
# Zero Deforestation Zones in Indonesia

## A proposal to curb deforestation and increase agricultural production in Indonesia

**Dana Miller, Research Analyst & Ruohong Cai, Ph.D. Economist**

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# EXECUTIVE SUMMARY

## I. Introduction:

Environmental Defense Fund (EDF) explores how jurisdictions in Indonesia, focusing on Kalimantan provinces, could become Zero Deforestation Zones (ZDZs). ZDZs are jurisdictions (provinces or districts) that have strong, mutually reinforcing public and private governance structures in place and are on a path to reaching zero net emissions from deforestation while increasing production and economic development. Companies could source commodities that meet their zero-deforestation commitments from ZDZs. ZDZs combine current private and public initiatives to reduce deforestation in Indonesia, such as zero deforestation commitments, certifications, laws and regulations, and jurisdictional programs for Reducing Emissions from Deforestation and forest Degradation (REDD+) to create a whole that's greater than the sum of its parts. We explore challenges of current initiatives that would need to be addressed before provinces in Indonesia could become ZDZs and synergies between public and private sector initiatives that could be enhanced if ZDZs were created.

## II. Challenges of Current Initiatives

**Governance:** Indonesian governance presents many barriers to addressing deforestation. For one, the moratorium, Indonesia's main means of implementing REDD+, excludes more than 46.7 Mha of secondary forests and forests on existing plantations (Murdiyarso et al., 2011). For another, Indonesia's Plantation Act mandates that land owners cultivate all suitable land within 6 years, so that companies with zero deforestation policies risk losing their licenses for conserving land (Greenomics, 2014).

**Different definitions:** Companies, roundtables, and government have created many different definitions and cut-off years for deforestation, which can have very different meanings in terms of carbon emissions and biodiversity. For example, many companies have pledged not to clear High Carbon Stock (HCS), High Conservation Value areas, or peatlands, while the Roundtable for Sustainable Palm Oil (RSPO) prohibits members from clearing primary forests. There are also various maps and monitoring systems, creating conflicts over land tenure.

**Leakage:** Without a jurisdictional approach that includes all actors, deforestation could leak between properties, regions, or commodities such as palm oil, biofuels and timber.

**Incentives for Small-holders and local communities:** Most importantly, small-holders need incentives and assistance in order to adopt sustainable practices, increase yields, and comply with private and public forest conservation policies. Indonesia also must deliver on its promise to recognize customary rights of communities, potentially affecting 10-40 million hectares (Daemeter, 2015).

## III. Solution:

**Governance:** The government of Indonesia would need to revise laws that allow and incentivize deforestation. In return, Indonesia could unlock payments for reducing deforestation from Norway through their Letter of Intent to finance sustainable development programs. Companies would commit to source commodities such as palm oil and timber from jurisdictions that meet the definition of a ZDZ.

**Definitions:** Public and private actors would agree on definitions, sources of funding, and enabling conditions for ZDZs. The definition would have to produce near zero net *emissions* from deforestation and be compliant with UNFCCC decisions on REDD+ and existing company commitments.

**Monitoring:** Public and private sectors would use satellite imagery, field sampling, and maps of High Conservation Value (HCV) areas, peatlands and community territories to monitor deforestation across the jurisdiction.

**Sustainable intensification and expansion:** Indonesia could meet projected palm oil demand, estimated at 6.3 million hectares (Mha) by 2020 (World Bank, IFC, 2011), through increasing yields (which would save 1.6 Mha from conversion, Fairhurst & McLaughlin, 2009) and shifting production to degraded lands (which span at least 6 Mha depending on the definition of "degraded", Gingold, 2010). In order to increase yields, the government would provide smallholders with technical assistance and finance mechanisms, such as subsidies for inputs or certifications. The government would use "land-swaps" to relocate concessions on areas with high conservation or carbon value to degraded concession-free areas.

## IV. Synergies:

**Lower risks of noncompliance with public and private zero deforestation policies:** If companies and governments harmonize their definitions and policies around zero deforestation, they can increase pressure on direct and indirect suppliers to comply with these policies. In addition, the government would revise laws that encourage deforestation so that companies would not risk losing their property when they follow their deforestation policies. This would also lower the risk for companies that commodities produced from deforestation are laundered into their supply chains through indirect suppliers.

**Shared definitions and monitoring, reporting, and verification systems:** Governments and companies would use the same maps and definitions of deforestation, which would lower conflicts over land tenure.

**Incentives:** By working with companies, Indonesia could reduce deforestation and unlock payments for performance from Norway under their Letter of Intent. These payments could be used towards increasing yields, land titling, or other programs to provide incentives for smallholders,

indigenous peoples, and local communities. ZDZs could also improve relations between communities and corporations by reducing land conflicts.

## V. EDF Case Study: Cost of Reducing Deforestation in Kalimantan provinces

EDF used the historical relationship between palm oil revenues and deforestation across Kalimantan to project future deforestation and develop a spatially-detailed map of the opportunity costs of conserving forests given this future deforestation pressure. We projected deforestation over the next ten years and translated the opportunity cost of conserving forests over this period into a price per ton of carbon. The minimum carbon price needed to fully compensate for the opportunity costs of deforestation varies widely across Kalimantan, ranging from near zero (in areas with low deforestation pressure) to \$100/t $CO_2$ (in areas with high agricultural value per ton of carbon conserved). We also found that it is more cost-effective to conserve portions of High Carbon Stock (HCS, more than 40tC/ha) and Low Carbon Stock (LCS, less than 40 t C/ha) lands than it is to only eliminate deforestation from HCS areas. At a carbon price of \$10/t $CO_2$e, we found that Kalimantan provinces could reduce 75 million tons (Mt) $CO_2$e per year from LCS areas, 185 Mt$CO_2$e per year from HCS areas, and 260 Mt$CO_2$e per year from both HCS and LCS. This represents a reduction in emissions of 74-78% below the estimated "business as usual" scenario without a carbon price. We also found that Kalimantan could achieve a 41% reduction goal in $CO_2$ emissions over the next ten years for an opportunity cost of less than \$1/ton $CO_2$e.

This analysis shows that a "Zero Deforestation Zone" approach focused on an entire landscape has the potential to more cost-effectively reduce emissions than an approach focused on just a particular subset of lands. This analysis does not consider the potential for "leakage" or shifts of deforestation from one location to another. Incorporating leakage would lend a further argument for a regional approach that would capture shifts in deforestation across an entire zone.

## VI. Pilots for Jurisdictional Approaches

**Central Kalimantan Roadmap:** The government of Central Kalimantan created a Road Map to reduce deforestation while increasing palm oil production (Irawan et al., 2014).

**Jurisdictional RSPO:** The Roundtable on Sustainable Palm Oil (RSPO), which has previously certified individual plantation and mills, is exploring ways to certify jurisdictions including Central Kalimantan (Zweynert, 2015).

## I. Introduction:

Indonesia made headlines world-wide for its rapid deforestation and more recently for the debilitating haze that ensues from forests fires. However, Indonesia has also been recognized for the flood of corporate commitments to eliminate deforestation from supply chains for palm oil and timber in the country. Indonesia and companies operating there will need to find a way to support economic growth without destroying the environment. In this report, we explore how districts and provinces in Indonesia, focusing on Kalimantan, could become Zero Deforestation Zones (ZDZs). ZDZ is a concept that links the policy framework Reducing Emissions from Deforestation and forest Degradation (REDD+) and private sector zero deforestation initiatives into one jurisdiction-wide approach.

Indonesia now has the largest percentage of forest lost, losing more than 6 Mha of natural forest between 2000 and 2012 (Margono et al., 2014). Lawson (2014) found that 80% of deforestation in Indonesia was driven by commercial agriculture, mostly for palm oil (36%) and timber plantations (24%), 80% of which was illegal. Indonesia also ranks among the top ten emitters of greenhouse gases (WRI, CAIT, 2014), with land use change and forestry representing almost 80% of its total emissions (Ministry of Environment, 2010). Land use change emissions in Indonesia are exacerbated by development on peatlands, which accumulate large stores of carbon in low oxygen, wetland conditions that slow decomposition (Keddy 2010). Finally, palm oil and timber plantations have been linked to deadly haze fires (Greenpeace, 2014) and degradation of water resources (Carlson et al., 2014).

However, palm oil and timber are also very important for Indonesia's economy and they should be part of the solution to deforestation. Indonesia produces half of the world's palm oil, which is used in a wide variety of products from cleaning solutions to food. Palm oil represents approximately 2.8% of Indonesia's GDP, supports over six million jobs, and produces billions in foreign exchange earnings (Boer et al. 2012, Paoli et al. 2013). Palm oil also produces more oil per hectare than any other major oil crop (Teoh, 2010, Boer et al. 2012), so it has the potential to reduce land required for seed oil production.

Across Indonesia, government and business leaders have started to address deforestation. The largest palm oil traders, who collectively control more than 90% of the palm oil market, have zero deforestation policies (Mongabay news, 2015, February 3). In 2009, Indonesia pledged to reduce emissions by 26% by 2020, or 41% with international assistance, compared to a business as usual baseline. Norway then signed a Letter of Intent (LoI) with Indonesia, committing $1 billion to create Indonesia's national program for Reducing Emissions from Deforestation and Forest Degradation (REDD+) and pay for results of emissions reductions. Indonesia also recently announced a target of 29% reduction in emissions by 2030 compared to business as usual (MOEF, 2015).

Despite the considerable momentum building in Indonesia, there are many barriers to reducing deforestation, including conflicting policies and definitions between public and private sectors. Our proposal is to combine initiatives under a Zero Deforestation Zone (ZDZ), building off of an article that EDF published last summer on ZDZs (Meyer and Miller, 2015), where companies would source palm oil and other commodities from districts or provinces that have strong government and corporate policies in place and are on a pathway to zero net emissions from deforestation across the ZDZ. In this paper, we explore the challenges that would need to be addressed for provinces in Indonesia to become ZDZs and the advantages ZDZs could bring for companies, local and national governments, indigenous peoples and local communities.

## II. Existing Initiatives

### A. Private Initiatives

**Company Commitments:** The Consumer Goods Forum (CGF), which is comprised of 400 companies with $3.1 trillion in revenues, announced a board resolution to help achieve zero net deforestation by 2020 (CGF, 2010). Companies that control over 90% of palm oil trade have committed to eliminate deforestation from their supply chains (Mongabay.com, 2015, February 3). Major palm oil companies Golden Agri-Resources (GAR) and Wilmar International, as well as Asia Pulp and Paper (APP), have been recognized for strong commitments not to clear High Conservation Value (HCV) areas, High Carbon Stock (HCS) areas, and peatlands. Cargill additionally committed to zero deforestation for all of its commodities. Two steering committees formed in order to define HCS (HCS Approach Steering Group, 2015; The High Carbon Stock Science Study, 2015). Companies have also called for greater collaboration with government. At the United Nations Climate Summit in New York in 2014, Cargill, Wilmar, GAR and the Indonesian Chamber of Commerce (KADIN) signed the Joint Palm Oil Pledge to eliminate deforestation and encourage the government to develop policies to implement their pledge (United Nations, 2014).

**Roundtables:** The Roundtable for Sustainable Palm Oil (RSPO), established in 2004, has certified 20% of the world's palm oil production, nearly half of which is produced in Indonesia (RSPO, 2015). 92 companies committed to buy certified palm oil by 2015 or earlier (WWF, 2013). The Consumer Goods Forum recommends that its members source RSPO certified palm oil to meet their zero net deforestation commitment (CGF Activation Toolkit, 2013). In 2011, The Agricultural Ministry also created The Indonesian Sustainable Palm Oil (ISPO) standard (No. 19/2011), which all plantation and mills operating in Indonesia were supposed to be in compliance with by December 2014 (Caroko et al. 2011, Yaap and Paoli 2014).

**B. Government:**

At the G20 Summit in 2009, the government of Indonesia announced its "Vision 7-26" plan, a voluntary commitment to reduce national greenhouse gas emissions below business as usual by 26%, or 41% with international support, while realizing a 7% growth in annual GDP (WWF and UNEP 2011). This commitment was supported by a Letter of Intent for up to $1 billion from the Norwegian government to create a REDD+ program. Indonesia recently released its Intended Nationally Determined Contribution (INDC), in which they committed to reducing emissions by 29% by 2030, although it has been criticized by Greenpeace for increasing its timeline without increasing its ambition (Jacobson, 2015, September).

It is unclear how the policies of President Joko Widodo, elected in mid-2014 on a campaign that included greater environmental protections, will affect deforestation. Since entering office, President Widodo has drastically changed the forest governance structure. He is also starting to take action to respond to enormous pressure from his country as well as Singapore and Malaysia to address the peat haze that's engulfing the region.

**REDD+:** Indonesia has 30 REDD+ projects and 45 other readiness activities such as developing National REDD+ policy, establishing a mechanism for monitoring, reporting, and verification (MRV) and building local capacity (theredddesk.org; FCPF, 2013). Central Kalimantan was designated as the REDD+ pilot province. Indonesia is receiving funding from UN-REDD, the World Bank's Forest Carbon Partnership Facility (FCPF), Australia, the German Government's International Climate Initiative, and other sources totaling $4.4 billion over the next few years (theredddesk.org). Norway has released about $50 million of funding so far, but the remainder of its $1 billion commitment will be distributed once Indonesia curbs its rising emissions from deforestation (Seymour et al., 2015).

**Moratorium:** After announcing Vision 7-26, the government created a moratorium by Presidential Instruction on all new licenses for oil palm, timber plantations, and selective logging on primary natural forest and all peatlands (Murdiyarso et al. 2011, Austin et al. 2014). The moratorium, which was extended by President Widodo until 2017, is intended to give Indonesia time to formulate good forest governance, collect data, and ensure data transparency for future land use planning purposes (Murdiyarso et al. 2011). After outrage over haze from peat fires mounted within Indonesia and neighboring countries, President Widodo issued a presidential instruction on October 24$^{th}$, 2015 that goes beyond the moratorium to prohibit development on all peatland, including within concession areas, and instead orders restoration of burned areas. However, many NGOs have argued that without a legally

binding presidential decree to this effect, local officials and producers can continue to ignore the presidential instruction without penalty (Mongabay Haze Beat 2015, November 13th).

**One map:** The government initiative One Map is an effort to convert multiple, conflicting maps by five different ministries and levels of government into a single, official base map of land cover and licensing data (including permits, administrative requirements, and concessions). Four ministries have signed a memorandum of understanding to use One Map when it is completed, showing their support for the initiative (Daemeter Consulting, 2015).

**Customary land rights:** In 2013, Indonesia's Constitutional Court ruled that customary forests will no longer be owned by the State, leading the government to recognize the rights of communities to their forests, affecting an estimated 10-40 million ha. Although implementation has been slow, this has been seen as a positive step (Daemeter Consulting, 2015).

**Land swaps:** Land swaps—moving existing concessions from high conservation value or carbon stock areas to less environmentally important, concession-free areas—have considerable potential to limit future oil palm development on carbon-rich lands. There are potentially 5.3 Mha of heavily degraded or deforested lands that are classified as forest estate (KH), managed by the Ministry of Forestry, while there are also high carbon or biodiversity lands that are classified as non-forest estate (APL), managed by the local governments (Butler 2013, Rosenbarger et al. 2013). There have been efforts to pilot land swaps, though they have yet to be successful (Kroeger 2014). For land swaps to be implemented, the government of Indonesia needs to work with companies and NGOs to simplify the complex and expensive legal process.

## III. Challenges

### A. Governance

Initiatives to address deforestation in Indonesia have been hindered by weak law enforcement, limited political will to address deforestation, and conflicting regulations and priorities between and among government officials and businesses. Indonesian law allows and in some ways encourages deforestation. Several policies will need to be reformed in order to tackle deforestation, including the forest moratorium, the new plantation act, and agricultural subsidies.

First, Indonesia's moratorium only applies to new concessions on primary natural forests and peatlands. Therefore, the moratorium excludes secondary and disturbed forests, which amount to 46.7 Mha (Murdiyarso et al. 2011), and forests on existing concessions, which amount to 3.5 Mha of primary and peat forests (Austin et al. 2012). The moratorium also excludes lands for energy and food needs, such

as for oil and rice (Murdiyarso et al. 2011). Finally, because the moratorium was created by Presidential Instruction, there are no legal consequences should it fail to be implemented (Murdiyarso et al. 2011). The moratorium could reduce emissions from deforestation if it were expanded. Austin et al. (2015) estimates that emissions could be reduced 9% by extending forest moratorium to include new concessions on primary forest and peat lands, 35% by prohibiting expansion on peat, primary and secondary forest lands, 46% by only expanding on areas with moderate carbon stocks, and by 55-60% by limiting expansion to areas with low carbon stocks.

Indonesia's forests are also threatened by low law enforcement. Two recent reports found that 80% of deforestation for commercial agriculture (Lawson, 2014) and 30% of Indonesia's total wood supply (Forest Trends and Anti-Forest Mafia Coalition, 2015) was illegal. Illegal production not only perpetuates corruption; it results in a loss of revenues for the government. Illegal logging has resulted nearly $9 billion in lost state revenue, according to the national anti-corruption agency (Vit, 2015, November).

Some regulations in Indonesia provide perverse incentives for land owners to clear forests. Under the new Plantation Act, companies are legally obligated to cultivate at least 30% of their land within three years after their concession is granted, and all area that is suitable for being planted with 6 years. Companies that set aside HCV and HCS areas could face administrative sanctions and even confiscation of their plantation by the state. In addition, subsidies for agriculture ($27,072 million per year) and biofuels ($79 million per year) dwarf REDD+ finance ($165 million per year), providing incentives for palm and timber expansion without adequate protections in place (McFarland et al., 2015).

Indonesia's government structure also poses many challenges for land use planning, including corruption, confusion over jurisdiction, and different application of laws in different provinces or districts (Myers & Ardiansyah, 2014). There have been many recent changes in government structure, with uncertain consequences for Indonesia's forests. President Widodo, who took office in October, 2014, made several commitments on natural resource management in his campaign, including extending the moratorium, restructuring government authorities on land use and clarifying land tenure (Jacobson, 2015, July). The president combined the Ministry of Forestry, the Ministry of Environment, the REDD+ Agency, and the National Council on Climate Change into one ministry, the Ministry of Forestry and Environment. Although this restructuring could reduce overlap and inefficiencies, it could also increase bureaucracy and corruption.

### B. Different Definitions

Company commitments, roundtables, and government bodies have created many different definitions and cut-off years for deforestation. RSPO members are prohibited from planting on lands that replaced primary forests on HCV areas after 2005. However, RSPO members can still clear secondary forests and shallow peat forests (May-Tobin et al., 2012). In addition, RSPO excludes companies that have deforestation after 2005. As mentioned above, the forest moratorium also only excludes primary forests and peatlands outside of existing concessions. In contrast, palm oil traders such as Wilmar, GAR, and Cargill committed not to produce or buy palm oil from plantations that cleared HCV or HCS areas, effective immediately after their commitments.

Different definitions of deforestation can have drastic consequences in terms of carbon emissions. Brown and Zarin (2013) illustrate the difference between net and gross deforestation by the following calculation: if each hectare of native forest has an average carbon stock of 150 MgC and reforested areas sequester 5 MgC/ha each year, for each hectare of native forest lost, there are net emissions of 145 MgC, or 532 $tCO_2$. To achieve zero net emissions, 30 ha of reforested land would be required to offset a single hectare of native forest. The difference between zero net deforestation and zero net emissions is even more drastic when considering Indonesia's peatlands and would be crucial for creating credible ZDZs. In Kalimantan, peatlands store an average of 1,954 MgC per hectare below ground (Wahyunto et al. 2010). Repeating Brown and Zarin's (2013) calculation for Kalimantan, if a hectare of Kalimantan's peatland were destroyed and replaced with planted secondary forest (which sequesters 5 MgC/ha each year), there would be net annual emissions of 1,949 MgC, or 7,146 $tCO_2$. To achieve zero net emissions, 391 ha of reforested land would be required to offset a single hectare of peat.

### C. Leakage and laundering:

Under current public and private initiatives, there could be leakage of deforestation between farms, commodities, or regions. First, even if a majority of the palm oil market has zero deforestation commitments, producers could still sell palm oil to buyers without commitments or even indirectly to committed companies. Palm oil is mainly consumed domestically in Indonesia (33%), with the remainder exported to EU (24%), India (23%) and China (20%) (Persson, 2014). Therefore, about three quarters of the demand for palm oil comes from emerging markets with low or no sustainability requirements. Palm oil is also mixed many times along the supply chain. As a result, palm oil can be laundered into the supply chains of companies with zero deforestation commitments through indirect suppliers. For example, palm oil produced with illegal encroachment in protected tiger corridors were linked to Wilmar's supply chain after the company made its forest conservation policy (Eyes on the Forest, 2014).

Finally, palm oil interacts with other commodities in environmentally detrimental ways. Some companies harvest timber prior to developing oil palm to increase profits (Fisher et al., 2011) or apply for palm oil concessions because they allow clear cutting of forests, abandoning the land after they extract timber (Sheil et al., 2009). In addition, deforestation for palm oil production could increase to fulfill domestic demand for biofuels, which may be bolstered by the government's recent policies to mandate biodiesel blending and increase subsidies for biofuels (Daemeter, 2015). Therefore, it is necessary to find a solution to deforestation that covers all commodities and companies.

### D. Small holders and local communities

Small holders need incentives to adopt sustainable practices and increase yields. Roundtables have attempted to lower costs of certification and increase incentives for small-holders, but many argue that premiums aren't high enough to offset upfront costs (FAO, 2012). Companies have also faced challenges in improving small-holder practices. In its independent evaluation of APP, Rainforest Alliance (2015) found that although the paper company halted forest clearance for new plantation establishment, they were not able to prevent forest clearance and illegal logging by supplier concessions and surrounding communities. Finally, the government still needs to implement its court order to recognize the customary rights of communities to their lands.

## IV. Solution

Our approach is to combine the strengths of current initiatives into one jurisdiction-wide solution, which we call Zero Deforestation Zones (ZDZs). A ZDZ is a jurisdiction (province or district) that has strong governance and policies in place to reach zero net emissions from deforestation while increasing production and economic development. ZDZ's provide the framework to align the incentives and initiatives of the public and private sector actors. ZDZ's would also have strong monitoring systems through REDD+ that would track deforestation across the jurisdiction, increasing transparency, enabling enforcement, and lowing costs per area of monitoring for companies. A potential pathway to implement ZDZs in Indonesia is explained below.

### A. Revise laws that allow and incentivize deforestation:

Indonesian provinces would need to enact several changes in order to curb deforestation and be considered a ZDZ. To create the good governance necessary for a ZDZ, local governments would use funding for capacity building from Norway and other donors to resolve land titling issues, revise conflicting and weak land use legislation, and provide technical support to meet palm oil demand while reducing deforestation. Local governments would continue to support the demarcation of indigenous

territories and concessions of companies and smallholders. The forest moratorium could be revised incrementally to improve transparency and expand protection (Murdiyarso et al., 2011). The government would also need to revise its New Plantation Act, which requires plantations to cultivate all suitable land within six years of receiving their land title, and allow companies to swap forested land with degraded land to achieve the same area of cultivation. Current agriculture and biofuel subsidies should be reformed to focus on increasing yields on existing lands and shifting expansion to degraded lands (McFarland et al., 2015). Consumer goods companies would also commit to preferentially source from ZDZs.

**B. Agree on definition of deforestation:**

Initiatives would need to harmonize their definitions of "zero deforestation" in order to mutually reinforce each other. A harmonized definition for degraded lands is also crucial to complete land swaps to ensure palm oil expansion doesn't replace carbon and biodiversity rich areas. To maintain environmental integrity, a national level definition would have to produce zero net *emissions* from deforestation and be compliant with UNFCCC decisions on REDD+, including environmental and social safeguards (Meyer, Miller, 2015). Multi-stakeholder initiatives that are already operating in Indonesia, such as FSC, RSPO and the HCS steering committee could play a role in facilitating the process of agreeing on the definition, sources of funding and enabling conditions for a ZDZ.

**C. Combine private and public monitoring systems and scale to jurisdictional level:**

Monitoring deforestation across a jurisdiction is important for implementing ZDZs. The REDD+ Agency is currently formulating a measurement, reporting and verification (MRV) institution that is compliant with UNFCCC decisions and has IPCC Tier 2 or higher accuracy under their agreement with Norway, which they planned to launch by the end of 2014 (Indonesia REDD+ Task Force, 2012). The Indonesian government should sync One Map with existing technology such as Landsat 8 and Carnegie Landsat Analysis System (CLAS) to track deforestation, monitor protected areas, and enforce forest conservation laws (Kroeger, 2014). RSPO and the private sector could use satellite imagery, coupled with GIS technology, soil type maps, and community territories, to track deforestation and identify land suitable for palm oil expansion (Fairhurst & McLaughlin, 2009). Companies have already begun to explore using remote sensing to monitor progress on their forest policies. A committee of companies and non-profits created the first version of a HCS Approach Toolkit, in which companies work with local communities to identify areas for conservation and development using satellite imagery, field sampling, and maps for HCV, peat lands, and riparian zones. Jurisdiction-wide MRV systems would create an economy of scale, reducing the cost per area for certification under RSPO and FSC and for implementing voluntary company commitments.

### D. Meet future palm oil demand through intensification and shifting expansion to degraded lands:

The World Bank Group and IFC (2011) estimated that an additional 6.3 million hectares (Mha) of oil palm would need to be planted to meet vegetable oil demand by 2020. Indonesia could meet this demand without deforestation through revised laws and regulations that encourage intensification and shifting palm oil to degraded lands. Governments would provide smallholders with technical assistance and finance mechanisms, such as subsidies for inputs or certifications such as RSPO and FSC. These inputs could increase yields by 35%, equivalent to about 1.6 Mha of new plantings under current yields (Fairhurst & McLaughlin, 2009). In addition, there are at least 6 Mha of degraded land that could support palm oil expansion (Gingold, 2010), easily meeting the projected need for new planted areas. The government could implement land swaps between forested and non-forested areas (Rosenbarger et al., 2013).

## V. Synergies:

### A. Lower risks of noncompliance:

If companies and governments harmonize their definitions and policies around zero deforestation, they can increase pressure on direct and indirect suppliers to comply with these policies. In addition, the government would revise laws that encourage deforestation so that companies would not risk losing their property when they follow their deforestation policies. This would also lower the risk for companies that commodities produced from deforestation are laundered into their supply chains.

### B. Shared definitions and monitoring, reporting, and verification systems:

Governments and companies would use the same maps and definitions of deforestation, which would lower conflicts over land tenure. Public and private sectors would also share costs of monitoring deforestation across the jurisdiction, which would be lowered due to economies of scale. Shared definitions and monitoring systems would also reduce inconsistencies between public and private efforts to reduce deforestation.

### C. Incentives:

By working with companies, Indonesia could reduce deforestation and unlock payments for performance from Norway under their Letter of Intent. These payments could be used towards increasing yields, land titling, or other programs to provide incentives for smallholders, indigenous peoples, and local communities. ZDZs could also improve relations between communities and corporations due to clearer land ownership and economic incentives for communities. Community relations can be especially costly for palm oil producers because conflicts with local communities can disrupt operations for days, resulting in opportunity costs of $1,000,000 (Levin, 2012).

## VI. EDF Case Study: Costs of reducing deforestation in Kalimantan provinces

EDF used the historical relationship between palm oil revenues and deforestation across Kalimantan to project future deforestation and develop a spatially-detailed map of the opportunity costs of conserving forests given this future deforestation pressure. The estimated opportunity cost of conserving forest varies widely across Kalimantan. Expressed in terms of dollars per ton of avoided emissions from deforestation, the cost ranges from near zero to $100 per $tCO_2$ (Figure 1). This indicates that the same price will have different effects in terms of reaching zero deforestation in different regions. Fisher et al. (2011) found that the opportunity cost of conservation was $46-48 per $tCO_2$ when they considered returns from timber extraction and post-logging palm oil production on the same lands. This price falls within the range of estimates across Kalimantan, but does not account for the spatial variation in cost, as some areas can be conserved at very high or low costs.

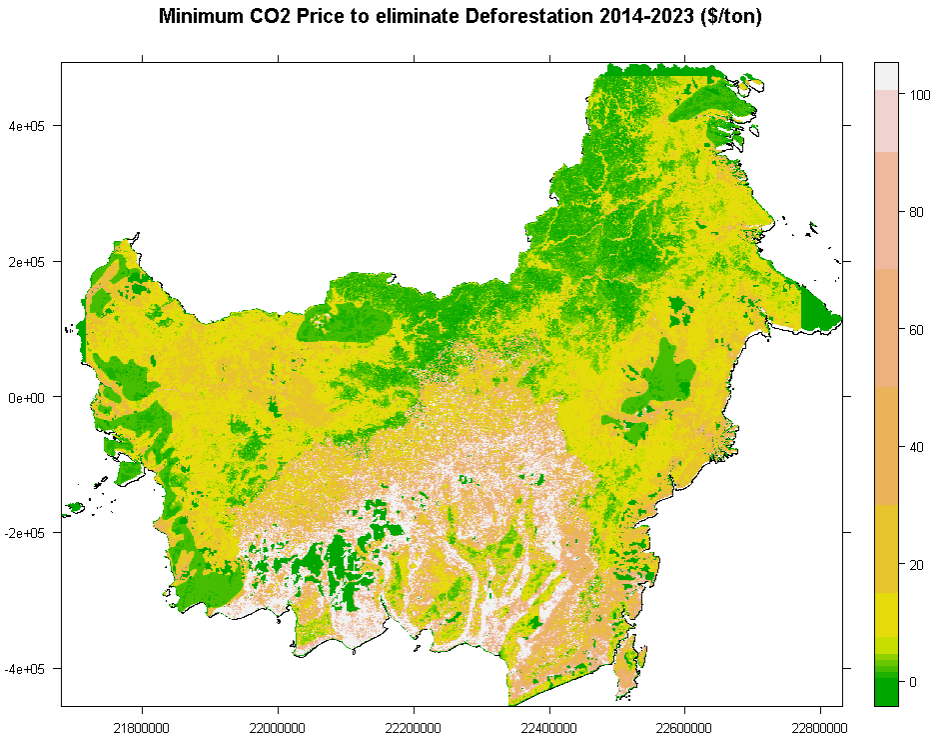


Figure 1. This spatial map shows the minimum CO2 price (local-specific) to eliminate deforestation in Kalimantan, Indonesia. (Cai, R. 2015, unpublished manuscript).

We also compared the cost of reducing emissions from deforestation of low carbon stock (LCS, less than 40 ton C/ha) and high carbon stock (HCS, more than 40 t C/ha). At a carbon price of \$10/t $CO_2e$ (including both above and below ground carbon), Kalimantan provinces can reduce 75 $MtCO_2e$ per year from LCS areas, 185 $MtCO_2e$ from HCS areas, and 260 $MtCO_2e$ per year from both HCS and LCS. In the highest scenario including HCS and LCS, Kalimantan could reduce emissions 74-78% below the projected "business as usual" scenario without any incentive for REDD+. Therefore, although there is more cost-effective potential to reduce emissions from HCS areas than LCS areas, there is significant cost-effective potential from LCS areas as well.

For comparison, Busch et al. (2011) found that an international carbon price of \$10/$tCO_2e$ would have reduced emissions from deforestation across Indonesia by 163-247 MtCO2e/year from 2000-2005, 20-31% below the reference scenario without REDD+ for Indonesia.

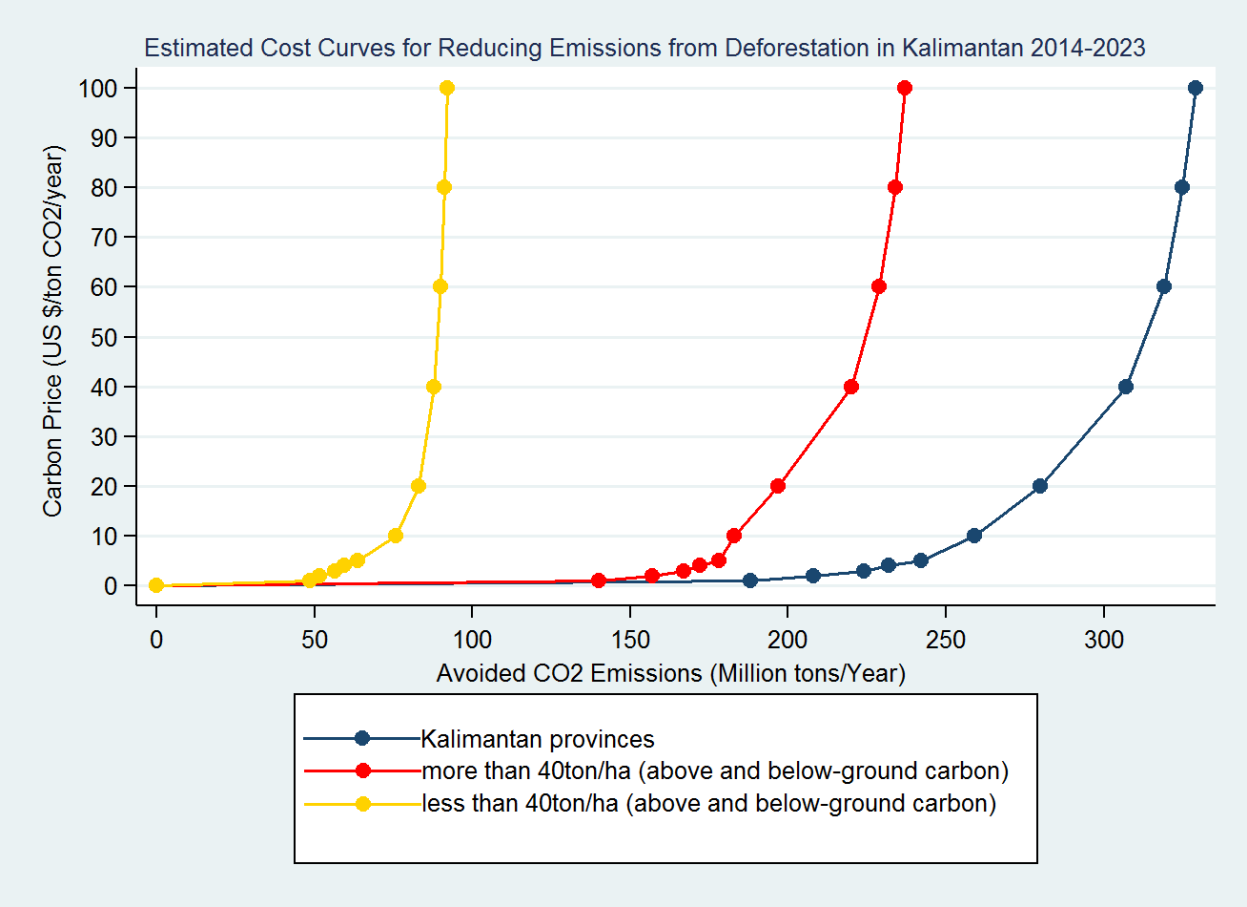


Figure 2. Total avoided $CO_2$ emission if we apply the same price across Kalimantan. (Cai, R. 2015, unpublished manuscript).

The difference in cost between only conserving HCS lands and conserving both HCS and LCS is further illustrated in Figure 3, which shows that Kalimantan provinces can reach its 26% and 41% reduction goals at less than $1/ton CO2 by focusing on HCS land alone. If Kalimantan provinces can conserve both low carbon stock and high carbon stock, we can further reduce the cost in order to can achieve its 41% goal.

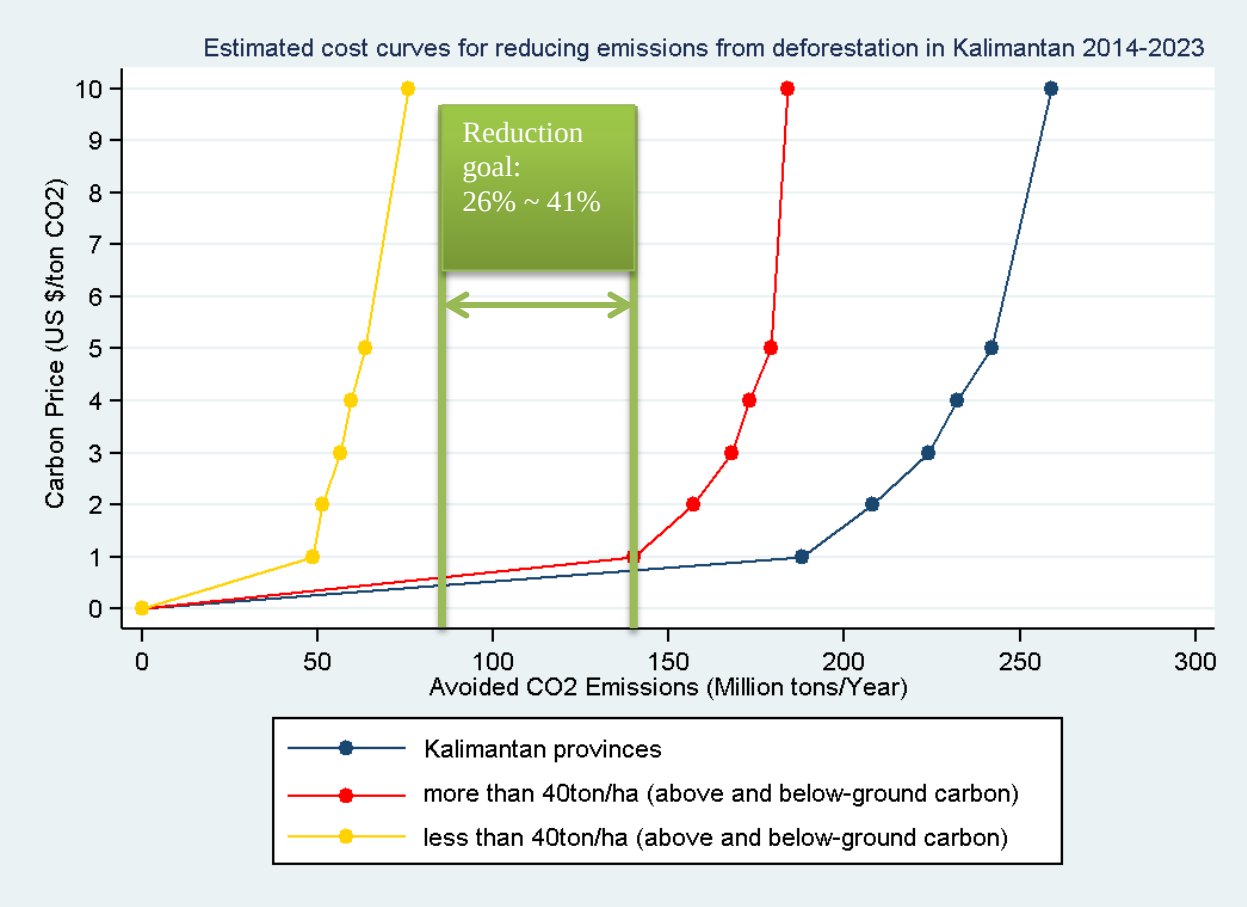


Figure 3: Carbon price to achieve 26-41% goal if we apply the same carbon price across Kalimantan. (Cai, R. 2015, unpublished manuscript).

## VII. Pilots for Jurisdictional Approaches

### A. Central Kalimantan Roadmap

The government of Central Kalimantan created a Road Map Low-Deforestation Rural Development, a plan to reduce deforestation while increasing palm oil production and improving livelihoods (Irawan et al, 2014). Under this road map, Central Kalimantan would resolve land tenure

impacting 1.6 million hectares, only grant permits to plantations in degraded lands, design a registration and monitoring system for assessing and eliminating deforestation, conserve primary forest and peatlands, and increase smallholder yields and production. If Central Kalimantan reaches its goal of ending deforestation by 2020, the road map estimates it could avoid emissions of 0.8 gigatons of $CO_2e$.

### B. Jurisdictional RSPO

Alongside Central Kalimantan's roadmap, the province committed to develop a jurisdictional certification approach for palm oil production with RSPO. RSPO recognizes that certification of smallholders has been a barrier to increasing its market share, and jurisdictional approaches could bring smallholders into the system. RSPO is also exploring a jurisdictional pilot program in Sabah, Malaysia (Zweynert, 2015).

## VIII. Barriers

There are several barriers that would have to be overcome in order to implement ZDZs within Indonesia. In the public sector, corruption and conflicting laws will have to be resolved. Political buy-in is also necessary to complete a successful land-swap. Secondly, if companies choose to source from ZDZs, organizations may still fault them for not tracking products throughout their supply chains. Companies would have to continue to increase transparency and traceability in their supply chains, but they should also source from ZDZs so they can address deforestation beyond their supply chains.

## IX. Conclusion

Indonesia has many challenges to address before it can eliminate deforestation. However, districts and provinces in Indonesia could become Zero Deforestation Zones, reaching zero net emissions from deforestation, by revising laws that allow deforestation, setting up monitoring systems, improving yields, and shifting new production to degraded lands. Furthermore, our analysis shows that ZDZs could more cost-effectively reduce emissions than an approach that focuses on particular subsets of lands. If jurisdictions created ZDZs, they could reduce inconsistencies between public and private policies, encourage private sector investment, and provide economic incentives for small holders and local communities.

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