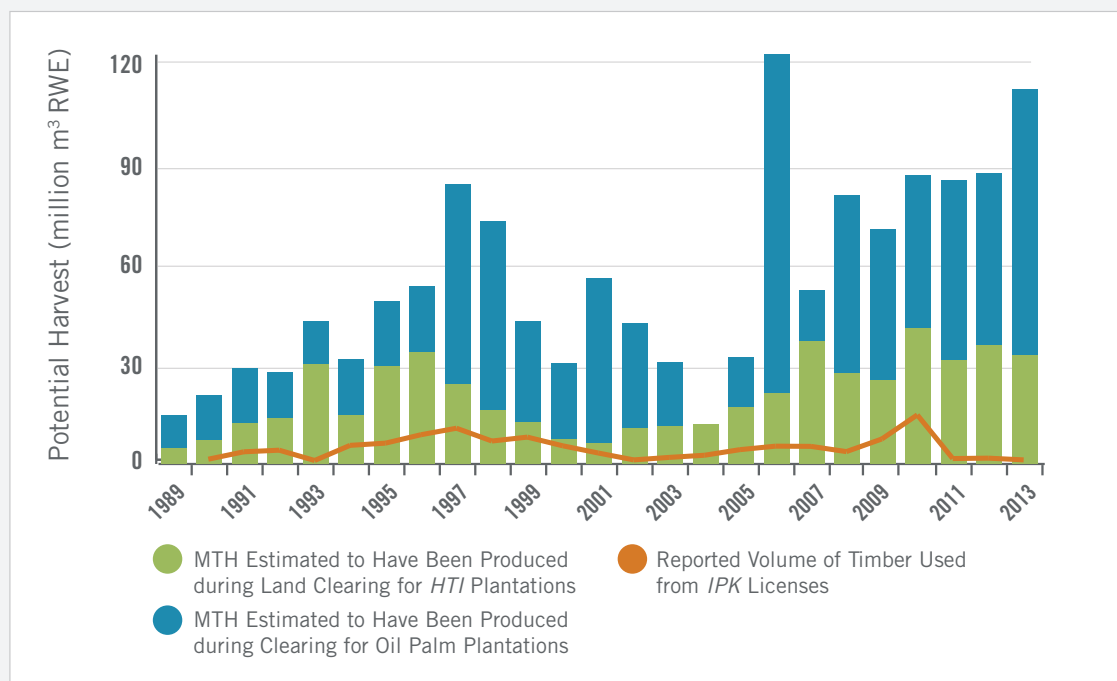
Source: Table 1 in Eyes on the Forest 2010. "EoF Calls on SMG/APP and APRIL to Keep their Promises: Stop conversion of natural forest and drainage of peat to produce pulp; Stop violation of the country's climate commitments." [eyesontheforest.or.id/attach/EoF%20\(30Nov10\)%20Riau%20RKT%202010%20natural%20forest%20and%20peat%20conversion%20EN%20FINAL.pdf](http://eyesontheforest.or.id/attach/EoF%20(30Nov10)%20Riau%20RKT%202010%20natural%20forest%20and%20peat%20conversion%20EN%20FINAL.pdf).

Given the area reported as planted for forestry *HTIs* (**Figure 7**), and assuming that yields in Table 5 are representative of land clearing across Indonesia, the implication is that the harvest of MTH during land clearing greatly exceeded the reported use from *IPKs* (**Figure 14**). Adding the timber that would have been harvested when clearing for oil palm plantations (**Figure 1**), the total timber yield exceeds the reported *IPK* use during this period by almost 11 times (**Figure 14**).¹⁶

¹⁶ Supplemental material (available at www.forest-trends.org/indonesia_timber_supply.php) tests the assumptions used in calculating MTH yields from land clearing for *HTI* and oil palm plantations.

FIGURE 14

Potential Timber Harvest Associated with Land Clearing for Plantations



Note: IPK use is for companies that consumed more than 6,000 m³ of wood per year. See text for justification for Mixed Tropical Hardwood (MTH) yield of 88 m³/ha (rounded).

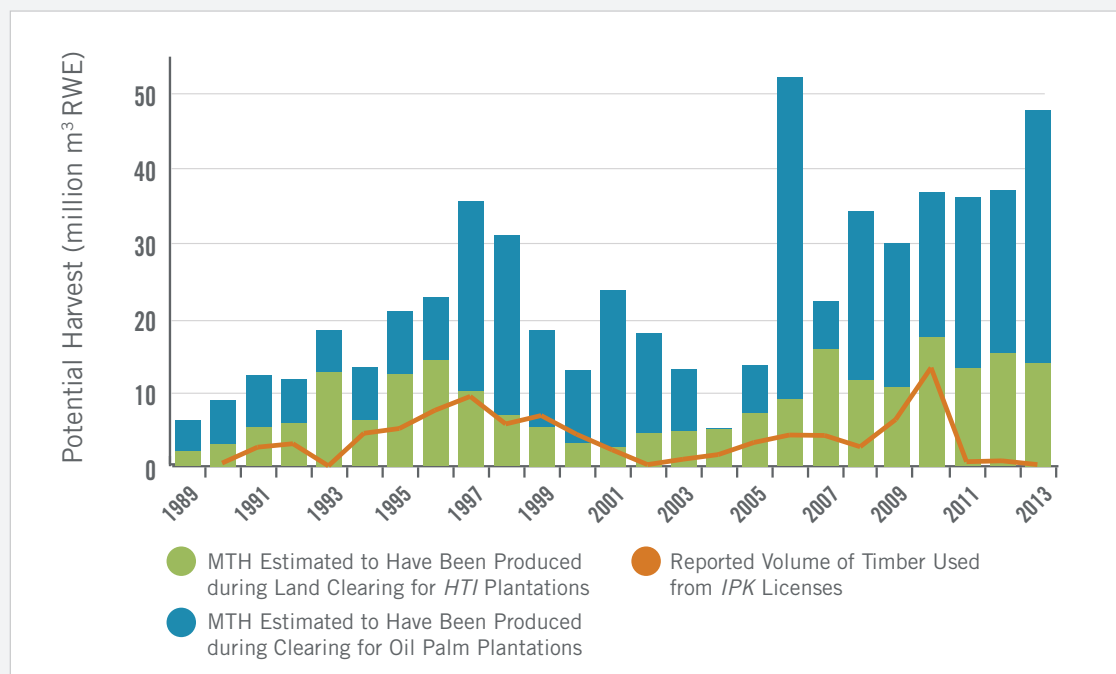
Source: HTI/IPK = MoF ARs to 2013; oil palm = DirGen Estate Crops, MoAg.

What if the Average MTH Logged during Land Clearing Is Not 88 m³/ha?

To test the implications of varying the estimate of MTH yield, a sensitivity analysis compared the results of substituting the various volumes of standing timber used in the FFA4 analyses. The FFA4 assumed 106 m³/ha in “primary production forests”, 72 m³/ha for “secondary production forests”, and 38 m³/ha for secondary “convertible production” forests. **Even assuming the FFA4’s lowest timber yield, the volumes produced just clearing for HTIs in the last two decades was almost twice the volume reported under IPK licenses (Figure 15). Land clearing for oil palm during the same period would have added at least a further 2.8 times the volume reported from IPKs.**

FIGURE 15

Potential Harvest Associated with Land Clearing for Plantations at the Lowest FFA4 Yield



Note: IPK use is for companies that consumed more than 6,000 m³ of wood per year. See text for justification for using the FFA4's timber-yield for secondary "convertible production" forests of 38m³/ha for the MTH yield in all plantation-land clearing.

Source: HTI/IPK= MoF ARs to 2013; oil palm = DirGen Estate Crops, MoAg.

Clearly, an inventory of the forest types that were cleared for plantation development is required in order to better estimate the amount of timber produced while preparing for planting. The MoF has requested such an inventory from HTIs, but civil society has objected to the fact that the results of these 'micro-delineations' will not be made public. However, assuming either 38 m³/ha or 88 m³/ha, then **clearing oil palm and HTI plantations would have resulted in 337 to 900 million m³ of timber above that reported under legal IPKs**. A final way of stating this: if IPKs were only awarded to oil palm and timber plantations, then, at the assumed harvest yields, the production reported under IPK licenses would have comprised at most 9 to 22 percent of all the timber that was likely harvested during clearing plantations for these two crops.

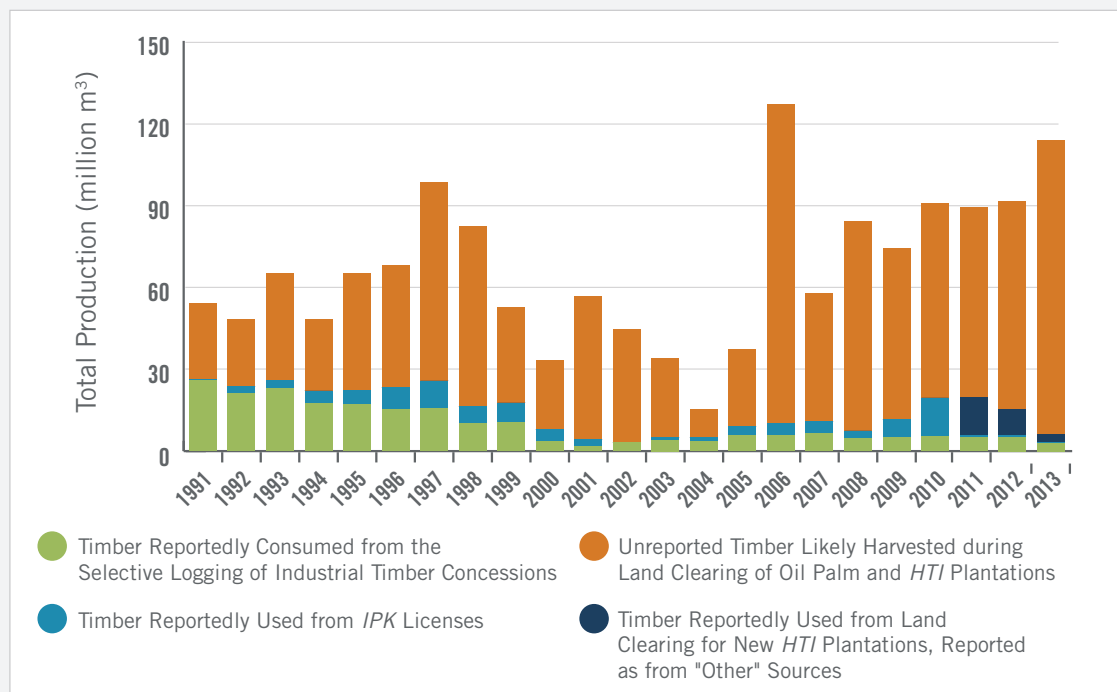
Implications of the Large Harvest Associated with Land Clearing

In 2013 (the last year the MoF reported the area of HTI planted), wood from land clearing alone reportedly contributed 14 percent of wood used (including from HTIs). If considering only the timber sourced from natural forests, then the amount reported from forest clearing jumps to 56 percent of MTH used.

If the *unreported* timber likely harvested during land clearing (i.e., from **Figure 14**) is also included then, since 1991, more than 80% of Indonesia's timber supply from natural forests would have come from the clearing, and thus elimination, of these forests (**Figure 16**).

FIGURE 16

The Origin of Timber Logged from Natural Forests



Source: Concessions, IPK, HTI planting = MoF ARs to 2013; oil palm planting = DirGen Estate Crops, MoAg.

The domination of wood from land clearing has serious implications for the long-term sustainable management of both Indonesia's timber supply and the forests themselves. Once the forests are gone, so will be much of Indonesia's timber supply. **A focus on improving the sustainability of logging in industrial concessions will only have a minor impact on the overall management — and ultimately fate — of Indonesia's forests.** A focus on the supply from land clearing (i.e., deforestation) is paramount.

Review of Phase 1 of the MoF's *Road Map for the Revitalization of Indonesia's Forest Industry*

In 2007, the MoF identified the two "major problems" facing Indonesia's timber supply as: "1) Insufficient supply of raw material; [and] 2) Over capacity."¹⁷ As the first phase (2007-2014) of the *Road Map* concludes, these problems remain. The MoF's analyses indicated that "the amount of illegal roundwood consumed by the timber industry" was 20.3 Mm³; that is, in 2005, 46 percent of the timber supply was illegal. By 2014, the analyses in this paper indicate that the gap remains almost 20 Mm³ (more than 30 percent of wood used). This is particularly troubling given the unsustainability of the current timber supply, as a result of both the reliance on deforestation as a source of timber, and the under-performance of the plantation sector.

¹⁷ Ministry of Forestry 2007.



Photography by Riau NGO Alliance

With respect to over-capacity, existing use already exceeds legal supply. This despite the fact that industry is not even operating at full current capacity. Indeed, in their last report, *APKI* claimed that the pulp and paper sector was only operating at 80 percent capacity. If the sector was to operate at full capacity then use would increase by more than 10 Mm³. If the sector was to operate at full capacity and mills planned for Sumatra, Kalimantan and Papua are built¹⁸, then the existing gap would increase by more 44 Mm³. In this scenario, more than 59 percent of all the timber used by large mills would be from illegal sources.

¹⁸ This assumes an investment of more than US\$12 billion by APP, Barito, Djarum, and Medco to increase capacity by 6.95 million ADT.



CONCLUSION

While these analyses present trends in supply and use, caution should be exercised in placing too much trust in the accuracy of any given data. The large differences between reports by the MoF and APKI on pulp production (Figure 4), for example, provide reason to be wary.

Nonetheless, **the sector is failing to meet the targets of the MoF's 2007 Road Map, and the MoF's own data indicate a lack of sustainability in timber supply. Immediate action is required. Certainly increased diligence in monitoring Indonesia's supply and use of forest products is urgently needed.** Here initiatives aimed at reforming the forest sector like those carried out by the MoF with the assistance of the Corruption Eradication Commission (KPK in the Indonesian acronym; Sihite 2013) should be supported to drive greater transparency, accountability, and much needed reform.

The MoF should conduct a thorough review of progress made in the first phase of their Road Map. Undoubtedly, **corrective action is needed.** It was notable that in the initial *Road Map* there was no commitment to avoid increasing processing capacity until a sufficient legal supply was obtained. Given that these issues were the two major problems identified in the sector, and that they are likely even worse than anticipated, the **MoF must prohibit any increase in processing capacity.**

The major results and recommendations of this study are:

- The forestry sector is continuing its evolution from plywood to pulp and paper (Figure 3).
- This will **increase the pressure on Indonesia's timber plantation sector**, increasing the need for new, more productive *HTIs*.
- This will **increase social conflict** between new *HTIs* and local populations.
- The **reported production of wood from HTIs is only about half of the volume assumed by the MoF in their projections of supply.**
- In addition to dramatically under-performing, **plantation production is insufficient to supply the pulp sector's current production, let alone existing capacity, much less any expansion (Figure 4).**
- **The sector will, therefore, continue to exert pressure on natural forests** as a source of fiber from mixed tropical hardwoods (MTH). This pressure is especially broad as the industrial demand for fiber by pulp mills is able to use a wider mix of tree species and sizes than most other milling processing facilities.

- There is a pressing **need for a complete inventory of existing HTI plantations** and the forests cleared during their establishment.
- The volume of **timber supplied from land clearing for HTIs is reportedly dropping, but the process is not regulated by IPK licenses** — most of the timber harvested during land clearing is now reported in MoF *Annual Reports* as coming from “other” sources. This may have implications on the regulatory framework that manages the forest conversion process, including monitoring. This is of particular concern because in the past it is likely that the conversion of forests for plantations was inadequately controlled (given that the volumes of timber felled during clearing for timber and oil palm plantations likely far exceeded the volumes reported under IPKs).
- **Poorly regulated land conversion is likely leading to a loss of government revenue** as MTH timber from natural forests may be avoiding reforestation (DR) royalties if the supply is mis-reported in the HTI category or unreported altogether.
- **Poorly regulated land conversion could severely undermine the SVLK** controls aimed at preventing the laundering of illegal timber into the legal supply chain. (This would also undermine the legality legislation governed by the VPA.)
- For the most recent data, between 2009-2013, **deforestation associated with land clearing contributed 60% to 74% of all timber reportedly sourced from natural forests**. (Note: This does not include the vast majority of timber that was likely harvested during land clearing for plantations but not reported under IPK licenses. Including these volumes would likely increase the contribution of timber harvested during deforestation to almost 90% of the timber used from natural forests [Figure 16].)
- Overall, the reported use of raw wood continues to exceed the legal supply (Figure 6).
- This is despite the fact that **MoF reports likely underestimate the actual use**, given that: i) the pulp industry reports much greater production than the MoF (Figure 4); and, ii) timber use by small processors is not included, nor is unreported/smuggled timber.
- Thus, **the gap between use and legal supply is likely much greater than reported here**.
- Financial institutions and other investors must ensure that operations have a sufficient legal supply of raw material. Given that Indonesia’s anti-money laundering legislation includes ‘forest crimes’ as a predicate offence, financial transactions involving the proceeds of such crime (e.g., the use of illegally-sourced wood) **expose lenders/investors to the risk of prosecution for money laundering** (Setiono 2005).
- Planned increases in capacity will increase the gap in legal supply and industry will continue to rely on the unreported, and likely illegal, MTH harvested from natural forests.
- Indonesia **should not increase processing capacity until the gap is closed** — that is, until there is timely, independent, public reporting of accurate data available for monitoring and evaluation to confirm that sufficient legal supply from plantations exist, **there should be no new mills or expansion of milling capacity**.

REFERENCES

- Anti Forest-Mafia Coalition. 2014. "SVLK Flawed: An Independent Evaluation of Indonesia's Timber Legality Certification System." Eyes on the Forest, Jakarta. <http://eyesontheforest.or.id/attach/Anti%20Forest%20Mafia%20Coalition%20%2818Mar14%29%20SVLK%20Flawed%20FINAL.pdf>.
- Brown, David W. and Fred Stolle. 2009. "Bridging the Information Gap: Combatting Illegal Logging in Indonesia." WRI Forest Note. World Resources Institute, Washington, D.C. <http://www.wri.org/publication/bridging-information-gap>.
- Carlson, Kimberly, M., Lisa M. Curran, Dessy Ratnasari, Alice M. Pittman, Britaldo S. Soares-Filho, Gregory P. Asner, Simon N. Trigg, David A. Gaveau, Deborah Lawrence, and Hermann O. Rodrigues. 2012. "Committed Carbon Emissions, Deforestation, and Community Land Conversion from Oil Palm Plantation Expansion in West Kalimantan, Indonesia." *PNAS* 109 (19):7559-7564. doi: 10.1073/pnas.1200452109.
- European Union. 2013. "Proposal for a COUNCIL DECISION on the conclusion of the Voluntary Partnership Agreement between the European Union and the Republic of Indonesia on forest law enforcement, governance and trade in timber products to the European Union / * COM/2013/0433 final - 2013/0205 (NLE) * /." <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52013PC0433&from=EN>.
- FAO. 2010. "Global Forest Resources Assessment 2010: Main Report." FAO Forestry Paper 163, Food and Agriculture Organization of the United Nations, Rome, 230. <http://www.fao.org/forestry/fra/fra2010/en/>.
- FAOSTAT Database on Agriculture, Item Code 1861. Food and Agriculture Organization of the United Nations, Rome. <http://faostat.fao.org/site/626/DesktopDefault.aspx?PageID=626#ancor>.
- FAOSTAT Database on Agriculture. Food and Agriculture Organization of the United Nations, Rome. <http://faostat3.fao.org/home/E>.
- Fenton, Robert. 1996. *The Indonesia Plywood Industry: A Study of the Statistical Base, the Value-Added Effects & the Forest Impact*. Field Report Series no. 29. Singapore: Institute of Southeast Asian Studies.
- Food and Agriculture Organization of the United Nations (FAO). 2009. "Indonesia Forestry Outlook Study." Working Paper No. APFSOS II/WP/2009/13, Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific, Bangkok. <http://fao.org/docrep/014/am608e/am608e00.pdf>.
- Forest Watch Indonesia and Global Forest Watch. 2002. "The State of the Forest: Indonesia." Forest Watch Indonesia, Bogor, and Global Forest Watch, Washington, D.C. http://pdf.wri.org/indoforest_full.pdf.

- Government of Indonesia Joint Fact-Finding Team. 2012. "Joint Fact-Finding Team Report (Laporan Tim Gabungan Pencari Fakta)," quoted in Human Rights Watch, 2013, "The Dark Side of Green Growth: Human Rights Impacts of Weak Governance in Indonesia's Forestry Sector," Human Rights Watch, New York, 13.
- Hansen, M.C., P.V. Potapov, R. Moore, M. Hancher, S.A. Turubanova, A. Tyukavina, D. Thau, S.V. Stehman, S.J. Goetz, T.R. Loveland, A. Kommareddy, A. Egorov, L. Chini, C.O. Justice, and J.R.G. Townshend. 2013. "High-Resolution Global Maps of 21st-Century Forest Cover Change." *Science* 342:850-853. doi: 10.1126/science.1244693.
- Hooijer, A., S. Page, J. Jauhiainen, W. A. Lee, X. X. Lu, A. Idris, and G. Anshari. 2012. Subsidence and carbon loss in drained tropical peatlands. *Biogeosciences*, 9, 1053-1071. http://biogeosciences.net/9/1053/2012/bg-9-1053-2012.pdf?origin=publication_detail.
- Human Rights Watch. 2009. "Wild Money: The Human Rights Consequences of Illegal Logging and Corruption in Indonesia's Forestry Sector." Human Rights Watch, New York. <http://www.hrw.org/reports/2009/12/01/wild-money-0>.
- Human Rights Watch. 2013. "The Dark Side of Green Growth: Human Rights Impacts of Weak Governance in Indonesia's Forestry Sector." Human Rights Watch, New York. <http://www.hrw.org/reports/2013/07/15/dark-side-green-growth>.
- Indonesian Pulp and Paper Association. 2010. Annual Report.
- Lawson, Sam and Larry MacFaul. 2010. "Illegal Logging and Related Trade: Indicators of the Global Response." Chatham House, London. http://awsassets.panda.org/downloads/chatham_house_illegallogging_2010.pdf.
- Margono, B.A., Potapov, P.V., Turubanova, S., Stolle, F., Hansen, M.C. 2014. Primary forest cover loss in Indonesia over 2000–2012. *Nature Climate Change*. DOI: 10.1038/NCLIMATE2277
- Mcbeth, John. 2014. "Nature Bites Back at Sumatra's Pulp Plantation Companies." *The Straits Times*, April 2. straitstimes.com/the-big-story/asia-report/indonesia/story/nature-bites-back-sumatras-pulp-plantation-companies-20140.
- Ministry of Agriculture. 2012. "DirGen Estates: Area & Production of Oil Palm." ditjenbun.deptan.go.id/cigraph/index.php/viewstat/komoditiutama/8-Kelapa%20Sawit.
- Ministry of Finance. 2012. "Annual Report 2011." Table IV.7.1
- Ministry of Finance. 2013. "Tingkat Utilitas Kapasitas per Tahun." <http://rpbbi.dephut.go.id/MonefUmum/UtilitasTahtunan.aspx>.
- Ministry of Forestry. 2007. "A Road Map for the Revitalization of Indonesia's Forest Industry." Ministry of Forestry of the Republic of Indonesia, Jakarta. Available in English at <http://www.slideshare.net/ignoramus/roadmap-for-revitalizationofindonesiasforestindustry2007> and in Bahasa Indonesia at http://rimbawan.com/images/stories/makalah/roadmap_for_revitalization_of_indonesia_s_forest_industry_nov_2007_indo.pdf.
- Ministry of Forestry. 2008-2014. *RPBBI* online database. rpbbi.dephut.go.id/MonefUmum/MonitoringPemenuhanBB.aspx.
- Ministry of Forestry. 2009. "Forest Minister of the Republic of Indonesia Decree Number P.58/Menhut-II/2009." <http://sss.or.id/file/IPK/P58%20tahun%202009.pdf>.

Ministry of Forestry. 2012. "Annual Report 2011."

Ministry of Forestry. 2014. Workshop Temu Usaha Dalam Rangka Evaluasi Kinerja Penanaman dan Peluang Dukungan Investasi Hutan Tanaman. <http://apki.net/wp-content/uploads/2014/10/01-Dirjen-BUK-Workshop-Temu-Usaha.pptx>

Murdiyarso, Daniel, Sonya Dewi, Deborah Lawrence, and Frances Seymour. 2011. "Indonesia's Forest Moratorium: A Stepping Stone to Better Forest Governance?" Center for International Forestry Research, Bogor. <http://cifor.org/online-library/browse/view-publication/publication/3561.html>.

Obidzinski, K., and M. Chaudhury. 2009. "Transition to Timber Plantation Based Forestry in Indonesia." *International Forestry Review* 11 (1): 79. http://www.cifor.org/publications/pdf_files/articles/aobidzinski0901.pdf.

Obidzinski, K., R. Andriani, H. Komarudin, and A. Andrianto. 2012. "Environmental and Social Impacts of Oil Palm Plantations and their Implications for Biofuel Production in Indonesia." *Ecology and Society* 17 (1): 25. doi: 10.5751/ES-04775-170125.

Obidzinski, K., and Ahmad Dermawan. 2012. "New Round of Pulp and Paper Expansion in Indonesia: What Do We Know and What Do We Need to Know?" Presented at the ARD Learning Exchange 2012, Jakarta, May 11. <http://www.cifor.org/ard/documents/background/Day5.pdf>.

Page, Susan E., Florian Siegert, John O. Rieley, Hans-Dieter V. Boehm, Adi Jaya, and Suwido Limin. 2002. "The Amount of Carbon Released from Peat and Forest Fires in Indonesia During 1997." *Nature* 420: 65. doi: 10.1038/nature01131.

Setiono, Bambang. 2005. Using the Anti Money Laundering Law; Catching the Intellectual Actors Behind Illegal Logging. CIFOR. Governance Brief No.18. http://www.cifor.org/publications/pdf_files/govbrief/GovBrief0606.pdf

Sihite, Ezra. 2013. "Forestry Management Reform Pact Signed by Ministers, Institution Heads." *Jakarta Globe*, March 11. thejakartaglobe.com/nvironment/forestry-management-reform-pact-signed-by-ministers-institution-heads/579117.

The Indonesian Pulp and Paper Association (*Asosiasi Pulp dan Kertas Indonesia [APKI]*). <http://apki.net/>

UNEP and INTERPOL. 2012. "Green Carbon, Black Trade: Illegal logging, Tax Fraud and Laundering in the World's Tropical Forests. A Rapid Response Assessment." United Nations Environment Programme, Norway. http://www.unep.org/pdf/RRALogging_english_scr.pdf.

Verchot, Louis V., Elena Petkova, Krystof Obidzinski, Stibniati Atmadja, Elizabeth L. Yuliani, Ahmad Dermawan, Daniel Murdiyarso and Salwa Amira. 2010. "Reducing Forestry Emissions in Indonesia." Center for International Forestry Research, Bogor. <http://cifor.org/online-library/browse/view-publication/publication/3142.html>.

Wilmar International. 2013. "No Deforestation, No Peat, No Exploitation Policy." <http://www.wilmar-international.com/wp-content/uploads/2012/11/No-Deforestation-No-Peat-No-Exploitation-Policy.pdf>.

World Bank. 2007. "Sustaining Economic Growth, Rural Livelihoods, and Environmental Benefits: Strategic Options for Forest Assistance in Indonesia." Working Paper 39245, World Bank, Jakarta, 46. <http://documents.worldbank.org/curated/en/2006/12/8060364/sustaining-economic-growth-rural-livelihoods-environmental-benefits-strategic-options-forest-assistance-indonesia>.



The Family of Forest Trends Initiatives

Ecosystem Marketplace

A global platform for transparent information on ecosystem service payments and markets

Water Initiative

Protecting watershed services through markets and incentives that complement conventional management

Forest Trade & Finance

Bringing sustainability to trade and financial investments in the global market for forest products



Business and Biodiversity Offsets Program, developing, testing and supporting best practice in biodiversity offsets



Building capacity for local communities and governments to engage in emerging environmental markets

Communities and Markets

Supporting local communities to make informed decisions regarding their participation in environmental markets, strengthening their territorial rights



Using innovative financing to promote the conservation of coastal and marine ecosystem services

Public-Private Co-Finance Initiative

Creating innovative, integrated, and efficient financing to support the transition to low emissions and zero deforestation land use

Learn more about our programs at www.forest-trends.org



This report is a collaboration between the Anti Forest-Mafia Coalition and the Forest Trade and Finance initiative of Forest Trends