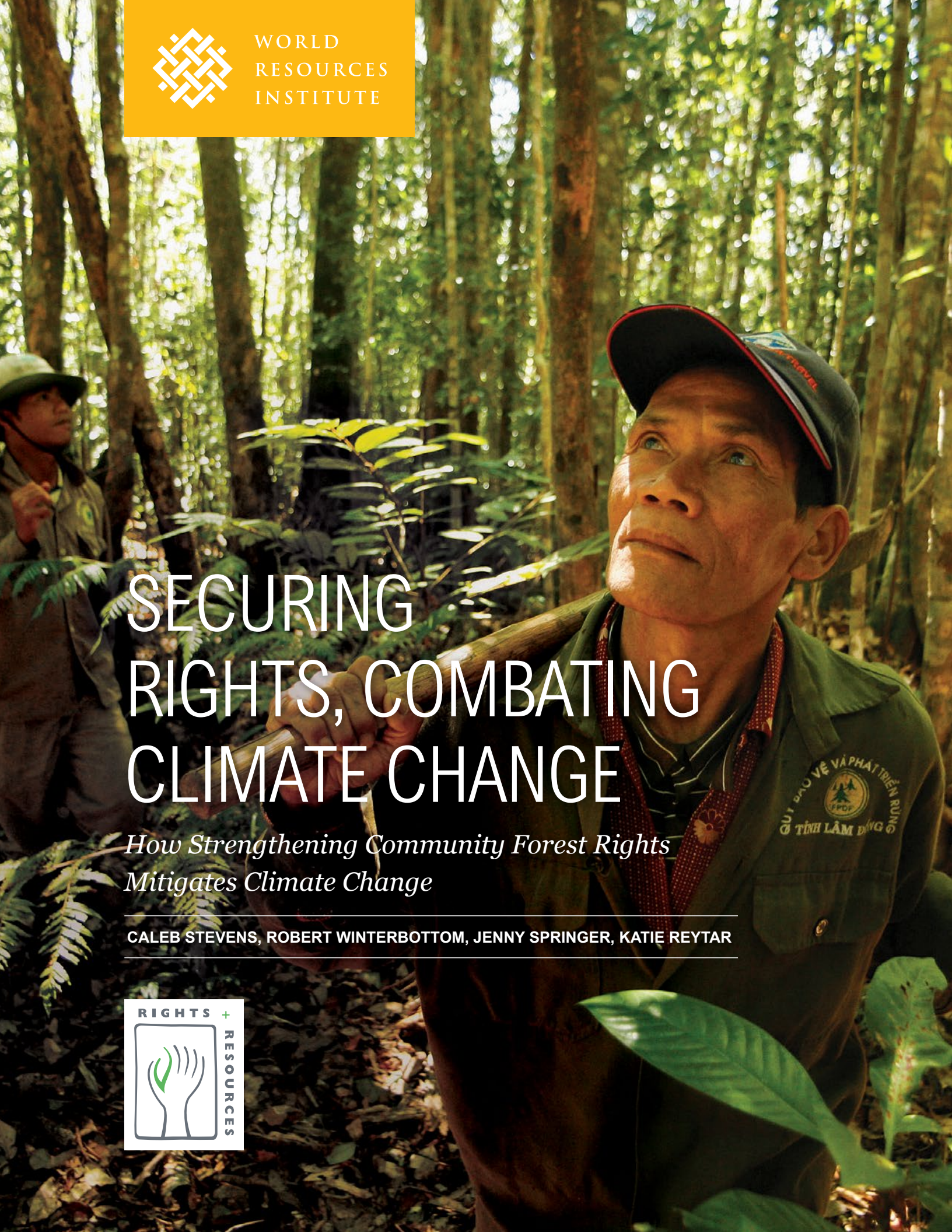

WORLD RESOURCES INSTITUTE

SECURING RIGHTS, COMBATING CLIMATE CHANGE

How Strengthening Community Forest Rights Mitigates Climate Change

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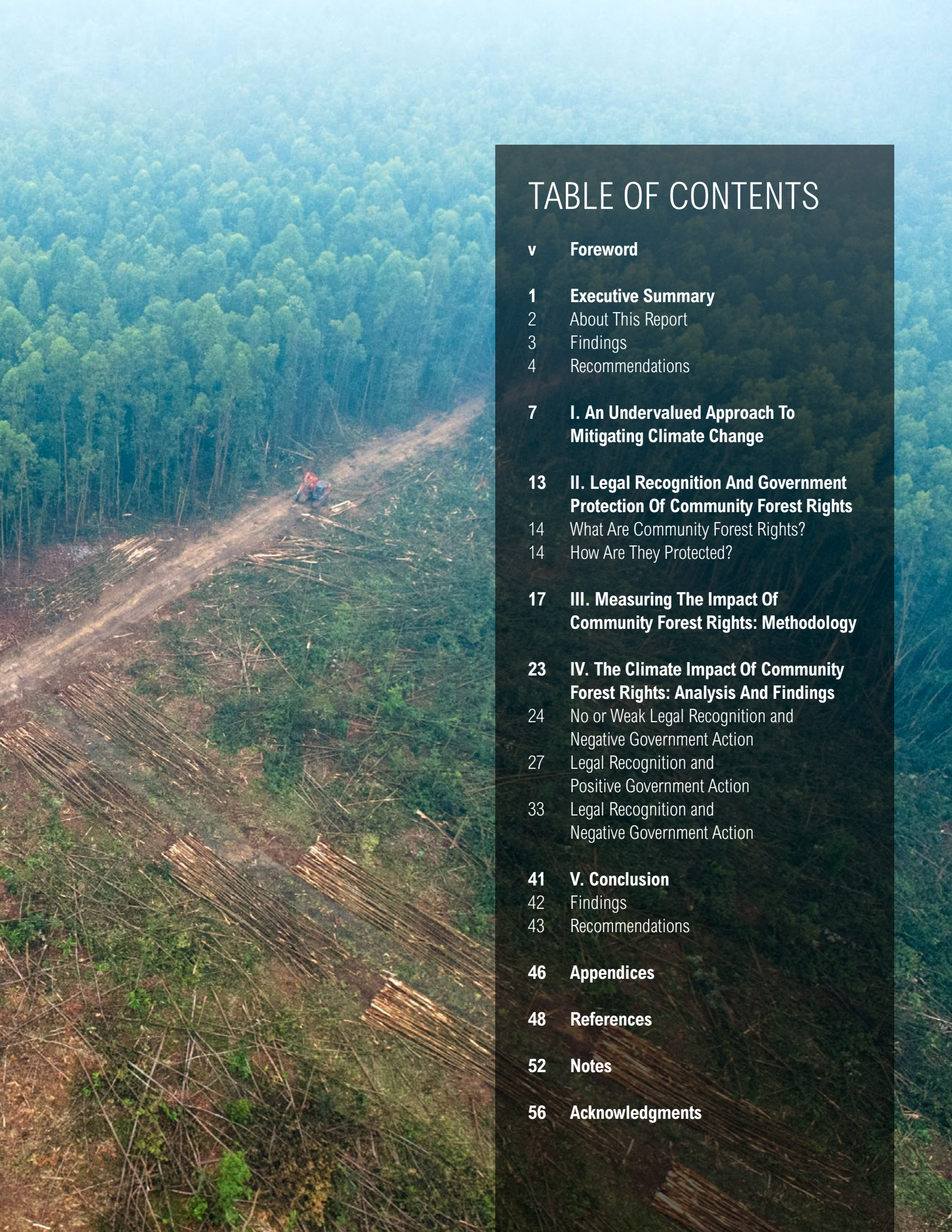

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FOREWORD

That the empowerment of local peoples and recognition of their customary rights has powerful social, economic, and environmental impacts is not news for researchers. A study of 80 forest areas in 10 countries in South Asia, East Africa, and Latin America shows that community-owned and -managed forests have delivered both superior community benefits and greater carbon storage. In Brazil, 27 times more carbon dioxide emissions from deforestation were produced in areas outside of indigenous community forests. These forests also contain 36 percent more carbon per hectare. In some community forests of Honduras, forest loss was 140 times lower under community-led forest rights initiatives. A further look at Brazil shows that it is precisely the government's recognition of indigenous and community rights to forestland that has driven the most successful conservation movements in modern history.

Yet, the connection between strengthening Indigenous Peoples and local communities' forest rights and mitigating climate change is rarely made. Governments continue to overwhelmingly claim ownership of forestland instead of recognizing the rights of the communities who depend on and are best positioned to protect the forests. But Indigenous Peoples and local communities already have ownership rights to at least one eighth of the world's forests—which store more carbon than all of North America's forests. With the knowledge and wisdom cultivated through generations, not only are forest communities able to protect their forests more effectively than governments do—they protect them less expensively.

This report on community forest rights and climate change provides much-needed evidence at the global scale to demonstrate the tremendous potential for reducing emissions by strengthening communities' forest rights. It analyzes examples from 14 forest-rich countries in Latin America, Africa, and Asia that include over two thirds of all government-recognized community forests in low- and middle-income countries. The report also presents recommendations for the international community of world leaders, government officials, advocates, and others who, if they are seriously committed to finding a far-reaching and concrete climate change solution, will call upon forested nations to strengthen community rights in their forests.

For too long this approach to mitigating climate change has not received the attention it deserves. We hope this report will turn that around and draw the world's focus to the most important factor in turning the tide against climate change and saving the world's forests: the Indigenous Peoples and local communities who depend on them.

Andrew Steer
President
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Coordinator
Rights and Resources Initiative

EXECUTIVE SUMMARY

The international community agrees on the urgent need to reduce greenhouse gas emissions from deforestation and forest degradation. With 13 million hectares of forest cleared every year, such efforts are critical to curbing climate change before it reaches a dangerous tipping point. But we are missing a vital opportunity to combat climate change—strengthening the land and resource rights of Indigenous Peoples and local communities whose well-being is tied to their forests.

This approach to mitigating climate change has long been undervalued. Although governments claim ownership over most of the world's forests, the real stewards of much of these areas are Indigenous Peoples and local communities with deep historical and cultural connections to the land. Around the world, millions of communities depend on forests for basic needs and livelihoods. These Indigenous Peoples and local communities can help avoid the destruction of the forests and associated carbon dioxide emissions and instead maintain their forests as carbon sinks, absorbing harmful carbon dioxide from the atmosphere.

Indigenous Peoples and local communities today have legal or official rights to at least 513 million hectares of forests, only about one eighth of the world's total. Collectively these forests contain approximately 37.7 billion tonnes of carbon, about equal to the carbon in all the forests of North America. Much larger areas of forest are held by communities under customary rights that are not legally recognized by governments. Most community forests are in low- and middle-income countries with strong deforestation pressures. Yet governments, donors, and other climate change stakeholders tend to ignore or marginalize the enormous contribution to mitigating climate change that expanding and strengthening communities' forest rights can make.

With deforestation and other land uses now accounting for about 11 percent of annual global greenhouse gas emissions, weak legal protection for forest communities is not just a land or resource rights problem. It is a climate change problem. Preventing actions that undermine community forest rights is part of the solution. This report aims to encourage the international community to prioritize support for forest communities in the developing world as a bulwark against rising global temperatures.

About This Report

This publication analyzes the growing body of evidence linking community forest rights with healthier forests and lower carbon dioxide emissions from deforestation and forest degradation. It presents a compelling case for expanding and strengthening community forest rights based on evidence drawn from comparative studies, advanced quantitative research, case studies, and original deforestation and carbon analyses by the World Resources Institute. The findings center on examples from 14 forest-rich countries in Latin America, Africa, and Asia. Together, these countries contain about 323 million hectares of government-recognized community forest—68 percent of the estimated total in all low- and middle-income countries—as well as large areas of community forests without legal or official recognition. Our analysis focuses on the links between legal community forest rights (or lack thereof), the extent of government protection of those rights, and forest outcomes.

Findings

1. **When Indigenous Peoples and local communities have no or weak legal rights, their forests tend to be vulnerable to deforestation and thus become the source of carbon dioxide emissions.** Deforestation of indigenous community forests in Brazil would likely have been 22 times higher without their legal recognition. In Indonesia, the high levels of carbon dioxide emissions from deforestation are driven in part by no or weak legal rights for forest communities. For example, oil palm concessions cover 59 percent of community forests in part of West Kalimantan.

2. **Legal forest rights for communities and government protection of their rights tend to lower carbon dioxide emissions and deforestation.** In Brazil, deforestation in indigenous community forests from 2000 to 2012 was less than 1 percent, compared with 7 percent outside them. The higher deforestation outside indigenous community forests led to 27 times more carbon dioxide emissions than were produced from deforestation on indigenous community forests. And indigenous community forests contain 36 percent more carbon per hectare than other areas of the Brazilian Amazon.

Summary of Analysis of How Community Forest Rights and Government Action Impact Forests

COUNTRY	LEGAL RIGHTS	GOV. ACTION	FOREST OUTCOMES
Bolivia (Amazon)	✓	✓	↑
Brazil (Amazon)	✓	✓	↑
Colombia (Amazon)	✓	X	↑
Ecuador (Amazon)	✓	X	↓
Guatemala (Petén)	✓	✓	↑
Honduras (Rio Platáno)	✓	X	↑
Mexico	✓	✓	↑
Nicaragua (Bosawas)	✓	X	↑
Peru (Amazon)	✓	X	↓
Niger	✓	✓	↑
Tanzania	✓	✓	↑
Nepal	✓	✓	↑
Indonesia	X	X	↓
Papua New Guinea	✓	X	↓

CHART KEY

LEGAL RIGHTS	GOVERNMENT ACTION	FOREST OUTCOMES
✓ = Legal Recognition	✓ = Positive Government Action on Strength of Rights	↑ = Positive Forest Outcomes
X = No/Weak Legal Recognition	X = Negative Government Action on Strength of Rights	↓ = Negative Forest Outcomes

The specific legal rights recognized vary across countries. Please see Table 2 and the case discussions in Section IV for more information.

3. **Indigenous Peoples and local communities with legal forest rights maintain or improve their forests' carbon storage.** Government protection of the forest rights of communities in Niger added 200 million new trees, absorbing 30 million tonnes of carbon over the past 30 years. Support for community forestry in Nepal has improved forest health and generated a carbon stock of more than 180 million tonnes across 1.6 million hectares.

4. **Even when communities have legal rights to their forest, government actions that undermine those rights can lead to high carbon dioxide emissions and deforestation.** The forests of indigenous communities in Peru, where government actions weaken community forest rights, are deforested at a higher rate than other parts of the Peruvian Amazon.

5. **Communities can partially overcome government actions that undermine their forest rights.** In Honduras and Nicaragua, indigenous communities have been able to partially forestall deforestation despite insufficient government efforts to protect their rights. In some cases community forest loss is 0.01 percent, compared with 1.40 percent in the surrounding area.

Recommendations

Based on these findings, the authors make five practical, evidence-based recommendations to donors, governments, civil society, and other stakeholders working on climate change, land rights, and forestry.

1. **Provide Indigenous Peoples and local communities with legal recognition of rights to their forest.** Attention must be given to the millions of forested communities without legal rights to their forest. In Indonesia, where communities generally have no or weak legal rights, new legislation is pending to recognize communities' ownership of their forests. Where communities have some legal forest rights, governments and their partners should strengthen these rights.

2. **Protect the legal forest rights of Indigenous Peoples and local communities.** Governments and their partners should help protect community forest rights by, for example, mapping community forest boundaries, helping to expel illegal loggers, and not granting commercial concessions over community forests. In Brazil, the government maps and registers indigenous community forests, helps communities remove illegal settlers, and is generally barred from granting commercial use of community forests to companies.

3. **Support communities with technical assistance and training.** Governments, donors, and civil society should provide training and technical assistance to communities and should undertake capacity building activities. For example, in Mexico some communities receive training and support from the government to improve sustainable forest use and market access.

4. **Engage forest communities in decision-making on investments affecting their forest.** Governments and businesses should work together to ensure that government planning is consistent with international standards and that investments do not violate community forest rights. In Peru, the government's failure to comply fully with international standards contributes to high deforestation of indigenous community forests.

5. **Compensate communities for the climate and other benefits provided by their forest.** Governments and their partners should commit funds and invest in supporting communities and their civil society partners to increase the economic incentives for communities to manage their forests sustainably. In addition, stakeholders should support the strengthening of community forest rights as part of a future international agreement on reducing emissions from deforestation and degradation.


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SECTION I

AN UNDERVALUED APPROACH TO MITIGATING CLIMATE CHANGE

Despite a growing volume of evidence, the positive connection between strengthening the forest rights of Indigenous Peoples and local communities and mitigating climate change is rarely made and often ignored. This report seeks to correct that bias by collecting and analyzing the evidence that strengthening community forest rights is associated with healthy forests and therefore an effective means to avoid carbon dioxide (CO_2) emissions and to maintain or increase forest carbon storage.

BOX 1 | DEFINITIONS OF TERMS IN THIS REPORT

Deforestation means a change from a forest to a non-forest state.

Forest loss means tree cover loss and thus may include deforestation or degradation.

Forest degradation means human-induced reduction in a forest's ability to provide forest products and ecosystem services, such as carbon capture.

Healthy forests means forests that maintain their biological diversity, productivity, regenerative capacity, and vitality so they are able to provide a full range of ecosystem services now and in the future.

Reforestation means reestablishing the tree cover on land through the protection, regeneration, and planting of trees.

Sustainable forest use means the harvesting of timber and non-timber forest products to benefit the community directly or for sale to non-community members in a way that restores or maintains a healthy forest.

Source: Adapted from Schoene et al., 2007.

Many of the world's remaining forests are under the stewardship of local communities or Indigenous Peoples. Globally, at least 513 million hectares, or about one eighth of the world's forests, are government-recognized community forests.[1] The vast majority of these—478 million hectares—are in low- or middle-income countries where pressures to exploit forests are strong.[2] *(See Box 1 for definitions.)*

Yet governments claim ownership of the majority of forests.[3] These include large areas to which communities hold customary rights that are not legally recognized by the government. Lack of legal recognition of community forest rights leaves these forests vulnerable to clearance for commercial logging, pasture, cropland, oil palm, or mining. In some areas, forest loss has even resulted from drug trafficking.[4]

The failure to establish and protect the rights of these forest communities has been costly not only in human terms but for earth's climate. Globally, 13 million hectares of forests are cleared every year—the equivalent of 50 soccer fields a minute.[5]

The CO_2 this and other land uses generates accounts for 11 percent of all global greenhouse gas emissions.[6] (These emissions consist of CO_2, methane, nitrous oxide, and fluorinated gases. Carbon dioxide makes up about 82 percent of global greenhouse gas emissions.)[7]

Despite this destruction, the world's forests still act as an enormously valuable carbon sink without which climate change would be even greater. Collectively, the world's forests store more carbon than the atmosphere does,[8] absorbing about 50 percent of fossil fuel greenhouse gas emissions in 2009.[9]

If communities are not provided with the legal recognition and government protection they need and deserve, their forests will likely become the source of CO_2 emissions.[a] Once deforested, these community forests are also lost as carbon sinks, creating a doubly negative climate impact.[b]

Across Latin America, Africa, and Asia, community forests are under pressure from large-scale land deals and investment projects (so-called land grabs).[10] For example, mining, oil, and natural gas concessions granted in recent years now cover nearly three quarters of the Peruvian Amazon, the home of many Indigenous Peoples and local communities.[11] And around half of heavily forested Liberia is allocated for commercial use, primarily by foreign mining and oil palm companies.[12]

With the exception of some international initiatives to reduce emissions from deforestation and degradation (REDD+) *(see Box 2)*, development agencies, governments, and others have failed to give enough weight to the connection between strengthening community forest rights and mitigating climate change. For example, the 2014 Fifth Assessment Report by the Intergovernmental Panel on Climate Change hardly mentions that clear land rights, enforcement, and community forest management are important to mitigation, and it merely concludes that "more research is needed."[13] Leading development agencies have also missed the opportunity to make strengthening community forest rights a central plank of their climate change policies or programs. The U.S. Agency for International Development, the world's largest aid donor,[14] barely mentions the issue in its *Climate Change and Development Strategy 2012–2016*.

BOX 2 | IMPLICATIONS FOR REDUCING EMISSIONS FROM DEFORESTATION AND DEGRADATION

The international climate change convention under negotiation will determine the combination of rules, finance, and information required for countries to not deforest or degrade but rather conserve and manage forests sustainably and even to enhance forest carbon stocks. This approach is known as REDD+. A number of REDD+ initiatives identify strengthening community forest rights as an important element of climate change mitigation. Many countries with REDD+ strategies identified strengthening community forest rights as part of their own strategy.[i] In addition, respect for the rights of local communities and Indigenous Peoples is an internationally agreed safeguard to ensure REDD+ does not harm people or the environment.[ii]

A new property right to forest carbon may also be part of REDD+. If a community's forest rights are weak or nonexistent, then the community will also likely lose their rights to carbon in the forest. This will undermine their ability to engage in REDD+ initiatives equitably, effectively, and independently. Legal uncertainty could contribute to governments nationalizing carbon property rights, leaving communities without the right to benefit from payments for carbon in their forests. Nationalizing carbon could also lead to carbon trading that dispossesses forest communities of their existing forest rights or that creates an additional barrier to the future recognition and strengthening of their rights.[iii]

But progress to ensure community forest and carbon rights has been halting. New laws strengthening community forest rights are not forthcoming.[iv] Moreover, many heavily forested developing countries have neither laws defining carbon rights nor legal frameworks governing trade in carbon.[v] Governments and companies often have legal rights to forests but communities do not. If REDD+ payments for carbon begin to flow in such a legal environment, governments and companies rather than communities will capture the benefits.[vi] Yet payments under REDD+ could incentivize governments to reform their legal frameworks and strengthen community forest rights if they are an integral part of a REDD+ agreement and implementation plan.[vii]

i RRI, 2014c; Williams, 2013.
ii Newton et al., in press.
iii RRI, 2014b.
iv RRI, 2014c.
v RRI, 2014b.
vi Rainforest Foundation UK, 2013; Karsenty et al., 2014; Larson et al., 2013.
vii RRI, 2014b.

a Although this report concerns climate change mitigation, strengthening the forest rights of Indigenous Peoples and local communities has other benefits. These include helping communities adapt to climate change, securing livelihoods, conserving biodiversity, cultural survival, political inclusion, and avoiding or reducing conflicts, among others. By focusing on climate change mitigation, we are not discounting these other invaluable benefits or implying that they are less important.

b Trees store CO_2 as carbon, with the carbon becoming CO_2 when released through deforestation or forest degradation. The weight ratio of CO_2 to carbon is 3.666 tonnes of CO_2 per tonne of carbon.

There is strong evidence that strengthening community forest rights is associated with healthy forests. For example, a recent study measured carbon in 30 community forests over three to four years, covering Guinea Bissau, India, Mali, Nepal, Papua New Guinea, Senegal, and Tanzania. The 30 community forests showed an overall average increase in forest carbon storage of 4.9 tonnes per hectare per year.[16] In three forests, total carbon stock decreased due to illegal clear-cutting for cropland by non-community members.[17] A separate analysis of 80 forests in 10 countries across Latin America, East Africa, and South Asia found that community forest management is associated with high levels of carbon storage.[18]

Globally, an estimated 37.7 billion tonnes of carbon stock are held in the living biomass of the 513 million hectares of government-recognized community forests[19]—about equal to the carbon in all the forests of North America.[20] If this carbon were released into the atmosphere as CO_2, it would be approximately equal to 29 times the annual CO_2 emissions produced by all the passenger vehicles in the world.[21]

Strengthening the rights of these communities and extending them to other community forests can provide a new front in the battle against climate change and should be recognized and prioritized as such by policymakers and aid agencies.
This report is organized as follows:

- SECTION II provides background on community forest rights, including a conceptual framework.
- SECTION III presents the report's methodology.
- SECTION IV discusses three categories of legal recognition and government action and their relationship to forest health.
- SECTION V concludes with a summary of the analysis, findings, and recommendations for action by donors, governments, businesses, and other stakeholders.

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SECTION II

LEGAL RECOGNITION AND GOVERNMENT PROTECTION OF COMMUNITY FOREST RIGHTS

Legal recognition and government protection of Indigenous Peoples and local communities' forest rights differ from one country to another as well as within countries and across communities.

What Are Community Forest Rights?

Many communities in practice exercise a range of rights over their forests but are granted only limited legal recognition of these rights by their governments. These allow them, for example, to use forest resources for specific purposes such as harvesting timber or medicinal plants.[22] Many other communities have no legal rights at all over the forest they call home, exercising rights that are entirely unofficial or customary.[23]

There are several rights that communities may enjoy and that governments have the power to legally recognize. For the purposes of this report we use the bundle of rights framework developed by the Rights and Resources Initiative (RRI), which includes:

- ACCESS: right to enter or pass through the forest.
- WITHDRAWAL OR USE: right to benefit from the forest's resources.
- MANAGEMENT: right to make decisions about forest resources and for a forest area over which the community has rights of access and withdrawal or use.
- EXCLUSION: right to refuse access to and use of the forest.
- DUE PROCESS AND COMPENSATION: right to legally challenge a government's efforts to take one, several, or all of the community's forest rights.
- DURATION: the length of time a community may exercise their rights—either limited or recognized in perpetuity.
- ALIENATION: right to transfer the forest to another by sale, lease, or some other means.[24]

Legal recognition is generally stronger where it includes a fuller bundle of these rights, with the exception of alienation, and where implementation is more widespread. Many of these rights can play a critical role in helping communities resist deforestation pressures and maintain healthy forests. For example, without the right to exclude outside interests such as loggers or mining companies, communities have no legal recourse to stop encroachments.[25] Communities with the healthiest forests are often those that make their own rules and retain management authority.[26] Countries where research has shown this association to be true are Honduras, Nicaragua, and Tanzania.[27] An analysis of 84 communities in Africa and Asia found a similar correlation.[28]

Likewise, a community's right to use or harvest forest resources can provide positive economic returns that then give communities strong incentives to invest in sustainably managing and protecting their forest.[29] Strengthening community forest rights can prompt increased local investment in the improved management of forests. And improvements in forest management can increase the flows of valued goods and services and reinforce the economic incentives for protecting forests.

How Are They Protected?

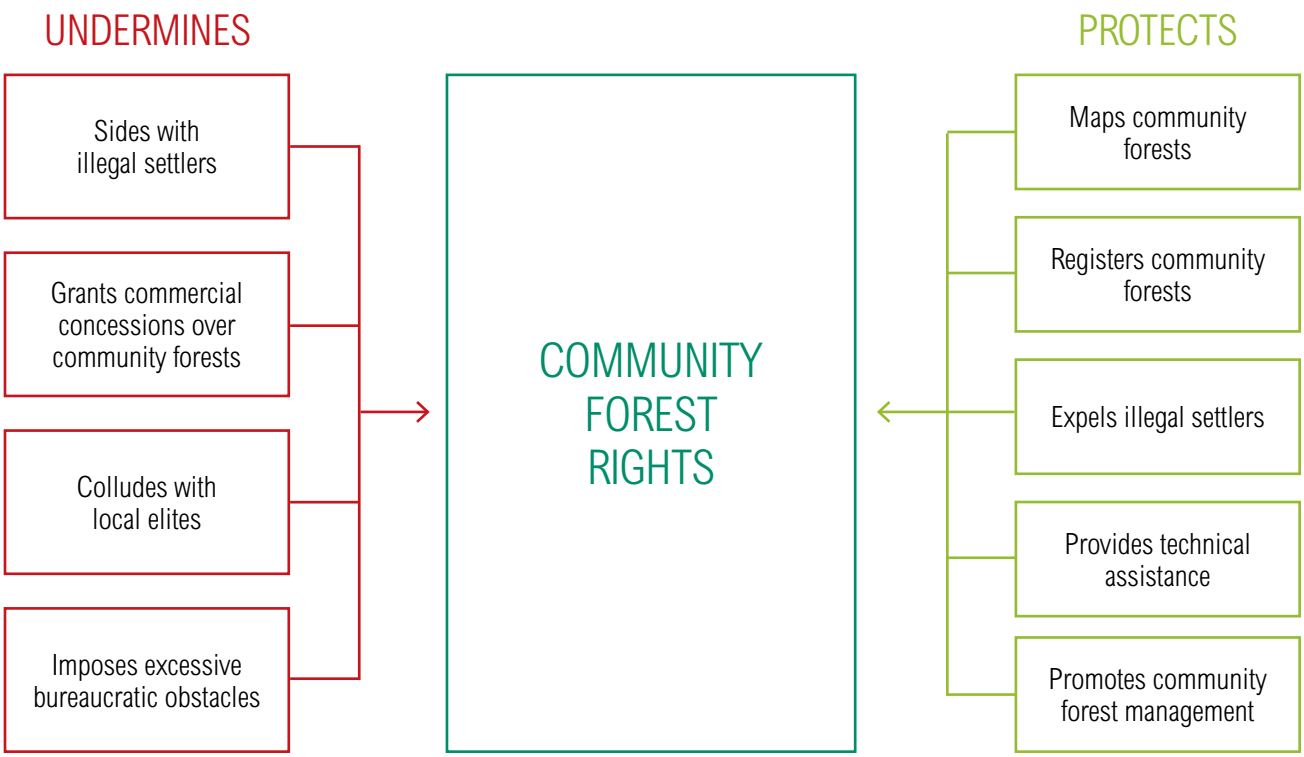
Beyond recognition of strong legal rights, many factors affect the security of a community's forest rights, including the level of conflict or cooperation in communities.[30] But perhaps the most important factor is whether the government acts to protect those rights, using the resources and legal authority at its disposal.[31] *(See Figure 1.)* Government protection can increase the security of a community's legal forest rights and help ensure the community obtains the full benefits of legal rights by:

- Documenting rights, such as by mapping and registering a community forest;
- Enforcing rights, such as expelling illegal settlers and loggers; or
- Providing technical assistance and incentives to improve sustainability and market access.[32]

Equally, government actions can have a negative impact on a community's forest rights and increase the risk of high CO_2 emissions through neglect or activities that undermine a community's forest rights. These may include:

- Imposing excessive bureaucratic obstacles, such as delaying government approval for communities to use and benefit from forest resources;[33]
- Failing to act against, or siding with, illegal settlers;[34]
- Granting mineral and oil concessions within a community's forest;[35] or
- Colluding with local elites to capture high-value forest resources.[36]

Figure 1 | **Some Government Actions That Can Protect or Undermine Community Forest Rights**



SECTION III

MEASURING THE IMPACT OF COMMUNITY FOREST RIGHTS: METHODOLOGY

This report's findings are based on analysis of about 130 studies on the intersection of community forest rights, deforestation and forest health, and climate change.

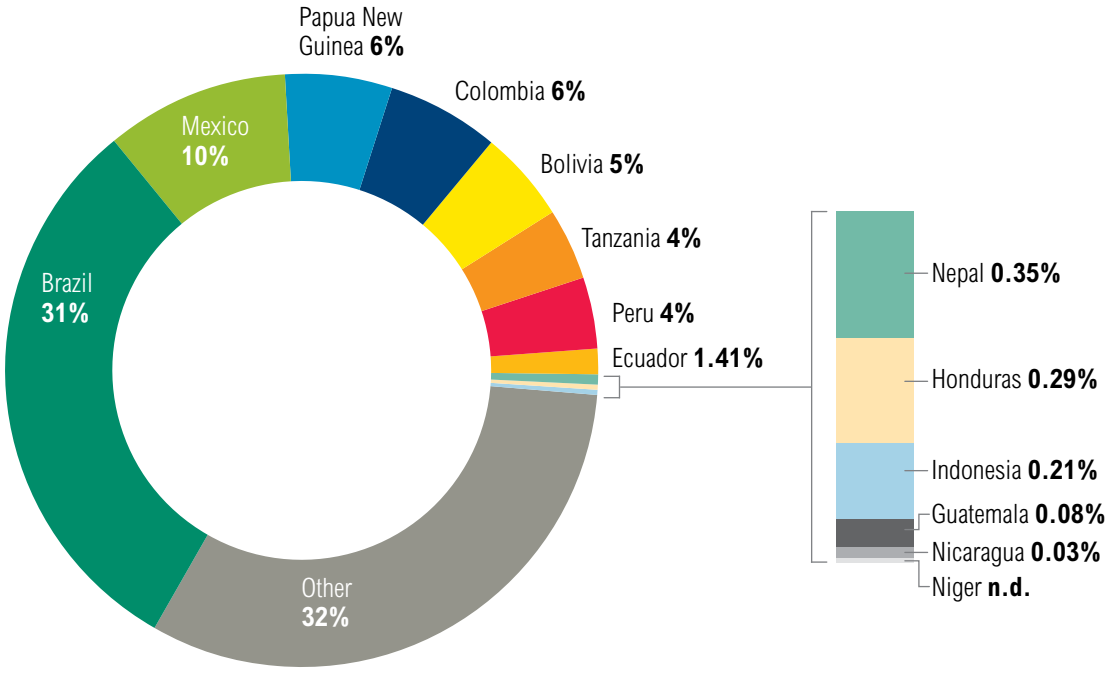
The studies were identified with key word searches and reference to two recent literature reviews: Seymour et al. and Zulu et al.[37] They include qualitative and quantitative case studies, meta-studies (which analyze results from multiple studies), and literature reviews. Almost all were published in the last 10 years, and some of the more recent studies use satellite data. The studies use various measurements of forest health, including percentage of forest cover and changes in the density, size, volume, or total biomass of trees.[38] The World Resources Institute (WRI) also conducted new carbon and satellite data analyses of forest loss and gain in relation to community forests. *(See Appendix A.)*

Together, the studies contained in the literature provide powerful evidence of the links between forest health and community rights, which can be organized into three types:

- META-STUDIES AND LARGE COMPARATIVE STUDIES provide robust evidence that legal recognition and government protection of community forest rights are associated with low deforestation.
- MATCHING AND SIMILAR STUDIES control for numerous variables and determine whether legal recognition and government protection of community forest rights likely prevent forest loss.
- CASE STUDIES provide more context and deep analysis.

The literature—and therefore this report—focuses on 14 countries in Latin America, Africa, and Asia. Together, these contain about 323 million hectares of government-recognized community forest—68 percent of the estimated total in low- and middle-income countries *(see Figure 2)*—as well as substantial community forests without legal recognition.[39] In six of the countries, including Brazil and Indonesia, forest covers at least half the land area.[40] *(See Table 1.)*

Figure 2 | **Government-Recognized Community Forests by Country as Percentage of Total Government-Recognized Community Forests in Low- or Middle-Income Countries**



Source: RRI, 2014c. Data on government-recognized community forest in Ecuador are from *Red Amazónica de Información Socioambiental Georreferenciada* (RAISG, 2012). Data on the amount of community forest in Nicaragua are from Inventario Nacional Forestal, 2008.

Table 1 | **Forest-Related Data for 14 Countries**

SOUTH AMERICA

BOLIVIA

53% Total forest cover
OF WHICH
44% is Government-Recognized Community Forest

BRAZIL

62% Total forest cover
OF WHICH
28% is Government-Recognized Community Forest

COLOMBIA

55% Total forest cover
OF WHICH
49% is Government-Recognized Community Forest

ECUADOR

36% Total forest cover
OF WHICH
55% is Government-Recognized Community Forest

GUATEMALA

34% Total forest cover
OF WHICH
10% is Government-Recognized Community Forest

HONDURAS

46% Total forest cover
OF WHICH
27% is Government-Recognized Community Forest

MEXICO

33% Total forest cover
OF WHICH
71% is Government-Recognized Community Forest

NICARAGUA

26% Total forest cover
OF WHICH
49% is Government-Recognized Community Forest

PERU

53% Total forest cover
OF WHICH
26% is Government-Recognized Community Forest

AFRICA

NIGER

1% Total forest cover
No Data on Government-Recognized Community Forest

TANZANIA

38% Total forest cover
OF WHICH
63% is Government-Recognized Community Forest

ASIA

INDONESIA

52% Total forest cover
OF WHICH
1% is Government-Recognized Community Forest

NEPAL

25% Total forest cover
OF WHICH
49% is Government-Recognized Community Forest

PAPUA NEW GUINEA

63% Total forest cover
OF WHICH
97% is Government-Recognized Community Forest

Note: Government-recognized community forests may include types of community forest not covered in the case discussions in Section IV. For example, Brazil includes Indigenous Lands, sustainable-use community forest, and Afro-Brazilian communities, among others. The Brazil case discussion here concerns only Indigenous Lands. Government-recognized community forest as a percentage of national forest was calculated using data on total hectares of forest from FAO, 2010, with data on total hectares of government-recognized community forests from RRI, 2014c. Data on government-recognized community forest in Ecuador are from RAISG, 2012. Data on the amount of community forest in Nicaragua are from Inventario Nacional Forestal, 2008.

BOX 3 | RESEARCH LIMITATIONS

Substantiating a causal relationship—as opposed to an association—between legal recognition and government protection for community forest rights and reduced deforestation is difficult.[i] The causes of deforestation have many variables,[ii] precise location data for community forests are hard to come by,[iii] and researchers define terms and concepts differently.[iv] Factors besides the strength of a community's forest rights can also affect deforestation levels and forest health. These include community links to support networks,[v] the location and size of a community's forest,[vi] and the value of the land or forest resources to potential investors.[vii] Nevertheless, the analysis here is based on a large volume of robust and compelling evidence.

i Zulu et al., 2014; Naughton-Treves and Wendland, 2014; Naughton-Treves et al., 2013.
ii Zulu et al., 2014; Agrawal and Chhatre, 2005; Ferretti-Gallon and Busch, 2014.
iii Naughton-Treves et al., 2013.
iv Naughton-Treves and Wendland, 2014.
v Lawry, 2013.
vi Larson et al., 2010.
vii Adeney, 2009; Andersson, 2012; Nepstad et al., 2006.

The remainder of this report examines the relationship, in these 14 countries, between legal forest rights, government action to protect those rights (or not), and associated deforestation and CO_2 emissions. Community forests in each country are assessed against two key factors: legal forest rights and government action.

As defined in Section II, *forest rights* are access, withdrawal/use, management, exclusion, due process/compensation, duration, and alienation. Determination of communities' legal rights for each type of community forest discussed is based on a country legal review done by RRI and on supplemental research.

Government actions are broadly grouped into two categories:

- POSITIVE GOVERNMENT ACTION (+): Government protects community forest rights by securing the rights or helping the community obtain the full benefits of their legal rights through, for example, mapping or registering their forest or providing technical assistance.
- NEGATIVE GOVERNMENT ACTION (–): Government weakens community forest rights by neglecting to protect or undermining their rights by, for example, allocating their forest to companies for mining or oil palm production.

Government action was determined to be positive or negative primarily by relying on studies found during the review. Communities' experiences vary, and government may be protective overall but fall short in other instances, or vice versa.

As mentioned, this report relies on studies that use various measures of forest health. In general, the studies compare deforestation or the health of community forest with neighboring areas or government-protected forests. Consistent with this, the report determines forest outcomes broadly as follows:

- POSITIVE FOREST OUTCOME: Observed reforestation, improvements in forest health, or low deforestation of the community forest.
- NEGATIVE FOREST OUTCOME: Observed high deforestation or degradation of the community forest.

The 14 country cases are first classified by legal rights and how governments act in relation to those rights. (See Table 2.)

The analysis of forest health and findings is then presented in three categories:

- Communities with no or weak legal recognition of their forest rights.
- Communities with some legal rights bolstered by positive government action.
- Communities with some legal rights but where negative government action undermines these rights.

The findings draw on studies that link low deforestation to legal recognition and government protection or that demonstrate that the absence of legal rights tends to make forests vulnerable to deforestation and associated CO_2 emissions. *(See Box 3 for a discussion of research limitations.)*

Table 2 | **Categorization of Country Cases by Community Forest Rights and Government Action**

REGION	COUNTRY	OFFICIAL TERM/ LEGAL CATEGORY	LEGAL RIGHTS RECOGNIZED	GOVERNMENT ACTION
Latin America	Bolivia (Amazon)	Original Community Titles	A WN WT M E D U	✓
	Brazil (Amazon)	Indigenous Lands	A WN WT M E D U	✓
	Colombia (Amazon)	Indigenous Reserves	A WN WT M E D U	X
	Ecuador (Amazon)	Indigenous Territories	A WN WT M E[i] U	X
	Guatemala (Petén)	Community Concessions	A WN WT M E D	✓
	Honduras (Rio Plátano)	Community Concessions	A WN WT M E[ii]	X
	Mexico	*Ejidos* and agrarian communities	A WN WT M E D AL[iii] U	✓
	Nicaragua (Bosawas)	Communal Lands	A WN WT M E U	X
	Peru (Amazon)	Native Community Lands	A WN WT[iv] M E D U	X
Africa	Niger	Agroforests	A WN WT M E[v]	✓
	Tanzania	Village Land Forest Reserves and Joint Forest Management	A WN WT M[vi] D U[vii]	✓
Asia	Nepal	Community Forests	A WN WT M E AL[viii] U	✓
	Indonesia	Various	Varies[ix]	X
	Papua New Guinea	Common Customary Lands	A WN WT M E D AL U	X

Key to Legal Rights: A = access; WN = withdrawal and use of non-timber forest resources; WT = withdrawal and use of timber forest resources; M = management; E = exclusion; D = due process and compensation; AL = alienation; U = unlimited duration.

Key to Government Action: ✓ = positive government action; X = negative government action.

i No data on whether Ecuadorian Indigenous Territories enjoy the right of due process and compensation.
ii No data on whether Honduran Community Concessions enjoy the right of due process and compensation.
iii For agrarian communities, alienation includes the right to lease the land and use the land as collateral for a loan only.
iv Law provides only a subsistence withdrawal right.
v No data on whether rights are for an unlimited duration.
vi Law provides the community with the right to sit on a management board.
vii Village Land Forest Reserves are for an unlimited duration. Joint Forest Management is for a limited duration.
viii Right to use forest as collateral for a loan only.
ix Pre-2013 Constitutional Court ruling, communities had legal rights to their forest but only if the government issued licenses, which the government has done for only a few communities. As a result, most communities have no legal rights to their forest.

SECTION IV

THE CLIMATE IMPACT OF COMMUNITY FOREST RIGHTS: ANALYSIS AND FINDINGS

Dozens of studies described in this section confirm an association between low deforestation and legal recognition and government protection for community forest rights. The converse is also true. When communities have no or weak legal rights, their forests tend to be vulnerable to deforestation and associated CO_2 emissions.

No or Weak Legal Recognition and Negative Government Action

In many countries, governments do not legally recognize community forest rights, or do so only weakly. For example, governments retain legal administrative control over 99 percent of forests in the Congo Basin region, 99 percent of forests in peninsular Southeast Asia, and all the forests in the Russian Federation.[41]

Yet, recent meta-studies and matching studies provide evidence that no or weak legal recognition likely results in high deforestation. A meta-study by Robinson et al. analyzed 118 cases of different forest rights, including for community forests, derived from 150 publications. Their conclusion: weak community rights are "tightly linked" to high deforestation while strong rights are linked to low deforestation.[42] *(See Box 4 on how matching studies apply to additionality and leakage.)*

By controlling for multiple variables, advanced quantitative research methods also suggest that no or weak legal forest rights likely result in deforestation of community forests. Nolte et al. analyzed legally recognized indigenous community forests in Brazil, as well as government-protected areas and sustainable-use forests, controlling for multiple variables (including location, topography, and travel time to major cities, among others), to determine the effect of legal recognition.[43] From 2001 to 2005, legally recognized indigenous forests in Brazil on average experienced deforestation of only 0.21 percent compared with a business-as-usual deforestation of 4.47 percent.[44] In other words, deforestation of the indigenous forests would likely have been 22 times higher if they had not been legally recognized and protected. This result is supported by evidence from Indonesia, where most communities have no legal recognition of their forest rights combined with negative government action.

Indonesia

Indonesia's large forest areas are under threat. While the country boasts the sixth highest aboveground biomass in the world,[45] it is also the second largest emitter of CO_2 from land uses,[46] mainly because of extensive deforestation. This situation is partly the result of a lack of legal recognition of community forest rights as well as government actions harmful to those rights.

The Indonesian National Forest Law empowers the government to manage the forest. The law provides for two forest categories: National Forest (*Hutan Negara*) and Private Forest (*Hutan Hak*). To date, no private forests have been recognized by the government. Four types of licenses can be issued to communities to recognize rights over National Forest,[47] but few potentially eligible communities have obtained legal recognition under the Forestry Law.[48] Out of at least 42 million hectares of forests customarily held by communities,[49] only 1 million hectares are legally recognized by the government.

The government routinely allocates community forests for oil palm concessions, industrial timber plantations for pulp and paper, and other conflicting land uses.[50] In 2008, for example, oil palm was responsible for 27 percent of total deforestation in one district of West Kalimantan, with commercial oil palm concessions covering 59 percent of community forests, whether legally recognized or not.[51] By 2011, the number of community forests overlapping with oil palm concessions more than doubled in that district.[52]

Original WRI analysis of deforestation from 2000 to 2012 in the Sakapat indigenous community in West Kalimantan is provided in Figure 3. The community mapped its forest and registered its claim with the National Indigenous People's Alliance of the Archipelago (AMAN), an Indonesian NGO, which submitted the maps for official recognition. The government, however, has yet to recognize the community's forest rights. And since 2005, deforestation increased noticeably.

Other communities in Indonesia have similar experiences. In the Papua region, governments and companies are converting the forests of Malind indigenous communities to commercial agriculture. In the absence of proper information from government or companies that their forest will be irreversibly lost, communities are consenting to long-term commercial use of their land for less than US$1 per hectare per year. Violent conflicts have erupted as a result.[53]

In 2013 the Indonesian Supreme Court declared unconstitutional a provision in the Forestry Law limiting indigenous community forest rights to National Forests. The ruling recognized community ownership over forests for the first time.[54] New legislation that will implement this ruling and recognize communities' legal ownership of their forests is pending and will lay the groundwork for potentially significant reductions in Indonesia's CO_2 emissions from deforestation.

BOX 4 | ADDITIONALITY AND LEAKAGE

"Additionality" is a climate change term that means a particular action, like strengthening a community's legal rights to its forest, has an added climate change mitigation benefit. In other words, additionality is concerned with what would have happened had no action been taken. This is relevant to community forests because in some cases community rights are legally recognized over a forest area that is not subject to deforestation pressures. It is unlikely to be deforested anytime soon. Thus, strengthening the community's rights did not provide an added climate benefit because the forest would not have been lost in any case.

To address this issue, a number of studies use research methods that control for multiple variables in order to determine what would likely have happened to the forest if the communities' rights had not been recognized. Several studies do this by "matching" legally recognized community forest with unprotected forests with similar characteristics.[i] For example, a global matching analysis conducted by Nelson and Chomitz found that legally recognized and protected Indigenous Peoples and local communities' forests are as effective as strictly protected government areas, or more so, in preventing deforestation, particularly in Latin America.[ii]

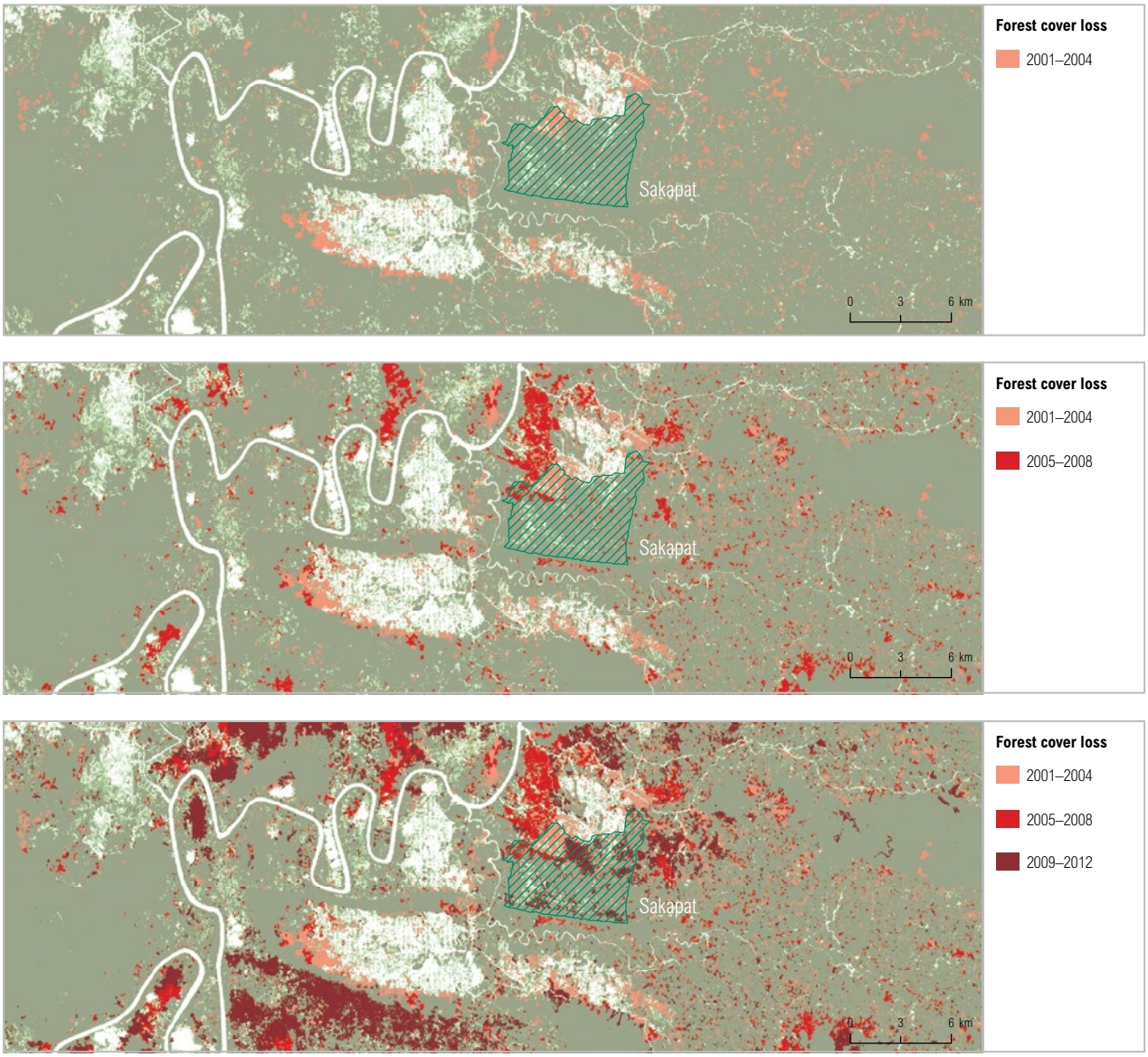
These kinds of techniques are not perfect measures of avoided deforestation and CO_2 emissions. They do not address the issue of leakage, a critical part of additionality.[iii] Leakage occurs when efforts to stop deforestation in one area serve to push it into another area that would otherwise have remained untouched. Carbon dioxide emissions thus move from one place to another rather than being prevented altogether. When this happens, the added mitigation benefits are reduced.[iv]

i Scullion et al., 2014.
ii Nelson and Chomitz, 2011.
iii Nepstad et al., 2006.
iv ODI, undated.

FINDING #1:

When Indigenous Peoples and local communities have no or weak legal rights, their forests tend to be vulnerable to deforestation and thus become the source of carbon dioxide emissions.

Figure 3 | **Satellite-Detected Forest Cover Loss in West Kalimantan, Indonesia, 2000–12, for Indigenous Community Forest without Official Recognition**



Source: Forest cover loss data are from Hansen et al., 2013, and depict forest change at a spatial resolution of 30 meters across the globe. Data for the community forest are from the Ancestral Domain Registration Agency in Indonesia and are based on community mapping undertaken by SEKALA, the Participatory Mapping Network, and AMAN. Using these data sets, WRI created the above analysis and graphic visualization.

Legal Recognition and Positive Government Action

Seven focus countries include community forests that enjoy legal recognition and have governments that generally protect those rights: Bolivia, Brazil, Guatemala, Mexico, Nepal, Niger, and Tanzania. These rights are linked to healthy forests and low deforestation, with resultant benefits for reducing CO_2 emissions.

Bolivia (Amazon)

Bolivia's Indigenous Peoples are entitled to obtain Original Community Titles (OCT) recognizing their rights to manage and benefit from the land. The government retains no formal ownership. Communities are prohibited from selling their land, but they may exploit forest resources for commercial use subject to a government-approved sustainable management plan.[55] An area of 22 million hectares, slightly larger than Greece, is held by Indigenous Peoples in Bolivia under OCTs.[56]

OCTs in Bolivia have experienced low deforestation. From 2000 to 2010, only about 0.5 percent of land on recognized OCTs was deforested, compared with 3.2 percent overall deforestation in the Bolivian Amazon.[57] Rates of deforestation were thus six times lower in forests where Indigenous Peoples have OCTs than in other forests. Detailed analysis of two OCTs shows more dramatic findings. The Tsimane and Multiethnic OCTs were created in 1990 covering 400,000 hectares each, although some of this area has since been reallocated to others.[58] From 1986 to 2009, the Tsimane OCT lost 5,100 hectares or 3.5 percent of its forest, with the Multiethnic OCT losing only 0.25 percent. Meanwhile, neighboring privately owned forestlands lost about 25 percent of their old-growth forest.[59]

Brazil (Amazon)

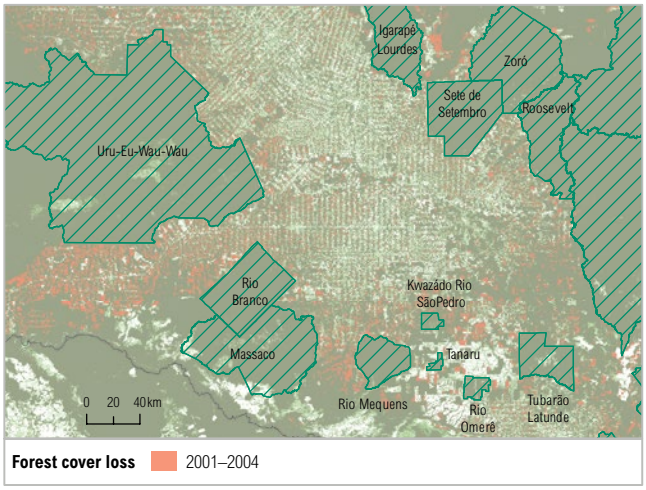
With about 63 billion tonnes of carbon locked in its biomass, Brazil has the most carbon-rich forests in the world.[60] The Brazilian Amazon contains about half the world's remaining tropical rainforest and 10 percent of the carbon stored in all land ecosystems.[61] Much of this carbon is in community forests, including a large number of legally recognized indigenous community forests. However, Brazil is also one of the largest emitters of greenhouse gases from deforestation in the world[62] and the site of most Amazon deforestation.[63] Yet, analysis shows that recognition of community forest rights is strongly associated with reduced deforestation, indicating CO_2 emissions from deforestation would almost certainly be worse if indigenous communities did not have legal forest rights and government protection.

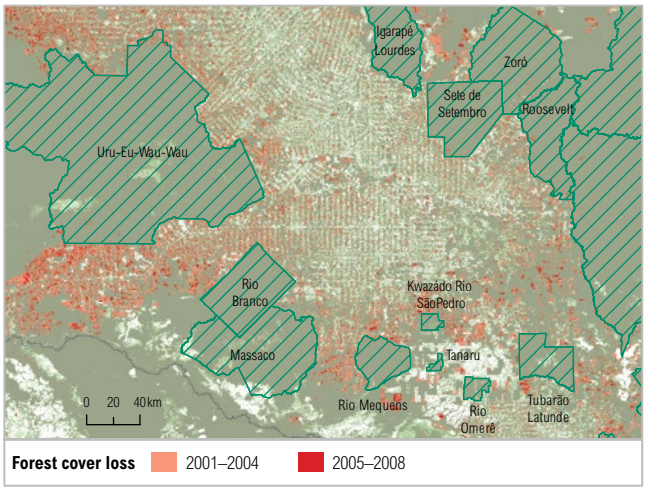
From 1980 to 2007, about 300 Indigenous Lands were legally recognized in Brazil, although completion of the official mapping and registration process has proved slow. Indigenous Lands vest the community with the perpetual right to exclude others and to manage and use the forest sustainably, with the government retaining formal ownership. Forest resources may be used for commercial purposes subject to an approved sustainability plan, but cutting trees for sale requires approval by the National Legislature. Importantly, Indigenous Peoples' right to exclude others extends to subsurface minerals, with the government generally barred from allocating mineral rights in these areas.[64]

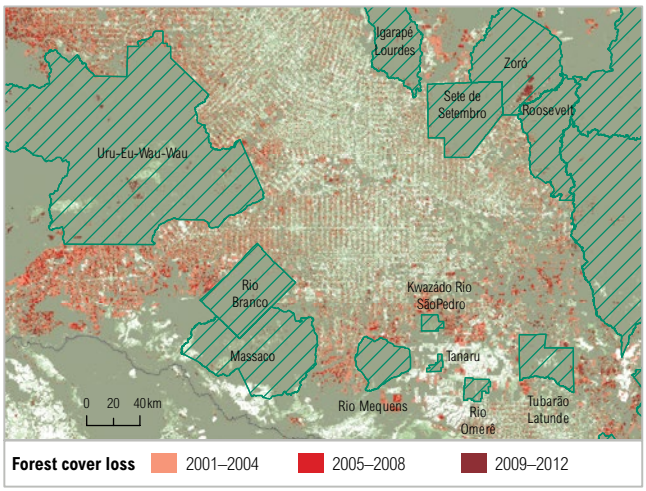
Numerous studies show the effectiveness of Indigenous Lands at resisting deforestation pressures in Brazil. A matching analysis by Nolte et al. compared the ability of government-protected areas, sustainable-use areas, and indigenous community forests to resist deforestation and concluded that Indigenous Lands "were consistently estimated to face the highest levels of deforestation pressures and to have achieved the greatest avoided deforestation."[65] Similarly, Nepstad et al. found that Indigenous Lands "strongly inhibited deforestation in the active agricultural frontier."[66]

These findings are supported by a WRI deforestation analysis for the Brazilian Amazon. From 2000 to 2012, forest loss was only 0.6 percent inside Indigenous Lands compared with 7.0 percent outside. *(See Figure 4.)* Figure 5 shows a section of the Brazilian Amazon under intense deforestation pressure. Forest loss between 2000 and 2012 is clustered close to, but rarely inside, the borders of Indigenous Lands.

Figure 5 | **Satellite-Detected Tree Cover Loss in Brazil, 2000–12, for Indigenous Lands in the Southwest of the Brazilian Amazon**







LEGEND

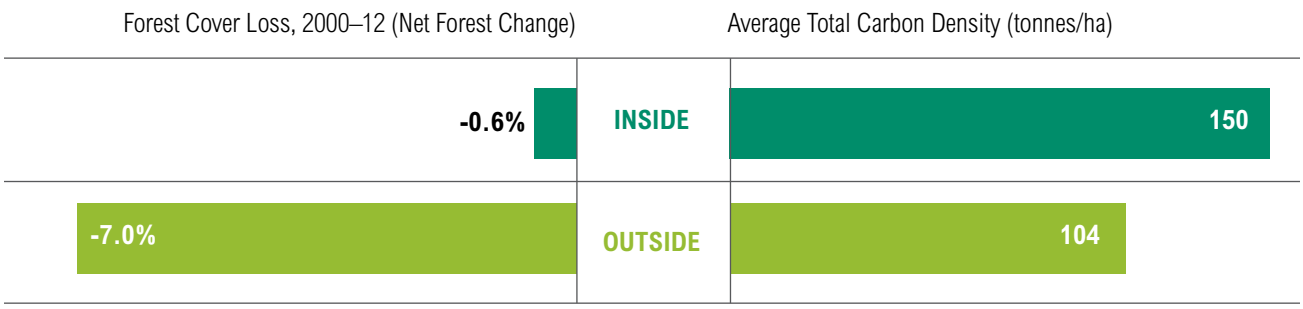
- Indigenous Lands
- Brazilian Amazon
- Highlighted Area (see left)

FOREST COVER AND DENSITY (2000)

- Closed forests (canopy cover >45%)
- Open forests (canopy cover 25-45%)
- Woodlands (canopy cover <25%)

Source: Forest cover loss data are from Hansen et al., 2013, and depict forest change at a spatial resolution of 30 meters across the globe. Data for Indigenous Lands are from the Ministry of Justice's National Indian Foundation (Fundação Nacional do Índio, 2013). The number of Indigenous Lands in the dataset is 371, which includes both fully recognized territories and those still in the registration process. NOTE: FUNAI's data on community lands show about 35 million fewer hectares than data from RRI. The reason for the discrepancy is FUNAI's data are for Indigenous Lands—not, as in the RRI data, for other tenure types: Extractive Reserves, Sustainable Development Reserves, Agro-Extractive Settlement Projects, Forest Settlement Projects, Sustainable Development Projects, and Quilombolas (peoples of African descent) Territories.

Figure 4 | **Comparing Forest Cover Loss, 2000–12, and Average Carbon Density Inside and Outside Indigenous Lands in the Brazilian Amazon**



Source: Hansen et al. 2013. Carbon data from Saatchi et al., 2011.

The Brazilian government generally protects Indigenous Peoples' forest rights, but Indigenous Peoples often forcefully defend their own forest by expelling loggers, ranchers, and other intruders.[67] Indigenous Lands are the only areas of the Amazon with roads cutting across them that have not succumbed to deforestation.[68] The roads do not always go around Indigenous Lands, but the deforestation does.

As a result, community forests in the Brazilian Amazon tend to be relatively carbon-rich, containing 36 percent more carbon per hectare than areas of the Brazilian Amazon outside Indigenous Lands *(see Figure 4)*.[69]

WRI analysis of deforestation and carbon stock found that 27 times more CO_2 emissions were produced outside Indigenous Lands than inside from 2000 to 2012. Forest cover loss of 22.5 million hectares in the Brazilian Amazon outside Indigenous Lands resulted in 8.7 billion tonnes of CO_2 emitted during those years. In the same period, 311 million tonnes of CO_2 emissions were produced from deforestation of about 677,000 hectares of forest on Indigenous Lands.

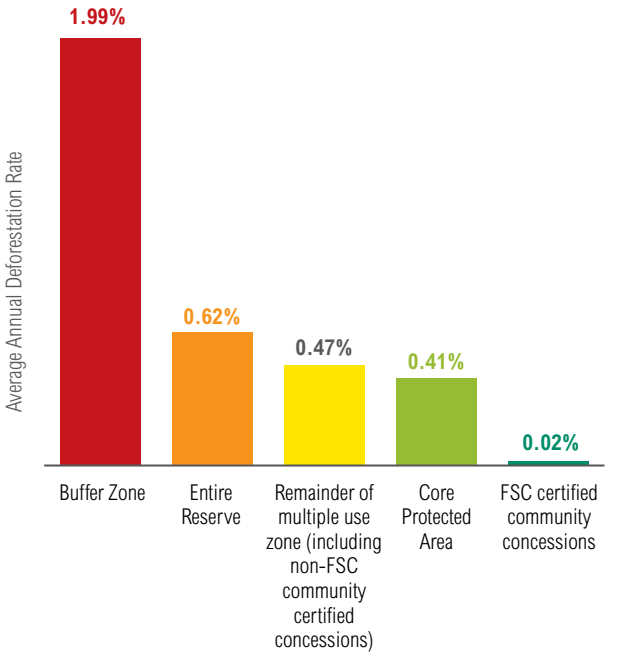
Brazil's Indigenous Lands therefore play a significant role in keeping CO_2 emissions from the atmosphere. One estimate suggests that Indigenous Lands and government-protected areas in the Brazilian Amazon could prevent 27.2 million hectares of deforestation by 2050, an area slightly larger than the United Kingdom. If the carbon in this large forest area were emitted as CO_2, it would amount to approximately 12 billion tonnes of CO_2[70]—the equivalent of about three years' worth of CO_2 emissions from all Latin American and Caribbean countries.[71]

Guatemala (Petén)

The Petén Maya Biosphere Reserve of Guatemala was established in 1989 as a UNESCO World Heritage Site protecting 2.1 million hectares of lowland forests. The Reserve includes Protected Areas where use of any forest resources is prohibited, adjacent buffer zones, and "multiple use zones" where 12 community concessions and two industrial logging concessions are located. The community concessions recognize Indigenous Peoples' rights to management, exclusion, and use, among others, and operate under management agreements for renewable 25-year terms. Sustainable commercial use of forest resources is permitted,[72] but communities must prepare forest management plans and obtain certification from the Forest Stewardship Council (FSC). This highly regarded international body that sets forest standards only certifies a community concession if it meets the FSC's principles and criteria, such as clearly defined forest rights.[73] Eight community concessions are FSC-certified, but four small concessions have not obtained certification because of encroachments by cattle ranchers.[74] Guatemala's National Council of Protected Areas, a government agency, oversees the community concessions but delegates much of its authority to a trained and accredited forestry technician. The forestry technician is mostly paid for by the communities and responsible for enforcing regulations, management plans, and other official duties.[75]

A comparison of FSC-certified community concessions with non-certified community concessions and nearby buffer zones and Protected Areas revealed that the lowest rates of deforestation occurred in FSC-certified community concessions. From 1986 to 2007 they experienced only 0.02 percent deforestation compared with 0.41 percent in the Protected Areas—about 20 times less deforestation.[76] *(See Figure 6.)*

Figure 6 | **Average Annual Deforestation Rates in the Maya Biosphere Reserve, Guatemala, 1986–2007**



Source: Hughell and Butterfield, 2008.

Mexico

In Mexico, *ejidos* and "agrarian communities" (community lands) account for 71 percent of the nation's forests.[77] Since 1986, the country's Forestry Law has recognized communities' full legal rights over their forests, including commercial use rights,[78] although sale of forested community lands is prohibited.[79] In the late 1990s the Mexican government increased institutional and resource support for community forest management, establishing a Ministry of the Environment and two government programs to support sustainable forest use. These programs helped train communities to improve sustainability and market access, among other things,[80] and the government paid for some community lands to receive FSC certification, which increased benefits to the community through the sale of certified timber.[81] As of October 2010, some 8.1 million hectares of Mexico's forests were under community forest management plans.[82]

This practical management and livelihood support has helped *ejidos* and agrarian communities with common forest resources to minimize deforestation.[83] Community-managed forests in the Yucatan Peninsula have recorded lower deforestation rates than even government-protected areas designated for strict conservation.[84] For example, from 2000 to 2005 the Calakmul Biosphere Reserve in Yucatan experienced a deforestation rate of 0.7 percent, compared with a rate of practically zero (0.002 percent) from 2000 to 2004 for a nearby community-managed forest.[85] From 1990 to 2006, two *ejidos* without community forest programs lost up to 11 times more forest than two *ejidos* with community forest management.[86]

FINDING #2:

Legal forest rights for communities and government protection of their rights tend to lower carbon dioxide emissions and deforestation.

In addition, some *ejidos* have fully individualized parcels, with no common forest resources remaining, whereas others retain common forest resources. The privatized *ejidos* show higher deforestation than the *ejidos* that retain common forest resources.[87]

The carbon mitigation potential here is enormous as community-managed forests improve their carbon storage and reduce Mexico's CO_2 emissions from deforestation. A sample of only five community-managed forests totaling 375,500 hectares estimated their carbon storage potential to be 64.1 million tonnes.[88] The climate change mitigation benefits would be even greater if extended to include the thousands of community forests in Mexico.

Nepal

Nepal is a well-documented case where legal recognition and government protection of community forest rights has halted tree clearance and helped maintain healthy forests,[89] particularly in the hills and mountains of the country, where 75 percent of remaining forests are located.[90] The government has devolved forest management rights to communities over the past 35 years[91] and supported the establishment of legally recognized community associations or Community Forest User Groups (CFUGs).[92] Communities are banned from clearing forests for agricultural use, but they can use them for subsistence and commercial purposes.[93] Twenty-five percent of CFUG revenues must be invested in rehabilitating the community forest, while surplus funds can be allocated to other community development investments.[94]

As of 2013, over 17,000 CFUGs manage about 1.6 million hectares of forests, benefiting more than 2 million households.[95] The community forests are spread throughout the country, being found in 74 of 75 districts.[96] With 32 percent of the population benefiting from community forestry, it has become one of the country's most important poverty reduction programs, and it generates substantial livelihood as well as environmental benefits.[97]

Ninety-three percent of CFUGs report improvements in the condition of their community forests.[98] In the Chitwan valley of Nepal, researchers observed improvements in forest health from 1989 to 2000 in areas managed by CFUGs. Communities actively protected and restored degraded forests, helping achieve a 22 percent increase in vegetation density. In 2008, a forest assessment in the Koshi Hills showed a 21 percent increase in biomass over 14 years.[99]

Improving the health of CFUG-managed areas also increased the forests' performance as a carbon sink. In 2009, an estimated 1.2 million hectares of community forests in Nepal accounted for a carbon stock of 183 million tonnes.[100] From 2004 to 2008, carbon stored in some Nepalese community-managed forests increased by 3 tonnes per hectare per year.[101] These impressive results demonstrate how communities backed by a government acting to secure and support their legal rights are capable of halting or even reversing trends in deforestation and forest degradation.[102]

Niger

In Niger, strengthening the rights of farmers to manage trees on cropland has resulted in the restoration of tree cover on a massive scale, sequestering at least 30 million tonnes of carbon over the past 30 years.[103] The government's support of farmer-managed natural regeneration of trees serves as a cost-effective approach for addressing a range of environmental challenges, including desertification and climate change. A relatively modest investment in the 1980s and 1990s by development assistance agencies and NGOs to strengthen community land and forest rights through institutional reforms and local training has generated about US$900 million in annual economic benefits.[104]

Rural communities in Niger exercise long-standing customary rights to manage trees and forest resources in combination with farming.[105] In the 20th Century these rights were weakened by colonial regimes, national policies, and Forest Service regulations that decreed all trees and forests to be government property, including economically valuable "protected" trees growing in cultivated fields. Government ownership of trees was enforced through a system of permits issued by the Forest Service for cutting trees and through fines for unauthorized tree felling. These laws aimed to conserve forests and high-value tree species, but they had the opposite effect. They discouraged communities from managing trees by limiting their ability to

FINDING #3:
Indigenous Peoples and local communities with legal forest rights maintain or improve their forests' carbon storage.

benefit from them, and they increased dependence on an ineffective and under-resourced government bureaucracy.[106]

After deforestation and land degradation took its toll, the government embarked on legal and institutional reforms in the 1990s.[107] Community land rights were recognized in an updated Rural Code, and the policies and regulations of the Forest Service were revised to recognize and strengthen community forest management rights. In cooperation with NGOs working to promote tree regeneration, the Forest Service agreed to no longer fine farmers who cut branches or otherwise manage the trees on their farms.[108] The Forest Service and local government authorities also respected the rights of farmers to harvest and sell timber from their trees and to prevent others from cutting them.[109] As a result of these reforms and incentives, land degradation was reversed and rural landscapes transformed.[110] Further, over the past 20 years farmers protected and regenerated some 200 million trees across 5 million hectares of agricultural land, leading to significant carbon benefits.[111]

Tanzania

Tanzania has achieved notable progress in supporting the legal recognition of community forest rights. More than 1,800 villages are engaged in legally recognized management of community forests, covering 3.6 million hectares or about 10 percent of the country's total forest area.[112] The result has been a demonstrable improvement in forest health within legally recognized community forests, which have lost less forest than government-controlled forests.[113]

Village Land in Tanzania is legally recognized community land, which includes the trees found there.[114] Communities have the option of obtaining an additional layer of legal recognition of their forest as Village Land Forest Reserves,[115] but few do so. All community forests, including Village Land Forest Reserves, recognize community rights to manage and benefit from forests with minimal government involvement (known as community-based forest management).[116] Sustainable commercial use of forest resources is allowed if the community establishes a government-approved management plan, although to date few communities have obtained commercial use rights to their forests.

Outside Village Land, the government manages forests, including a network of National or Local Authority Forest Reserves. For a few of these the government developed joint management programs with communities living next to the forest. Under joint forest management, community representatives have the right to a place on these Reserves' management boards,[117] and sustainable commercial use is permitted—also with a government-approved management plan.[118]

Research by Blomley et al. compared community-based management on Village Land Forest Reserves, jointly managed National or Local Authority Forest Reserves, and forests managed solely by the government. They found marked improvements in forest health on both community-based and jointly managed forests as compared with solely government-managed ones.[74]

Legal Recognition and Negative Government Action

This section highlights the experiences of countries where communities have legal rights but where these are undermined by negative government actions such as allocating community forests for commercial use or failing to remove illegal settlers who encroach on community lands. Research on these countries—Colombia, Ecuador, Papua New Guinea, Peru, Honduras, and Nicaragua—provides compelling evidence of the link between lack of government support for community forest rights and negative outcomes for forest and climate protection. Two exceptions are Honduras and Nicaragua. In Honduras, communities created a union to advocate for better protection of their forestry concessions. In Nicaragua, communities have been effective at protecting their borders despite the government's neglect.

Colombia (Amazon)

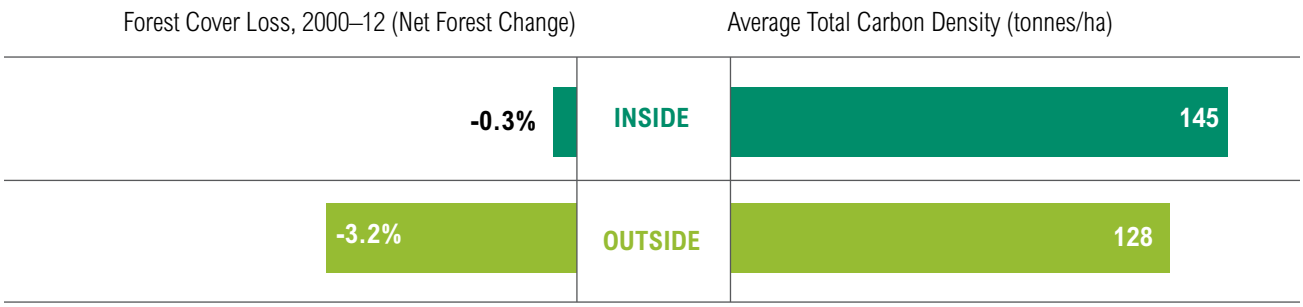
In Colombia, indigenous communities enjoy legal rights to their forest. The inhabitants of official Indigenous Reserves enjoy legal rights similar to those in Brazil, including the right to exclude outsiders, manage their forest, and benefit from timber and non-timber forest resources. However, the government's ability to protect indigenous community forest rights is limited by decades of armed conflict.[120]

Colonization pressures stemming in large part from armed conflict have rendered community forests vulnerable to deforestation. Large areas of the Colombian Amazon were occupied by armed groups in the 1980s and 1990s and thus effectively outside government control. In particular, in the 1980s armed conflict triggered a wave of settler migration onto Indigenous Reserves close to settler pressures from the Andes Mountains.[121]

Overall deforestation has been low on Indigenous Reserves. From 2000 to 2012, forest cover loss across these areas was only 0.3 percent compared with 3.2 percent in the wider Colombian Amazon. *(See Figure 7.)* On average, 5–7 percent of forest on the Reserves' border areas was lost through a combination of armed conflict and coca farming.[122] Two indigenous lands with the highest deforestation rates, *Barranco Colorado* and *La Fuga*, are dissected by roads built after a wave of forest exploitation.[123] *(See Figure 8.)*

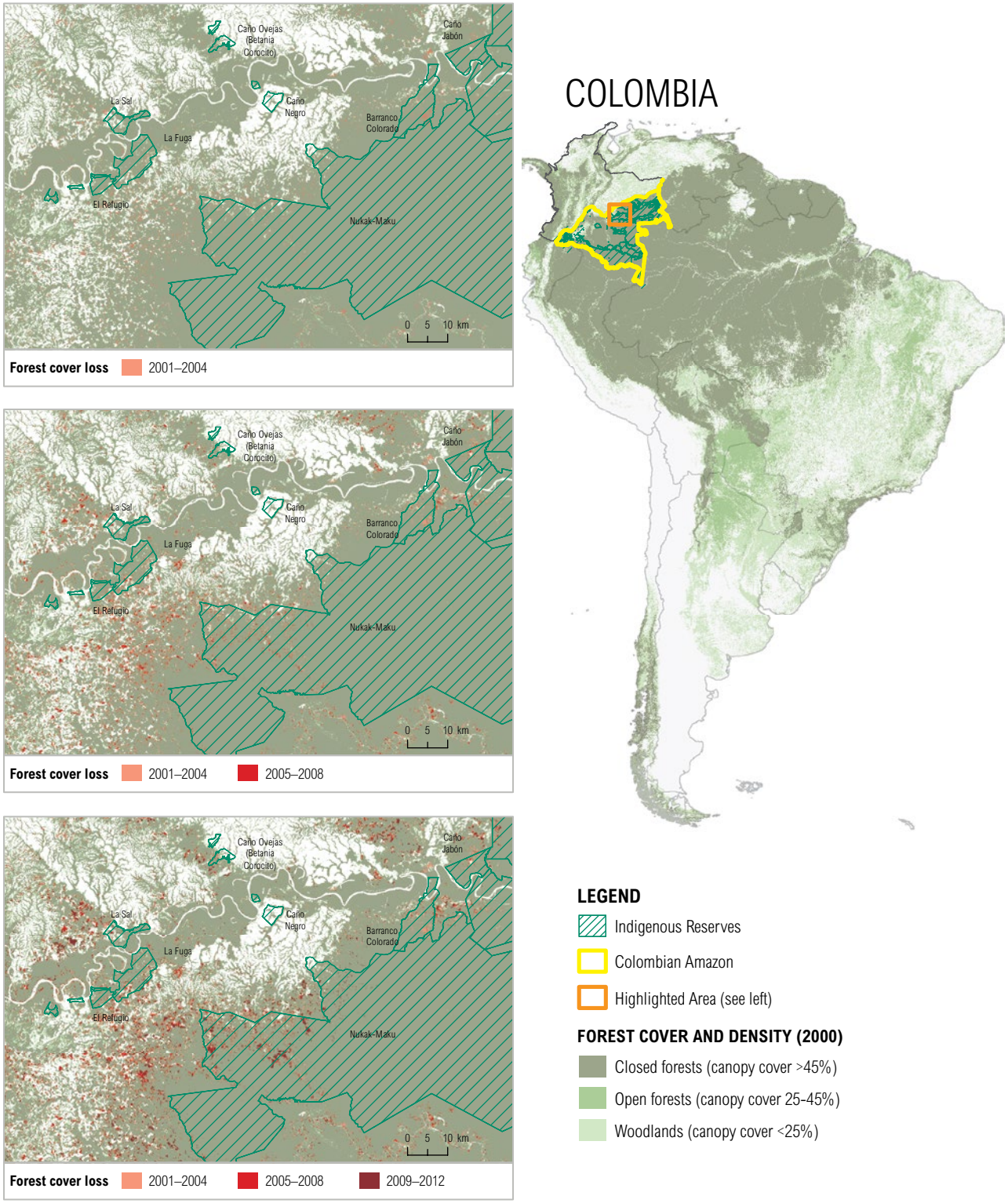
Low deforestation rates on Indigenous Reserves in Colombia have resulted in relatively low CO_2 emissions. According to WRI calculations, Indigenous Reserves have higher carbon density, at 145 tonnes per hectare, than other Amazonian forest, with 128 tonnes per hectare. *(See Figure 7.)* From 2000 to 2012, loss of about 70,000 hectares of forest on Indigenous Reserves resulted in about 34 million tonnes of CO_2 emissions, equal to 484 tonnes of CO_2 per hectare. During the same period, the Colombian Amazon outside Indigenous Reserves lost 694,000 hectares of forest, resulting in 316 million tonnes of CO_2 emitted (456 tonnes per hectare). To ensure that deforestation and CO_2 emissions on Indigenous Reserves remain low in the post-conflict environment, the Colombian government will need to protect and support the Reserves as effective government control over the area is restored.

Figure 7 | **Comparing Forest Cover Loss, 2000–12, and Average Carbon Density Inside and Outside Indigenous Reserves in the Colombian Amazon**



Source: Hansen et al. 2013. Carbon data from Saatchi et al., 2011.

Figure 8 | **Satellite-Detected Forest Cover Loss in Colombia, 2000–12, for Indigenous Reserves in the Colombian Amazon**



Source: Forest cover loss data are from Hansen et al., 2013, and depict forest change at a spatial resolution of 30 meters across the globe. Data for Indigenous Reserves are from the *Instituto Geográfico Agustín Codazzi (IGAC) Subdirección de Geografía y Cartografía.* The number of Indigenous Reserves in the dataset is 209.

Ecuador (Amazon)

Under Ecuador's 2008 Constitution, many Indigenous Peoples enjoy the right to exclude others from their forest and to use it sustainably for commercial purposes with an approved management plan.[124] Yet these rights are undercut by the many oil and mining concessions that overlap with officially recognized indigenous lands.[125]

From 2000 to 2008, stand-alone indigenous lands (those that do not overlap with government-protected areas) in the Northwestern provinces of Sucumbíos and Orellana suffered some of the highest deforestation rates in the country, losing 6.5 percent of their forest,[126] partly as a result of oil and mining concessions.[127] Concessions then bring roads that trigger an influx of settlers who, in part because of earlier government policies, consider much of the Amazon open for settlement.[128]

By contrast, some indigenous lands fall within government-protected areas, where only subsistence use of forest resources is permitted.[129] In these areas, where government oversight is stronger, only 1.5 percent of forest cover was lost from 2000 to 2008.[130]

Papua New Guinea

In Papua New Guinea, the Constitution recognizes community ownership of 97 percent of forests as Common Customary Land.[131] Ownership includes access, management, exclusion, due process and compensation, and use rights to timber and non-timber forest resources.[132]

Yet between 2003 and 2010 the government issued leases of up to 99 years to private companies, giving them the right to exploit Common Customary Lands covering about 4 million hectares—an area the size of Switzerland. These "special agricultural or business leases" were used to dramatically expand lucrative oil palm and other commercial concessions beyond public land and onto Common Customary Land.[133] If logged to convert the forest to oil palm or other non-forest uses, areas covered by special leases could release almost 3 billion tonnes of CO_2.[134]

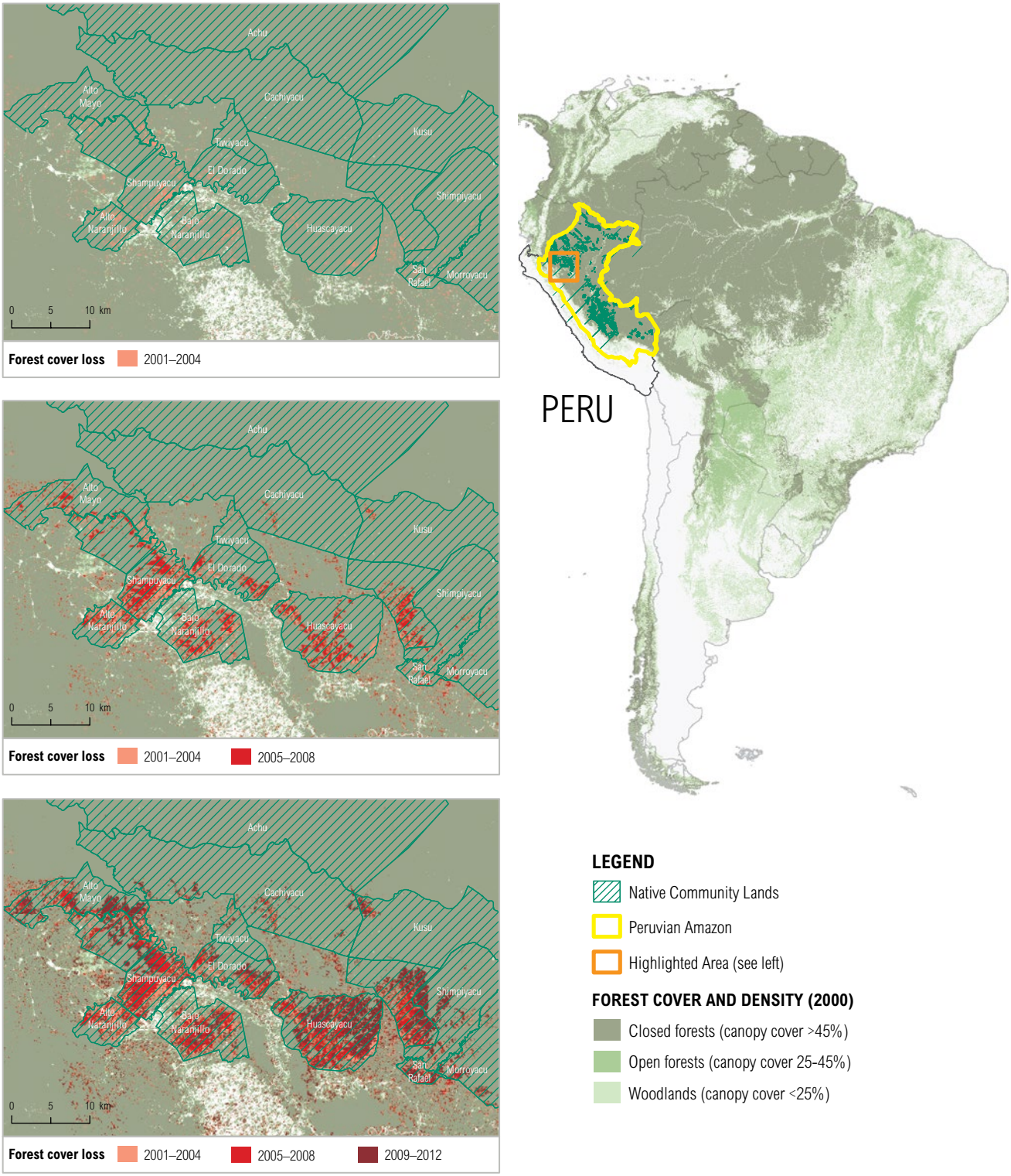
This situation arose after the government instituted a lease-leaseback scheme in 1979, with the intention of leasing Customary Land from communities and then leasing it back to them. The arrangement was planned as a temporary measure to compensate for the absence of a legal mechanism to register Common Customary Land titles.[135] But the government also granted itself the authority to issue the controversial 99-year leases of Customary Lands to third parties.

Not only are communities having their ownership rights overridden, they are being deprived of financial benefits from the special leases in the form of rental payments and economic opportunities. Instead, Papua's elites and foreign companies are the prime beneficiaries.[136] A Government Commission of Inquiry created in 2011, in response to international condemnation, recommended revoking some of the leases, but the government has so far failed to act.[137]

FINDING #4:

Even when communities have legal rights to their forest, government actions that undermine those rights can lead to high carbon dioxide emissions and deforestation.

Figure 9 | **Satellite-Detected Forest Cover Loss in Peru, 2000–12, for Native Community Lands in the Northwest of the Peruvian Amazon**



Source: Forest cover loss data are from Hansen et al., 2013, and depict forest change at a spatial resolution of 30 meters across the globe. Data for Native Community Lands are from the Initiative for the Conservation in the Andean Amazon, a project of USAID and the U.S. Department of Interior.

Peru (Amazon)

In the Peruvian Amazon, 83 percent of deforestation occurs within 20 kilometers of a road.[138] Legally recognized indigenous lands, called Native Community Lands, succumb to these pressures.[139] For example, according to the Amazon NGO RAISG, three Native Community Lands in the northwest of Peru—*Huascayacu, Alto Mayo*, and *Shimpiyacu*—lost, respectively, 51 percent, 33 percent, and 24 percent of their forest between 2000 and 2010—some of the worst deforestation in the entire Amazon,[140] due to a combination of poverty, migrant pressures, and hydrocarbon concessions. *(See WRI analysis in Figure 9.)* As a consequence, from 2000 to 2010 forest loss inside Native Community Lands (2.2 percent) was higher than forest loss in the entire Peruvian Amazon (2.1 percent).[141]

Government allocations of indigenous lands to mining, oil, and natural gas concessions are a major cause of these devastating deforestation levels. Oil and gas concessions cover nearly 75 percent of the Peruvian Amazon.[142] Fully 87 percent of Peruvian indigenous lands in part of Madre de Dios overlap with mining, oil, and gas concessions and other conflicting land uses.[143] Although Indigenous Peoples have legal rights to the forest, including subsistence use, management, and exclusion, the government retains the right to subsurface minerals. Indigenous communities cannot legally exclude government-sanctioned mining operations, and the mining companies bring roads and infrastructure, which attract settlers and illegal loggers. Nevertheless, a recent matching analysis covering part of Madre de Dios concluded that things would likely be worse without Native Community Lands. From 2006 to 2011, their presence likely reduced deforestation, saving 0.59 percent of indigenous communities' forests from deforestation.[144]

Honduras (Rio Plátano)

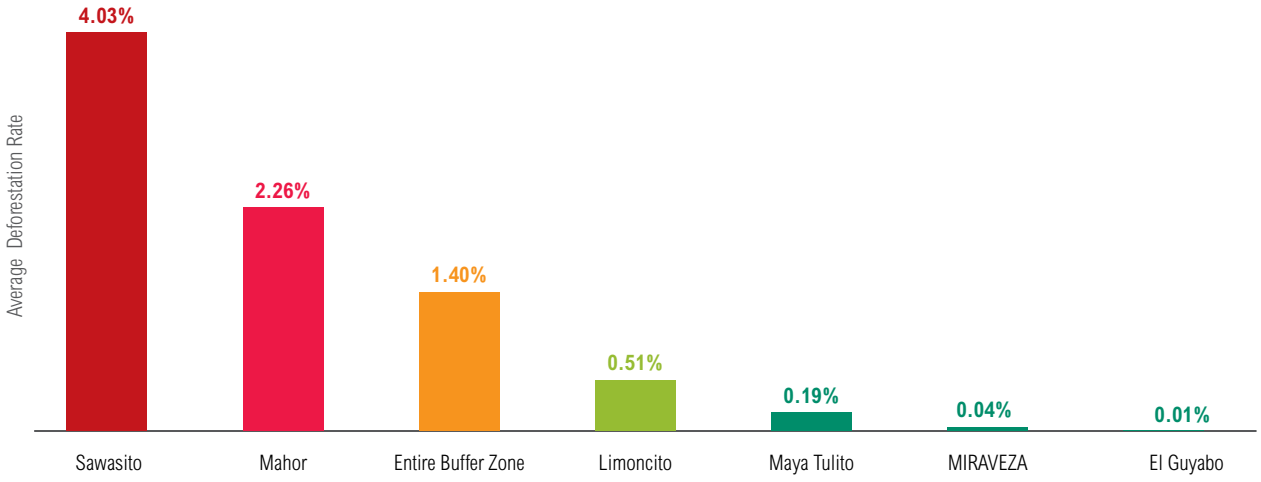
The Rio Plátano Biosphere Reserve in Honduras, a UNESCO World Heritage Site, is home to 12 community concessions managing 107,000 hectares of broadleaf tropical forest. Communities enjoy rights to access, use, manage, exclude, and benefit from the forest for renewable 40-year periods, but the government retains formal ownership. Seven of the 12 community concessions are FSC-certified, enabling the inhabitants to sell sustainably sourced timber. Similar to the Maya Reserve in Guatemala, the Rio Plátano Reserve is divided into a cultural zone and a buffer zone. Both contain community concessions where sustainable commercial use is permitted, with settlers found mostly in the buffer zone.[145]

In 2006, the community concessions created the Union of Agroforestry Cooperatives of the Rio Plátano Biosphere Reserve[146] to collectively overcome problems created by inadequate government protection and support. These included excessive delays in government approval of forest management plans and harvesting permits, government inaction in the face of illegal logging by non-community members, and lack of government financial support for developing management plans.[147]

Overall, this arrangement to empower communities has paid forest and climate dividends, leading to lower deforestation rates inside community concessions than in surrounding areas. A comparison of nine community concessions found that seven lost less forest cover than the surrounding Reserve area, whether in the buffer or cultural zone. From 2006 to 2011, four community concessions in the buffer zone experienced deforestation rates between 0.01 percent and 0.51 percent compared with 1.40 percent across the buffer zone.[148] Thus, deforestation was up to 140 times lower in some community concessions compared with the buffer zone as a whole. *(See Figure 10.)*

FINDING #5:
Communities can partially overcome government actions that undermine their forest rights.

Figure 10 | **Average Deforestation Rates for Six Community Concessions in the Rio Plátano Biosphere Reserve, Honduras, 2006–11**



Source: Forest Trends, 2013.

Nicaragua (Bosawas)

Together with the neighboring Rio Plátano Reserve in Honduras and two other protected areas, Nicaragua's Bosawas Biosphere Reserve forms one of the largest protected tropical forests in Central America.

The national government has issued at least six titles to indigenous Miskito and Mayanga people in the Reserve,[149] with communities operating under sustainable use plans not officially recognized by the authorities. These rights were a long time coming, with communities and their partners spending over a decade fighting to implement constitutional recognition of their forest rights.[150] The first titles for indigenous Communal Lands were eventually issued in 2009 in line with Nicaragua's 2003 Communal Lands Law. This provides "full recognition of rights over communal property, [and] use, administration and management of traditional lands and natural resources."[151] Although the right to exclude is not expressly mentioned, non-natives are not permitted on indigenous lands.[152]

Although the government has now issued titles for most indigenous Communal Lands, its efforts to restrict encroachments on indigenous community forests have been weak.[153] The communities have stepped into the breach and are generally successful at policing their own borders.[154]

Deforestation data show that indigenous communities protect their forests and resist deforestation pressures from settlers. In 2001–02, about 2,400 hectares of Communal Lands in the Bosawas Reserve were deforested compared with a rate 14 times higher in neighboring Reserve areas occupied by settlers.[155] During the same period, three times more forest was lost in the settler area bordering the Communal Lands than in the indigenous occupied border area.[156]

SECTION V

CONCLUSION

The preceding sections make a compelling argument for the support of community forest rights as a bulwark against climate change. The evidence they provide reveals a strong correlation between the level of legal recognition along with government protection and a community's ability to resist deforestation, maintain forest health, and lower CO_2 emissions.

If communities have no or weak legal rights, as is the case in many countries around the world, their forest is vulnerable to deforestation. On the other hand, many communities with legal rights coupled with government protection see less forest loss and CO_2 emissions. Communities that have legal rights but lack government protection can lose their forest to illegal encroachments unless—as in Honduras and Nicaragua—they take steps to partially overcome negative government action. When governments recognize some legal rights but act in ways that undermine them, high deforestation and CO_2 emissions commonly result. Papua New Guinea and Peru are prime examples, with governments weakening Indigenous Peoples and local communities' forest rights by giving companies the legal right to convert forest for mining, oil palm, or other commercial uses. Figure 11 summarizes the results of this analysis.

Findings

1. **When Indigenous Peoples and local communities have no or weak legal rights, their forests tend to be vulnerable to deforestation and thus become the source of carbon dioxide emissions.** Deforestation of indigenous community forests in Brazil would likely have been 22 times higher without their legal recognition. In Indonesia, the high levels of carbon dioxide emissions from deforestation are driven in part by no or weak legal rights for forest communities. For example, oil palm concessions cover 59 percent of community forests in part of West Kalimantan.

Figure 11 | **Summary of Analysis of How Community Forest Rights and Government Action Impact Forests**

COUNTRY	LEGAL RIGHTS	GOV. ACTION	FOREST OUTCOMES
Bolivia (Amazon)	✓	✓	▲
Brazil (Amazon)	✓	✓	▲
Colombia (Amazon)	✓	X	▲
Ecuador (Amazon)	✓	X	⚒
Guatemala (Petén)	✓	✓	▲
Honduras (Rio Platáno)	✓	X	▲
Mexico	✓	✓	▲
Nicaragua (Bosawas)	✓	X	▲
Peru (Amazon)	✓	X	⚒
Niger	✓	✓	▲
Tanzania	✓	✓	▲
Nepal	✓	✓	▲
Indonesia	X	X	⚒
Papua New Guinea	✓	X	⚒

CHART KEY

LEGAL RIGHTS	GOVERNMENT ACTION	FOREST OUTCOMES
✓ = Legal Recognition	✓ = Positive Government Action on Strength of Rights	▲ = Positive Forest Outcomes
X = No/Weak Legal Recognition	X = Negative Government Action on Strength of Rights	⚒ = Negative Forest Outcomes

2. **Legal forest rights for communities and government protection of their rights tend to lower carbon dioxide emissions and deforestation.** In Brazil, deforestation in indigenous community forests from 2000 to 2012 was less than 1 percent, compared with 7 percent outside them. The higher deforestation outside indigenous community forests led to 27 times more carbon dioxide emissions than were produced from deforestation on indigenous community forests. And indigenous community forests contain 36 percent more carbon per hectare than other areas of the Brazilian Amazon.

3. **Indigenous Peoples and local communities with legal forest rights maintain or improve their forests' carbon storage.** Government protection of the forest rights of communities in Niger added 200 million new trees, absorbing 30 million tonnes of carbon over the past 30 years. Support for community forestry in Nepal has improved forest health and generated a carbon stock of more than 180 million tonnes across 1.6 million hectares.

4. **Even when communities have legal rights to their forest, government actions that undermine those rights can lead to high carbon dioxide emissions and deforestation.** The forests of indigenous communities in Peru, where government actions weaken community forest rights, are deforested at a higher rate than other parts of the Peruvian Amazon.

5. **Communities can partially overcome government actions that undermine their forest rights.** In Honduras and Nicaragua, indigenous communities have been able to partially forestall deforestation, despite insufficient government efforts to protect their rights. In some cases community forest loss is 0.01 percent, compared with 1.40 percent in the surrounding area.

Recommendations

Based on the above analysis and findings, the authors make the following five practical, evidence-based recommendations to donors, governments, civil society, and other stakeholders working on climate change, land rights, and forestry.

1. **Provide Indigenous Peoples and local communities with legal recognition of rights to their forest.** Attention must be given to the millions of forested communities without legal rights to their forest. In Indonesia, where communities generally have no or weak legal rights, new legislation is pending to recognize communities' ownership of their forests. Where communities have some legal forest rights, governments and their partners should strengthen these rights. While this recommendation applies to all relevant countries, those that are heavily forested and have weak community forest rights are of critical importance. In addition, stakeholders should support strengthening community forest rights as part of a future agreement on REDD+.

2. **Protect the legal forest rights of Indigenous Peoples and local communities.** Governments and their partners should help protect community forest rights by, for example, mapping community forest boundaries, helping to expel illegal loggers, and not granting commercial concessions over community forests. In Brazil, the government maps and registers indigenous community forests, helps communities remove illegal settlers, and is generally barred from granting commercial use of community forests to companies. Governments and their partners should commit funds and invest in supporting communities and their civil society partners. In addition, governments and donors should include programs to support community forest rights in their climate change strategies.

3. **Support communities with technical assistance and training.** Governments, donors, and civil society should provide training and technical assistance to communities and should undertake capacity building activities. For example, in Mexico some communities receive training and support from the government to improve sustainable forest use and market access. In addition, governments, donors, and civil society should help ensure that people and local communities are able to participate genuinely in the development of legal and policy frameworks related to REDD+.

4. **Engage forest communities in decision-making on investments affecting their forest.** Governments and businesses should work together to ensure that government planning is consistent with international standards and that investments do not violate community forest rights. In Peru, the government's failure to comply fully with international standards contributes to high deforestation of indigenous community forests. For example, national laws should require that the status of Indigenous Peoples and local community forest is determined well in advance of any decisions affecting the community. Also, if legal commercial extraction of subsurface minerals does occur on indigenous or local community forestlands, ensure that the extraction is conducted in the least invasive way possible and only after free, prior, and informed consent of the affected communities.

5. **Compensate communities for the climate and other benefits provided by their forest.** Governments and their partners should commit funds and invest in supporting communities and their civil society partners to increase the economic incentives for communities to manage their forests sustainably. In addition, stakeholders should support strengthening of community forest rights as part of a future agreement on REDD+. Ensure that communities receive payments for protecting their forests as part of the design and implementation of REDD+.

If all these recommendations are fully implemented by donors, governments, businesses, and other stakeholders, the evidence presented in this report suggests that communities can and will increase the carbon in their forests. In so doing, they will help reduce CO_2 emissions, supporting global climate change mitigation efforts at the same time as protecting their own rights and benefits.

The authors strongly urge members of the international climate change, land tenure, and forestry communities to use the evidence in these pages to press for strengthening community forest rights in developing countries as a climate policy priority.

APPENDIX A: METHODOLOGY FOR FOREST COVER CHANGE AND CARBON STORAGE

To explore the relationship between community forest rights and deforestation, the World Resources Institute (WRI) conducted an original analysis using geospatial data on community lands in combination with satellite-derived data on forest cover change and carbon density. The analysis was done for Brazil and Colombia. In addition, forest cover change analysis was done for a portion of Peru. These countries were chosen primarily because accurate spatial data on community forest boundaries were available, given that such data are limited overall. Furthermore, these countries are all located in the Amazon basin, where environmental conditions could be expected to be relatively similar.

The satellite-derived data on forest cover change are from Hansen et al., who produced a global dataset of annual forest cover loss between 2000 and 2012 and of forest cover gain for the collective period of 2000 to 2012.[157] The global dataset represents forest cover change as detected through analysis of Landsat satellite images at a resolution of 30 meters, starting with baseline forest cover data for the year 2000.

Hansen et al. data measure forest cover loss and gain across all land. Forest cover is defined as "all vegetation taller than 5 meters in height" and forest cover loss is defined as "the complete removal of tree cover canopy at the Landsat pixel scale."[158] Therefore the data capture all types of tree cover loss, whether or not it meets the definition of deforestation and forest loss used in this report. For example, tree cover loss on natural forests, removal of trees within working tree plantations (e.g., oil palm), and loss of trees due to natural causes (e.g., fire) are all captured as forest cover loss under this algorithm. Thus these data are an imperfect measure of deforestation, and the WRI report authors use the terms "forest cover loss," "forest loss," "forest change," and "deforestation" in relation to data from Hansen et al. with this qualification in mind.

WRI analysis of forest cover loss and gain in the Amazon regions of Brazil and Colombia from 2000 to 2012 permits a simple comparison of forest cover change within community lands and outside of community lands in the Amazon biome. The analysis does not consider other types of land uses that would influence deforestation rates, such as protected areas or working plantations. Therefore, the analysis represents a simple comparison of the average forest cover loss and gain to supplement the literature review.

WRI performed a basic spatial analysis in a geographic information system (GIS) to estimate how much carbon is stored in community forests in the Amazon region of Brazil and Colombia. Using spatial carbon data from Saatchi et al.,[159] the authors compared carbon stored within legally recognized community forests with carbon stored outside of legally recognized community forests but within the Amazon biome. The Saatchi et al. data cover the global extent of the tropics, roughly between latitudes 20N and 20S, at a resolution of 1 kilometer. The dataset includes aboveground and belowground biomass carbon in metric tons (tonnes). This analysis is a simple estimate of the differences in total carbon storage and average carbon density between legally recognized community forest and other forests. As with the forest cover change analysis, the carbon analysis does not distinguish between different types of forest uses, such as commercial agroforestry plantations or government-protected conservation areas. This is a straightforward comparison that includes settlements and non-forest uses in the Amazon, and for Brazil it captures officially recognized Indigenous Lands and those undergoing the recognition process.

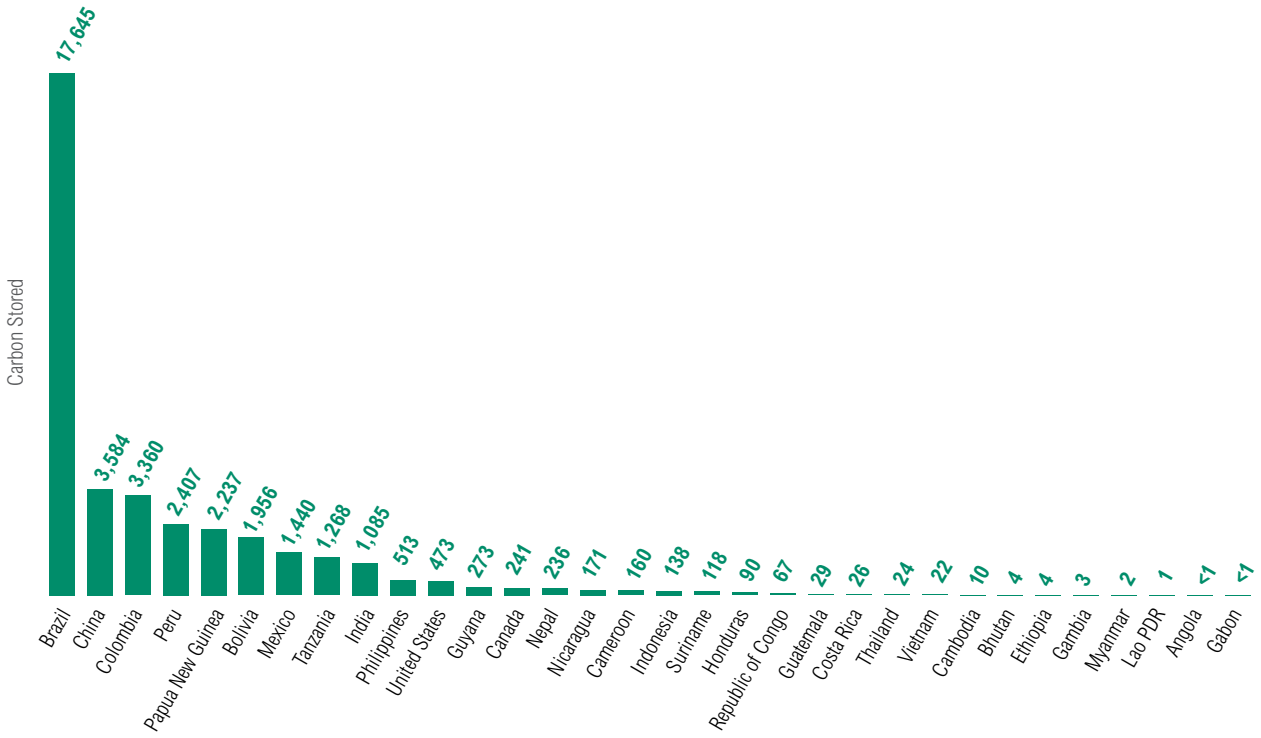
Taking the analysis one step further, WRI estimated how much carbon had been lost (and gained) due to forest cover change in Brazil and Colombia and then translated that estimate into CO_2 emissions. To perform this analysis, forest cover loss and gain data from Hansen et al. (representing the collective period of 2000 to 2012) was overlaid with the carbon stock data from Saatchi et al. (representing approximately the year 2000). Using GIS, the carbon stock data were "assigned" to the locations of forest loss and gain to create a proxy for the amount of carbon stored in the forests in 2000 that was subsequently lost (or potentially gained). Summing the resultant datasets to balance the carbon gains with carbon losses produced an estimate of carbon loss associated with forest cover change in the Amazon region of each country, which was used to estimate total CO_2 emissions and average CO_2 emissions per hectare.

APPENDIX B:
CARBON IN GOVERNMENT-RECOGNIZED COMMUNITY FORESTS

Figure B-1 presents national-level estimates of carbon stored within government-recognized community forest, totaling 37.7 billion tonnes. The carbon for each country was estimated by multiplying the total government-recognized community forest area (in hectares) with a national-level average carbon density value (tonnes per hectare). The forest tenure data are from the Rights and Resources Initiative, which compiled data for several countries in 2013,[160] and from the 2008 *Inventario Nacional Forestal for Nicaragua*[161] and from RAISG for Ecuador.[162] The carbon data are from the 2010 *Global Forest Resources Assessment* of the Food and Agriculture Organization (FAO) and represent carbon stock in living forest biomass.[163]

FAO carbon data for 2010 were used as a proxy for 2013, and 2012 and 2008 for Ecuador and Nicaragua, respectively, since carbon data were not available specifically for those years. Given that the forest tenure data and carbon data are not spatially explicit and represent national-level averages, the data in Figure B-1 should be interpreted as a very rough estimate of carbon stored in government-recognized community forests. Also note that these carbon estimates differ from those for Brazil and Colombia in Section IV because of the differing methodologies. The estimates in Section IV are based on spatially explicit data of community lands and carbon data from Saatchi et al.[164]

Figure B-1. | **Carbon in Government-Recognized Community Forests, 2013 (million tonnes)**



Source: Community forest data from RRI, 2014c. Community forest data for Ecuador and Nicaragua from, respectively, RAISG, 2012, and the Inventario Nacional Forestal, 2008.

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ENDNOTES

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2. RRI, 2014c.
3. Bluffstone et al., 2012.
4. Informe PRISMA, 2014.
5. Sizer et al., 2013.
6. Searchinger et al., 2013.
7. See http://www.epa.gov/climatechange/ghgemissions/gases.html.
8. Buizer et al., 2014, p. 2.
9. Pan et al., 2011.
10. Wily, 2011.
11. Scullion et al., 2014; Oxfam, 2014.
12. De Wit, 2012.
13. IPCC, 2014, WG3 Chapter 11, p. 55, and Chapter 15, p. 42 of 102.
14. Data on Overseas Development Assistance compiled by the Organisation for Economic Co-operation and Development, available at http://www.oecd.org/dac/stats/data.htm.
15. USAID, 2012.
16. Skutsch and Solis, 2011.
17. Ibid.
18. Chhatre and Agrawal, 2009.
19. Please see Appendix B for an explanation of how this calculation was made.
20. FAO, 2010. According to FAO, as of 2010 the total carbon stock in the aboveground and belowground biomass of Canada, Mexico, and the United States was 35.259 billion tonnes.
21. This comparison was made by multiplying 37.7 billion tonnes of carbon by 3.666 to determine its CO_2 equivalent of 138 billion tonnes. Equivalency to annual global car emissions was determined by the Greenhouse Gas Equivalencies Calculator, available at http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results.
22. Larson and Pulhin, 2012.
23. RRI, 2014a.
24. RRI, 2012b; Larson, 2012. Although alienation is a part of the bundle of rights, it is not included in our determination of the strength of community forest rights. This is because alienation has often contributed to the dispossession of communities.

25. Larson et al., 2010.
26. Blomley, 2013.
27. Hayes and Persha, 2010.
28. Persha et al., 2011.
29. Seymour et al., 2014.
30. Clerc, 2012; Resosudarmo et al., 2014.
31. Larson et al., 2008.
32. Barbier and Tesfaw, 2012.
33. Larson, 2011.
34. Community Forestry Association, 2013.
35. Oxfam, 2014.
36. De Wit and Stevens, 2014; Global Witness, 2013.
37. Seymour et al., 2014; Zulu et al., 2014.
38. Zulu et al., 2014.
39. RRI, 2014c.
40. FAO, 2010.
41. RRI, 2014c.
42. Naughton-Treves et al., 2013.
43. Nolte et al., 2013.
44. Ibid.
45. FAO, 2010; from most to least, the countries with the most forest carbon stock are Brazil, Russia, United States, Canada, and Indonesia, with approximately 13 billion tonnes.
46. FAOSTAT, available at http://faostat3.fao.org/faostat-gateway/go/to/browse/G2/GF/E. FAOSTAT defines emissions from land use in accordance with the IPCC to include CO_2 and other greenhouse gas emissions associated with forestland converted to other uses and other land management activities. http://faostat3.fao.org/faostat-download-js/PDF/EN/GL.pdf.
47. RRI, 2014c; Bock, 2012.
48. RRI, 2014c; AMAN, 2014.
49. AMAN, 2014.
50. Carlson et al., 2012.
51. Ibid.
52. Ibid.
53. IRIN News, 2014.
54. Ituarte-Lima et al., forthcoming.
55. Larson and Dahal, 2012; Pokorny and Johnson, 2008.
56. RRI, 2014c.
57. RAISG, 2012.
58. Paneque-Gálvez et al., 2013.
59. Ibid.
60. FAO, 2010; carbon stock in aboveground living biomass of Brazil's forests totaled 62.607 billion tonnes in 2010.
61. IDB, 2012.
62. FAOSTAT, available at http://faostat3.fao.org/faostat-download-js/PDF/EN/GL.pdf.
63. RAISG, 2012.
64. Davis, 2013 (references Brazilian Constitution, art. 231).
65. Nolte et al., 2013, p. 4957.
66. Nepstad et al., 2006, p. 69.
67. Ibid.
68. Ibid.
69. Saatchi et al., 2011.
70. Ricketts et al., 2010. The authors found: "Simulation models suggest that ILPAs established between 2003 and 2007 could prevent 272,000 km2 of deforestation through 2050, equal to 3.3 +-1.1 GtC, more than 1/3 of the world's annual CO2e emissions." To obtain 12 billion tonnes of CO_2 the conservative estimate of 3.3 GtC was converted to billions of tonnes and then multiplied by 3.666, the weight ratio of carbon to CO_2.
71. This equivalency was calculated by reference to WRI's Climate Data Explorer. Available at http://cait2.wri.org/profile/Latin%20America%20&%20the%20Caribbean#Country GHG Emissions.
72. Gómez and Méndez, 2005; Hughell and Butterfield, 2008.
73. The FSC 10 principles and 57 criteria can be found at https://us.fsc.org/mission-and-vision.187.htm.
74. Radachowsky and Ramos, 2012.
75. Nittler and Tschinkel, 2005.
76. Hughell and Butterfield, 2008.
77. RRI, 2014c; Cronkleton et al., 2011; Charnley and Poe, 2007.
78. Barismantov and Antezana, 2012.
79. Corbera et al., 2011.
80. Fonseca, undated.
81. Klooster, 2011.

82. Bray, 2010 (Table 1).

83. Durán-Medina et al., 2005.

84. Bray, 2010.

85. Ellis and Porter-Bolland, 2008.

86. Barsimantov and Antezana, 2012.

87. DiGiano et al., 2013.

88. Klooster and Masera, 2000.

89. Ojha et al., 2009.

90. USAID, 2013, Annex 3.1; Luintel et al., 2009.

91. Anup et al., 2013.

92. Nagendra, 2010; Pokharel, 2012.

93. Zulu et al., 2014.

94. USAID, 2013.

95. Ibid.

96. Nagendra and Gokhale, 2008.

97. Magrath et al., 2013.

98. Luintel et al., 2009.

99. Ibid.

100. Ibid.

101. Skutsch, 2011.

102. Nagendra et al., 2008.

103. Carbon storage per tree is extrapolated from Trees of Hope project's allometric equations for Faidherbia albida, cited in Whalen, 2012. Estimated average density of 40 trees/hectare across 5 million hectares based on consultation with Tony Rinaudo, Natural Resources Advisor at World Vision, and on surveys by G. Tappan, United States Geological Survey (USGS). Field surveys by USGS in 2005–06 estimated 12.6 tonnes of aboveground woody biomass/hectare in regenerated agroforestry formations.With a conversion factor of 0.45, this amounts to 5.67 tonnes of carbon per hectare. G. Tappan, private communication, June 4, 2014.

104. Surveys by ICRAF and others (Pye-Smith, 2013) indicate that the value of wood, fodder, fruit, pods, leaves, and other tree products amounts to approximately US$1,000 per household per year. The estimated value of firewood alone amounts to about US$250 per household, while benefiting women by reducing the distance travel and time required to harvest firewood. Approximately 4.5 million people live in the areas where FMNR has been scaled up; with an average household size of five persons, this equals 900,000 households (Reij, 2006, cited in Sendzimir et al., 2011).

105. Large areas of natural forests and woodlands were set aside as government-owned and -managed national forests and forest reserves. Local communities sometimes retained limited usufruct rights in these forest reserves, but they were largely excluded from the management except in the case of donor-funded participatory forest management projects.

106. Sendzimir et al., 2011.

107. Reij et al., 2009.

108. Stickler, 2012.

109. Pye-Smith, 2013.

110. USAID, 2013. Annex 3.2.

111. WRI, 2008.

112. Zulu et al., 2013 (citing Blomley et al., 2008).

113. Blomley, 2008.

114. Veit et al., 2012.

115. Ibid.

116. Tanzania Ministry of National Resources and Tourism, 2006.

117. RRI, 2014c.

118. RRI, 2012a.

119. Blomley et al., 2008.

120. Taylor, 2006.

121. Armenteras, 2009.

122. Ibid.; Ruiz and Kallis, 2013.

123. RAISG, 2012; Porter-Balland et al., 2012.

124. USAID, 2011.

125. Holland et al., 2014; Stocks et al., 2012.

126. Holland et al., 2014.

127. Ibid.

128. Ibid.

129. Ibid.

130. Ibid.

131. RRI, 2014c.

132. Ibid.

133. Filer, 2011.

134. Greenpeace, 2012.

135. Filer, 2011.

136. Filer, 2012; Greenpeace, 2012.

137. Garret, 2014.

138. Oliviera et al., 2007.

139. Ibid.

140. RAISG, 2012.

141. Ibid.

142. Oxfam, 2014.

143. Scullion et al., 2014.

144. Ibid.

145. Forest Trends, 2013.

146. Fortín et al., 2010.

147. Ibid.

148. Forest Trends, 2013.

149. USAID, undated.

150. Larson, 2011.

151. Larson and Lewis-Mendoza, 2012.

152. Hayes, 2007.

153. Stocks, 2007.

154. Ibid.

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157. Hansen et al., 2013. Data available at http://earthenginepartners.appspot.com/science-2013-global-forest.

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159. Saatchi et al., 2011.

160. RRI, 2014c.

161. Inventario Nacional Forestal, 2008.

162. RAISG, 2012.

163. FAO, 2010.

164. Saatchi et al. 2011.

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ABOUT WRI

WRI is a global research organization that works closely with leaders to turn big ideas into action to sustain a healthy environment—the foundation of economic opportunity and human well-being.

Our Challenge
Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

Our Vision
We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of government, business, and communities combine to eliminate poverty and sustain the natural environment for all people.

ABOUT THE RIGHTS AND RESOURCES INITIATIVE (RRI)

RRI is a global coalition of 14 Partners and over 140 international, regional and community organizations advancing forest tenure, policy and market reforms. RRI leverages the strategic collaboration and investment of its Partners and Collaborators around the world by working together on research, advocacy, and convening strategic actors to catalyze change on the ground. RRI is coordinated by the Rights and Resources Group, a non-profit organization based in Washington, DC.

For more information, please visit www.rightsandresources.org.

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