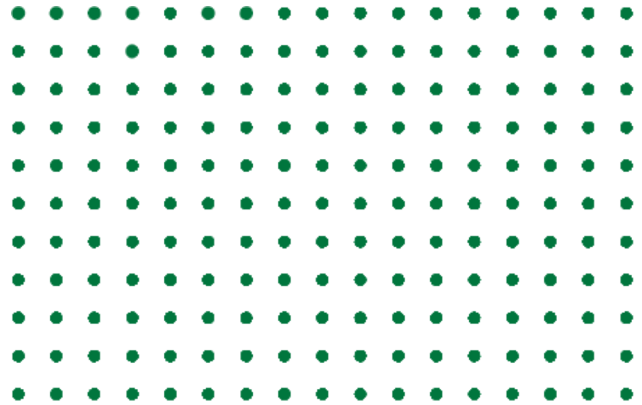




USAID
FROM THE AMERICAN PEOPLE

COMMODITY-DRIVEN FOREST LOSS

A STUDY OF SOUTHEAST ASIA



A SUMMARY FOR POLICY MAKERS



COMMODITY-DRIVEN FOREST LOSS: A STUDY OF SOUTHEAST ASIA

INTRODUCTION

Nearly 15 percent of the world's tropical forests are found in Southeast Asia, and the region includes at least four of the twenty-five globally important biodiversity hotspots. Unfortunately, the region's forests also have experienced high levels of deforestation, which:

- threatens the region's exceptionally high biodiversity,
- degrades water and air quality, and
- releases vast amounts of greenhouse gases into the atmosphere.

Deforestation often is linked to the conversion of forests into agricultural land for the production of “boom crop” global commodities such as rubber, palm oil, and pulpwood. A key challenge is finding ways to reconcile agricultural and economic development with environmental protection and carbon sequestration.

To address this challenge, the United States Agency for International Development's (USAID) Regional Development Mission for Asia (RDMA) supported an assessment of crop development, forest loss, and landscape carbon stocks in Southeast Asia, led by the US Department of Agriculture's Forest Service (USFS), Spatial Informatics Group (SIG), and World Agroforestry (ICRAF).

The assessment focused on seven countries: **Cambodia**, **Indonesia**, **Lao PDR**, **Myanmar**, **Philippines**, **Thailand**, and **Vietnam**. Its goals were to determine the primary crops that have replaced natural forests from 2000 to 2015, to calculate the carbon losses or gains associated with these conversions, and to make recommendations that guide sustainable investments by the private sector, land use decision makers, and development partners. Additionally, the assessment is intended to support Southeast Asian countries align development policies with their Nationally Determined Contributions (NDCs) to the United Nations Framework Convention on Climate Change (UNFCCC), as well as to their Sustainable Development Goal (SDG) commitments.

This document summarizes key findings and recommendations from the assessment. The [full report](#) provides in-depth analysis and discussion of regional and country-specific findings.

METHODS

Carbon emissions linked to land use change from forest loss are well established, but few methods and studies have provided ways to estimate emissions from forest converted to specific crop systems, such as rubber or oil palm, or the impact of climate smart agriculture practices, such as agroforestry (the cultivation and use of trees and shrubs with crops and livestock in agricultural systems). This assessment was designed to fill these information gaps by providing localized data that allows land use decisions to be tailored to meet national needs.

For the study, researchers examined 1,000 sample plots in each of the seven Southeast Asian countries (with an additional 600 plots in Indonesia to account for its size). At each sample, satellite imagery was used to label the land cover type—natural forest, tree crops, other crops, etc.—for the years 2000 and 2015. The researchers then calculated carbon budgets—i.e, carbon emitted and carbon sequestered—for both forests and the land cover types that replaced forests. The study determined the aboveground biomass carbon pool of commodity crops that replaced forests between 2000 and 2015, as well as the difference compared to carbon stock estimates of intact forestlands.



FINDINGS

For the region as a whole, key findings of the assessment are as follows:

- A total of 15.8 million hectares (ha) of forestlands were lost between 2000 and 2015 in Southeast Asia; about 9.4 million ha of that land now supports crops.
- In total, 3 million ha of forestlands were converted to herbaceous crops, such as cassava and cereal grains, representing 32% of the lost forestlands now under cultivation. Oil palm production accounted for 26% of the forest loss due to agricultural conversion.
- The carbon stored within the aboveground biomass of the crops replacing forests amounted to 269 million tonnes. If these lands were still forested, they would store 1.7 billion tonnes. This is a loss of 85%, which is equivalent to the greenhouse gas (GHG) emissions from approximately 280 million passenger vehicles driven for one year.

Perhaps the most surprising finding was that oil palm and rubber concessions were not the primary cause of deforestation in the region. While these crops were the prime driver of deforestation in Indonesia, at a regional level, forests were replaced primarily by traditional herbaceous row crops, rice, orchards, or some combination of these.

On formerly forested lands, 139,796,328 ha were covered in monoculture crops across the region, while just over 129,000,000 ha were covered in some form of agrisilviculture. Natural forest contained far more carbon in aboveground biomass than an equivalent area of any type of crop grown in a monoculture, as well as more than any crop grown in an agroforestry system. However, some agroforestry systems contained nearly as much carbon as early growth or degraded natural forest—suggesting a large potential for carbon storage through agroforestry.

REGIONAL RECOMMENDATIONS

The study offers a range of regional-level recommendations intended to promote both sustainable economic development and carbon storage in landscapes:

1. Encourage nations to expand agricultural production on fallow or degraded lands that currently sequester relatively little carbon.
2. Expand use of climate smart agriculture practices, such as intercropping, water-saving technology, alternate wetting and drying, enhanced efficiency fertilizers, and agroforestry.
3. Provide farmers with technical and financial assistance to increase yields associated with agroforestry.
4. Improve the process for granting economic land concessions (ELCs) so that it is fair, inclusive, transparent, and respectful of the historic rights of local communities.
5. Allow shifting agriculture (i.e., swidden or slash-and-burn), so long as it reuses fallows and does not lead to clearing of virgin forest.
6. Continue to work with international agribusinesses to expand the production and marketing of deforestation-free products.
7. Reform land and resource use rights to increase control by local communities, thereby creating better incentives for local people to manage forests sustainably.
8. Enforce restrictions on illegal logging.
9. Reduce emissions from rice cultivation.

One recommendation is worth emphasizing: Agroforestry practices should be implemented more broadly in existing monoculture plantations. Agroforestry can quickly improve landscape carbon storage while also likely improving production capacity and some ecosystem services.

All of these recommendations have been implemented in the region, although at a limited scale and scope. National and local governments must scale up locally appropriate practices. Only through innovative, pro-people, pro-environmental policy change will the region begin to follow a path of climate-friendly development that preserves life on land while helping people realize a life without hunger or poverty.

COUNTRY FOCUS: CAMBODIA

INTRODUCTION

In 2000, forestlands covered 12 million hectares (ha) of Cambodia, or more than 66 percent of the country. By 2015, forest cover was down to 9.5 million ha. FAO estimated that in the period from 2005 to 2010, **Cambodia had the third-highest rate of deforestation in the world.**



Deforestation has been driven by logging (both legal and illegal), charcoal production, mining, and ELCs for commodity crop plantations. While deforestation is occurring mostly outside of protected forests, concession areas within protected areas are a major threat. These areas are not policed because of jurisdictional laws, and deforestation rates are higher in these areas than elsewhere.

FINDINGS



1.1 MILLION ha of forestlands were converted to other uses between 2000 and 2015, a **loss of 9.5%**.



796,096 ha of the formerly forested land now supports agriculture, primarily herbaceous plants (cassava, soybeans, and maize) and tree crops (fruit and nut, rubber, pulpwood).



The carbon stored within the aboveground biomass of the crops replacing forests is 20.9 million tonnes, compared to 71.9 million tonnes if these lands were still forested. The land use change therefore represents a **loss of 71% in carbon stored.**



Many of the crops were interplanted following agroforestry practices, and the greatest stock of carbon on cultivated land is found in herbaceous crops grown in agroforestry systems.

COUNTRY-SPECIFIC RECOMMENDATIONS

- **Establish profitable, carbon-intense crops on degraded lands:** Crops such as rubber, teak, and fruit/nut trees can store substantial amounts of carbon and have a high economic value, offering better options compared to oil palm and pulpwood.
- **Reduce charcoal and fuelwood use:** Eliminating charcoal and fuelwood, both of which are key drivers of deforestation, will be difficult because they are the only available cooking fuel in many regions and their production provides a livelihood to many people. However, the use of charcoal and fuelwood could be limited by wider distribution of fuel-efficient cookstoves, production of charcoal from waste materials, building of more bio-gas digesters, and installation of more solar arrays.
- **Scale up climate smart agriculture practices:** Many farmers in Cambodia are already using agroforestry practices such as intercropping, which suggests that scaling up such carbon-intensive practices may be relatively simple. In areas that are not suitable for agroforestry, gains could be made through water-saving technology, alternate wetting and drying, and enhanced efficiency fertilizers.
- **Improve forest policy and law enforcement:** Reversing the practice of allowing concessions in protected areas should be a primary concern for those who want to preserve landscape carbon. Additionally, protecting forests through law enforcement will require reducing corruption within the government, providing better financing and training for rangers, and expanding community-based monitoring.

Improving the livelihoods of people in Cambodia need not come at the expense of the environment, because there are ways to develop the country's economy without further damaging its natural resources. The required large-scale change is not easy, but it can be achieved with thoughtful investment and a willing, well-educated populace.

COUNTRY FOCUS: **INDONESIA**

INTRODUCTION

Indonesia was lushly forested and teeming with biological diversity as late as 1950, with forests covering 159 million ha, or 87% of land area. By 2015, the country had lost 68 million ha of forests and pressure on landscapes has continued since then. The granting of ELCs for commodity crop production has been the primary cause of forest loss: Indonesia has become the world's top producer of palm oil and a major producer of rubber, copra, cocoa, coffee, and spices. Mining, energy production, wildfires, and urbanization have contributed to deforestation as well.



Commodity crop plantations are often located on former peatland, and this land use change releases vast amounts of carbon into the atmosphere—a key reason why the Agriculture, Forestry and Other Land Use (AFOLU) sector has been Indonesia's largest source of GHG emissions.

FINDINGS



10.6 MILLION ha of forest in Indonesia was converted to other uses between 2000 and 2015, about 6 million ha of that land now supports crops.



2.3 MILLION ha were converted to oil palm plantations, representing 19% of the lost forestland now under cultivation.



189 million tonnes of carbon are stored within the aboveground biomass of crops that have replaced forests—**86% less** than would have been stored had the forests remained intact.



0.9 million ha of peat swamp have degraded since 2000, and 693,000 ha are now under cultivation, resulting in **an additional 10.8 million tonnes of carbon emitted** from peat decomposition.

COUNTY-SPECIFIC RECOMMENDATIONS

- **Protect peatlands:** To preserve carbon in the landscape and ensure that Indonesia can meet its commitment to reduce GHG emissions by 41% by 2030, the country must protect its vast tracts of peat. This will require:
 - Prevention of peat fires.
 - Restoration of degraded peatlands.
 - Tightening the ban on development of peatlands to include those that are less than 3 m deep, which are now excluded from the ban.
 - Expanding production of paludiculture (i.e., wet-soil) crops and non-timber forest products (NTFPs) that allow economic development while preserving peatlands.
- **Encourage extensive production systems that preserve native tree canopy:** Products such as jungle rubber can be harvested within existing forest structures, avoiding carbon losses associated with clearing.
- **Promote use of village funds:** Indonesia employs programs that give money directly to villages for investment in roads, schools, and clinics. Such funds could also be used to help villages adopt sustainable development options.

Indonesia is a middle-income country with near-complete cell phone penetration, placing it in a good position to transition its economy from natural resource exploitation to technology and services. If this potential is realized, the country would leave forests intact, preserve biodiversity, and reduce GHG emissions. The government, the private sector, and development partners must focus on climate-friendly development to allow the country to meet its Sustainable Development Goals.

COUNTRY FOCUS: LAO PDR

INTRODUCTION

Forests are vital for people's livelihoods in Lao PDR, with an estimated 70% of the country's 6.6 million people dependent on forests and waterways for subsistence and income generation. Natural resources have also fueled the country's economic growth, reducing the forest cover to 41% by the early 2000s. Much of the current forest cover is a mix of secondary forests, plantations, and bamboo.

The Lao PDR Government is committed to reversing this trend by increasing forest cover up to 70%. Improved understanding of the extent of GHG emissions or reductions due to land use change is an important prerequisite for achieving these ambitious national targets.



FINDINGS



945,000 ha of forest were lost between 2000 and 2015; about 500,000 ha of that land was converted to agriculture.



50% of forestlands converted to agriculture (245,000 ha) includes herbaceous crops, such as maize, cassava, and sugar cane; the remainder were converted to tree crops, including pulpwood and rubber.



The total carbon storage within the aboveground plant biomass of the crops replacing forested land is 9.1 million tonnes, meaning that deforestation caused an 84% reduction of the carbon stock.

COUNTRY-SPECIFIC RECOMMENDATIONS

- **Support smallholder coffee farmers:** Boosting sustainable practices, such as electronic certification schemes to verify deforestation-free commodities, could improve profits and trade opportunities for coffee growers.
- **Diversify rubber farming:** Promoting rubber farming on degraded lands, and incorporating it with agroforestry or shifting agriculture, could enable smallholders to produce food while earning extra income.
- **Promote conservation agriculture:** Small loans and adequate training could help to integrate conservation agriculture with traditional shifting cultivation practices, reduce soil erosion, increase soil fertility, and keep more carbon in the ground.
- **Document and secure land tenure:** Participatory land use planning offers opportunities for reducing land use conflicts, particularly in remote areas where large land concessions are not yet present.
- **Support microfinance, farmer cooperatives, and expanded access to markets:** Such support has been shown to increase food security, market access, and livelihood opportunities. This is of particular relevance for farming slow-growing species such as teak.
- **Harness the potential of REDD+:** As the Government of Lao PDR is preparing to access results-based payments under REDD+, the institutional arrangements for benefit sharing will play a pivotal role in securing positive impacts on forest cover and community livelihoods.

Lao PDR is making significant strides towards increasing its forest cover and supporting village forestry. Reducing shifting cultivation is an important objective for the Lao PDR Government. However, there are also ample opportunities for improving shifting cultivation practices by incorporating trees into the landscape. Community participation, long-term engagement, and collaboration with civil society can ensure long-term, sustainable results.

COUNTRY FOCUS: MYANMAR

INTRODUCTION

Myanmar's history of deforestation is short but dramatic. In 2010, Myanmar had the highest percentage of forest cover globally, with 48% of the country occupied by forests. Now, Myanmar has one of the highest deforestation rates in the world.

Factors leading to deforestation in Myanmar are complex, ranging from consequences of the long civil conflict to the rapidly growing economy. Increased international trade of wood products, increased infrastructure and hydropower development, and the growth of the mining and agricultural sectors have played significant roles.



FINDINGS



1.2 MILLION ha of forest were lost between 2000 and 2015; approximately 760,000 ha of that land now supports crops



37% of lands with tree cover were converted to herbaceous crops (386,000 ha) and 32% to tree crops (327,000 ha), including pulpwood and rubber.



The carbon within the aboveground biomass of crops replacing forests is 16.8 million tonnes, compared to 95.2 million tonnes if these lands were still forested. This land use change represents **a loss of 82% of aboveground carbon**.



Agroforestry systems represent only 24% (185,000 ha) of the agricultural systems that replaced forests. This is **much lower** than many other countries in Southeast Asia.

COUNTRY-SPECIFIC RECOMMENDATIONS

- **Enhance transparency and equity around land tenure:** Globally, high deforestation rates have been associated with policies aimed at maximizing profits in forest areas with unstable tenure regimes. In Myanmar, policies related to land concessions must be reformed to reduce rampant deforestation in concession areas, as well as to create greater transparency and equity in land titling processes. Providing communities with land rights through community forestry is another important strategy to reduce deforestation, promote sustainable livelihoods, and support the peace process. Additionally, a centralized system that records land titles and land uses is essential for a fair and transparent tenure system; therefore, the continuation and expansion of current efforts, such as OneMap Myanmar, are critical.
- **Scale up climate smart agriculture practices:** Given the comparatively low prevalence of agroforestry systems in Myanmar, agroforestry represents an underutilized opportunity to capture carbon while simultaneously providing more ecosystem services, food, and livelihood benefits compared to monocultures.
- **Strengthen value chains:** Increasing the number of timber processing plants in Myanmar can result in increased profits by adding value to the high-value timber that is currently being exported with little processing. Given the high degree of interest among communities and forestry officials, there is also significant potential to further develop value chains for NTFPs.

By rethinking economic growth, involving communities, and engaging in fair and transparent governance, Myanmar will see progress in achieving multiple Sustainable Development Goals concurrently.

COUNTRY FOCUS: PHILIPPINES

INTRODUCTION

The Philippines has experienced high levels of deforestation. In 1900, about 70% of the Philippines was forested, but that figure dropped to 21.5% by 1988. More recently, however, the country has introduced a number of reforestation efforts—including the Expanded National Greening Program (E-NGP)—that have led to overall increases in forest cover.



A few studies have indicated that continuing forest loss in the Philippines appears to be due to smaller clearing events, including shifting agriculture, rather than the large agro-industrial operations that have driven deforestation elsewhere in Southeast Asia. Trade statistics, however, show that the Philippines has embraced the region's boom crops: exports of most economically important commodity crops from the Philippines more than doubled between 2000 and 2015. Little data is available quantifying the amount of land converted to cultivation to produce such crops. This study was intended to fill that information gap.

FINDINGS



327,000 ha of forest in the Philippines were converted to other uses between 2000 and 2015; about 165,000 ha of that land now supports commodity crops.



80,000 ha of lands with tree cover were converted to herbaceous crops—such as grains, sugarcane, and cassava—between 2000 and 2015. Coconut plantations covered 24,050 ha, or 15%, of the former forest area. A smaller amount of forestland was converted to oil palm (9,396 ha) and other tree commodities (28,013 ha).



4.2 million tonnes of carbon are stored within the aboveground biomass of crops that have replaced forests, 89% less than if the forests had remained intact.

COUNTRY-SPECIFIC RECOMMENDATIONS

- **Add livestock to agroforestry systems:** Studies indicate that ruminants—especially goats, given the rising demand for goat-milk products in China—could be incorporated into many agroforestry systems, particularly coconut, to reduce erosion, improve soil nutrient cycling, and increase profits.
- **Rehabilitate degraded forestlands:** The E-NGP, which restores unproductive lands, should target areas where communities are already using forests sustainably and thus have formed habits conducive to reforestation.
- **Sustainably expand rubber production:** Rubber trees could be integrated into monoculture herbaceous cropping systems and planted on fallows and degraded land as ways to increase carbon storage and improve livelihoods.
- **Improve agricultural value chains:** The Philippines has lagged in poverty reduction, largely because it has failed to connect farmers with exporters and traders. Better access to finance and trade networks could help improve livelihoods sustainably.

The high rate of deforestation in the Philippines appears to be contributing to rising rates of poverty, out-migration, and social conflict. Reforesting lands and finding ways to make them productive in a sustainable way will bring economic and environmental improvements. The key to success in such interventions, in the Philippines and elsewhere, is to ensure that communities—including women and other disadvantaged groups—participate in development processes and have the chance to self-determine their own futures.

COUNTRY FOCUS: THAILAND

INTRODUCTION

Over the past century, Thailand's forests have been cleared for rice cultivation, logging, teak and other tree crops, and herbaceous crops like maize and jute. In 1985, Thailand's government committed to retain 40% of forested areas. Since then, overall forest cover in Thailand has increased—making Thailand unique among countries in Southeast Asia. This increase is driven in part by the rapid regeneration of northern upland fields formerly cleared for shifting agriculture, a practice that the government now discourages.



Deforestation, however, has continued, especially in Thailand's south. A recent study determined that most recent forest loss is driven by commodity crop expansion, rotational plantation forestry, and shifting agriculture. There also has been significant clearing of mangrove forests for the construction of shrimp ponds.

FINDINGS



896,000 ha of forest in Thailand were lost between 2000 and 2015; approximately 650,000 ha (73%) of that land now supports commodity crops.



392,000 ha (60%) of the forest area lost to agricultural cultivation were converted to tree crops, primarily pulpwood, rubber, and oil palm.



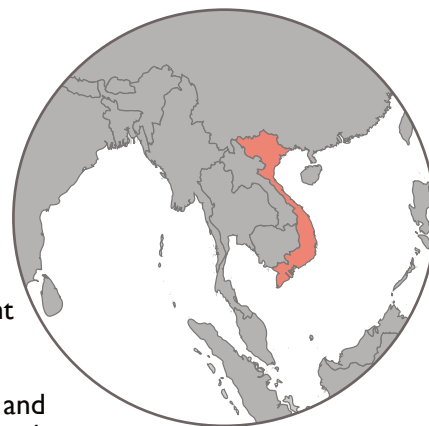
The total carbon stored in the aboveground biomass of crops replacing forested land is 17.2 million tonnes, meaning that deforestation caused an **82% reduction of the carbon stored in the landscape**.

RECOMMENDATIONS

- **Expand community forestry:** Although the majority of forests in Thailand are owned and managed by the government, there are approximately 14,000 community forest sites encompassing 500,000 ha. Recognition of local land rights, including within protected areas, will improve livelihoods and the landscape.
- **Explore responsible ecotourism:** Although ecotourism has detractors and supporters, some such ventures in Thailand have helped communities while preserving forests. Ecotourism should remain an economic development option in areas that have natural forests or high carbon stocks.
- **Adjust subsidy policies:** Given that government-subsidized maize farming has been a driver of deforestation, future subsidies should target tree crops and reforestation. Teak, for example, can boost ecosystem services, increase farmer incomes, and store large amounts of carbon.
- **Restore mangrove forests:** The replacement of mangrove ecosystems—among the most carbon-rich in the world—by paddy or shrimp farms has been a devastating development. Rehabilitating these ecosystems will improve carbon storage and protect the coast from the rising sea levels and more intense monsoons associated with climate change.

As a middle-income country, Thailand has already found opportunities for sustainable development, and, unlike many of its neighbors in Southeast Asia, has had success with reforestation. In the future, officials must recognize that participation by all members of a community—including women, the elderly, and ethnic minorities—will lead to the best outcomes, because people who are invested in their lands will protect and grow that investment. Approaches that keep local people at the heart of development will help Thailand meet Sustainable Development Goal targets across not only environmental sectors but also in health, sustainable consumption, human rights, and education.

COUNTRY FOCUS: VIETNAM



INTRODUCTION

Forest cover in Vietnam declined from nearly 43% in 1943 to between 16% and 27% in 1993, a reduction caused by defoliants used in wartime followed by clearing for lumber, fuel, and agriculture.

Over the past three decades, forests have started to recover, with current forest cover at about 44%. This success can be attributed largely to initiatives such as the Strategic Orientation for Sustainable Development (2004), which ensured that economic growth was accompanied by social and environmental advances. Vietnam has experienced reductions in poverty and economic growth, thanks in part to rising production of rice, coffee, and tea. Effective government policies have made economic growth less environmentally destructive than it has been in other parts of the world. Even as overall forest coverage increases, however, significant forest losses continue in certain areas.

FINDINGS



759,000 ha of forest were converted to other land uses between 2000 and 2015; growth in commodity production accounts for about 519,000 ha of that loss.



These commodities store 11.9 million tonnes of carbon as aboveground biomass, which is 51.5 million tonnes less carbon than if natural forests were still in place, an **81% loss**.



Agroforestry offers a good opportunity for increasing carbon stocks on previously deforested land because it is already widespread throughout the country.

COUNTRY-SPECIFIC RECOMMENDATIONS

- **Accelerate reforestation:** Although Vietnam shows an overall trend towards reforestation, the rate needs to increase. And in order to allow forests to regrow, the country will need to find ways to use current agricultural land more productively to feed its growing population.
- **Restore mangroves:** Mangroves are one of the most carbon-rich ecosystems in the tropics and also provide invaluable ecosystem services such as coastal protection, water regulation, and habitat for aquatic animals.
- **Diversify crops:** Crop diversification—such as planting cacao in monoculture tree plantations—offers a good way to improve the economic value and carbon storage potential of existing croplands.
- **Minimize GHG emissions from paddy rice cultivation:** Techniques such as alternate wetting and drying can reduce methane emissions, although numerous logistical hurdles will have to be addressed before nationwide scale-up is possible.
- **Improve policy and practices:** The Forest Land Allocation policy, which governs the allocation of forestland to rural farm households, has contributed to reforestation and reduced shifting agriculture. Its effectiveness could be enhanced by measures, such as better training in climate smart agriculture practices, accessible loans, improved roads, and more secure land tenure rights.

As it becomes a middle-income country, Vietnam must identify strategies and investments that prioritize sustainable production and consumption so that it can avoid the resource-intensive path taken by its neighbors Thailand and Indonesia. The government has already taken many progressive steps that have improved land use. With continued thoughtful, international support and inclusive internal processes, Vietnam will be able to become a regional leader for sustainable economic growth and development.