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Climate Change and International Deforestation: Legislative Analysis

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Summary

Deforestation accounts for nearly 20% of anthropogenic greenhouse gas emissions in the world. Deforestation results in carbon emissions when trees and underlying vegetation are burning or decomposing. Deforested areas that are later cultivated also release carbon to the atmosphere when soil carbon is oxidized. Further, deforested areas converted to other land uses (e.g., pastures) might sequester less carbon than forests, enabling greater levels of CO_2 in the atmosphere. Providing incentives to prevent deforestation in foreign countries has been proposed in climate change legislation. An objective of this legislation is to provide funding from carbon markets to assist foreign countries in reducing deforestation and increasing forest restoration and afforestation. Challenges to this approach include implementing deforestation reduction activities in developing countries that may lack the capacity to monitor and enforce measures, avoiding harm to indigenous communities who rely on forest resources, and matching policies with the various drivers of deforestation in different regions around the world. Legislative policies on deforestation and climate change are analyzed in this report, and challenges for restoring forests in the tropics are discussed.

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Deforestation[1] is responsible for the largest share of additional carbon dioxide (CO_2) released to the atmosphere due to land use changes, approximately 20% of total anthropogenic greenhouse gas (GHG) emissions annually.[2] Deforestation results in carbon emissions when trees and underlying vegetation are burning or decomposing. Deforested areas that are later cultivated also release carbon to the atmosphere when soil carbon is oxidized. Further, deforested areas converted to other land uses (e.g., pastures) might sequester less carbon than forests, enabling greater levels of CO_2 in the atmosphere. Forests store approximately 45% of terrestrial carbon, and in the 1990s were estimated to remove 2.6 billion tons of carbon ($mtCO_2$) from the atmosphere per year; this sequestered amount is equivalent to approximately 33% of anthropogenic carbon emissions from fossil fuel and land use changes.[3] Data on carbon sequestration and emissions are not available for many regions, making global estimates uncertain.

Much of the deforestation responsible for CO_2 releases occurs in tropical regions, specifically in developing countries such as Brazil, Indonesia, and the Democratic Republic of the Congo. Tropical forests store approximately 25% of the total global terrestrial carbon. Scientists estimate that tropical deforestation and other land use changes may have been responsible for releasing approximately 1.5 billion metric tons of CO_2 per year to the atmosphere during the 1990s, and may be contributing similar amounts of carbon to the atmosphere today.[4] Some contend that deforestation due to logging might result in small carbon emissions because timber converted into products will not release CO_2 immediately. Others disagree, stating that the percentage of wood transformed into wood products is probably small in tropical and temperate regions.

Deforestation rates vary across the world, yet are generally higher in tropical regions (see **Figure 1**). By continent, the highest rate of net forest loss is in South America, which lost approximately 4.3 million hectares (ha) of its forest (0.5%) annually from 2000 to 2005. This is followed by Africa, which lost approximately 4.0 million ha (0.6%) of its forest annually during the same period. North America (including Central America), in contrast, lost approximately 333,000 ha (0.05%) annually from 2000-2005; and in China, there was a reported gain of 4.1 million ha of forest annually (2.2%) during the same period, primarily due to large-scale afforestation efforts.[5]

[1] Deforestation is the conversion of forests to pasture, cropland, urban areas, or other landscapes that have few or no trees. Afforestation is planting trees on lands that have not grown trees in recent years, such as abandoned cropland.

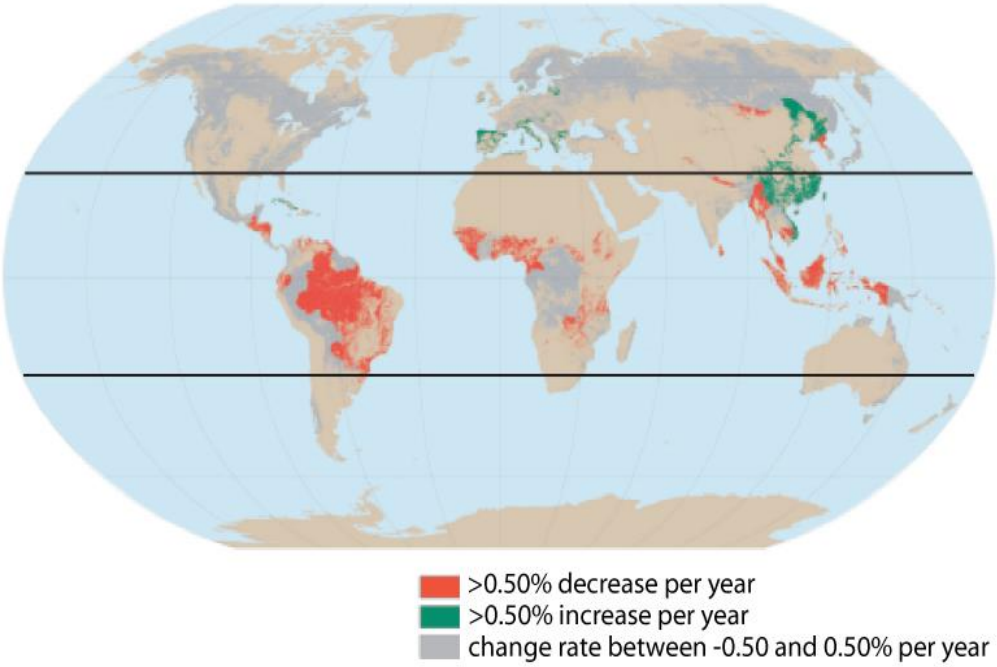
[2] Intergovernmental Panel on Climate Change, "Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change," *Climate Change 2007: The Physical Science Basis* (2007). Available at http://ipcc-wg1.ucar.edu/wg1/wg1-report.html. (Hereafter referred to as 2007 IPCC WG I Report.)

[3] Gordon B. Bonan, "Forests and Climate Change: Forcings, Feedbacks, and the Climate Benefits of Forests," *Science*, v. 320 (2008): 1444-1449.

[4] 2007 IPCC WG I Report, Table 7.1, p. 517.

[5] *Global Forest Resources Assessment 2005*. (Rome, Italy: FAO, 2006), Global Tables, at http://www.fao.org/forestry/fra2005/en/.

Figure 1. Global Change in Forest Cover, 2000-2005



Source: The U.N. Food and Agriculture Organization, *Global Forests Resources Assessment* (Rome, Italy: 2006), 320 pp.

Note: Dark lines represent the Tropics of Cancer and Capricorn.

International Deforestation in Climate Change Legislation

The role of forests in the carbon cycle and the extent of deforestation and its impact on GHG emissions are primary reasons deforestation is addressed in climate change legislation. Many experts contend that protecting forests or preventing deforestation may be less expensive than other technologies to reduce CO_2 emissions, and provide other environmental and socioeconomic benefits such as preserving biodiversity. Others contend that increasing carbon sequestration through restoration and preventing deforestation, though compelling in theory, might be challenging and more expensive in practice.

Bills that address deforestation propose in their findings that international deforestation is a major contributor to GHG emissions, and that foreign countries with forests have a role in preventing deforestation and engaging in restoration and afforestation activities. Some argue that congressional intent to address deforestation is misplaced with funding initiatives to prevent deforestation in foreign countries. They question the ability of some foreign countries to implement and monitor forest restoration and preservation programs, and the potential value to the United States of implementing these programs. Further, they argue that funds should be focused on domestic efforts to address forest restoration and carbon sequestration technologies.

This CRS legislative analysis covers key issues and policies addressed by three selected climate change bills introduced in the 110th Congress that include international deforestation: S. 3036, H.R. 6186, and H.R. 6316.

Objectives and Definitions

These bills would address deforestation and climate change by authorizing funding to eligible foreign countries to reduce deforestation, increase forest restoration and afforestation, and improve forest management. Forest carbon activities (or deforestation reduction activities) would be supported by programs proposed in the legislation. The definitions of forest carbon activities are specific, and include:

- activities directed at reducing GHG emissions from deforestation and forest degradation;
- activities that increase sequestration through restoration of forests and degraded land that has not been forested prior to restoration; and
- increasing sequestration through afforestation and improved forest management.

Restoring recently deforested tracts is not an eligible forest carbon activity under these bills. The intent to exclude this activity might be to dissuade countries from deforesting new areas with the expectation of financial assistance for restoration afterwards. For example, it has been argued by some that countries could receive the economic benefits from selling tropical timber in the international market, and then potentially receive international assistance to replant without requiring countries to assume the economic costs of preventing deforestation. This would subsidize tropical timber production with perverse effects in both trade and GHG emissions. However, some argue that excluding recently forested areas from the program might neglect the potential for restoration in large areas of tropical and temperate forests. Indeed, some may contend that previously forested land might offer the best ecological conditions for successful restoration. For example, in tropical forests, where soils are fragile, several studies report that reforestation is most successful soon after deforestation, and sometimes is least successful when lands have been used for grazing, agriculture, or other human-related activities for several years.[6]

Eligibility for Assistance

Most deforestation and net forest carbon emissions occur in developing countries. Some of these countries have little capacity to undertake forest carbon activities and effectively monitor and measure results. All three bills acknowledge this possibility and authorize a set of eligibility requirements for countries that could participate in their programs. Countries eligible for receiving financial assistance under forest carbon programs roughly fall into two categories:

- Category I—countries with a demonstrated capacity to monitor and measure carbon stocks; capped GHGs; a GHG reduction program or an emission reduction plan for the forest sector; and data on natural forest carbon stocks; and
- Category II—countries that need assistance to achieve the eligibility requirements of Category I. (These would be countries that have demonstrated a commitment to conduct preparatory activities to build their capacity to engage in deforestation or forest degradation activities, or need to develop the capacity to measure and monitor forest carbon changes.)

H.R. 6186 and H.R. 6316 distinguish these two categories and would provide funding for both categories; S. 3036 includes only countries under the first category as eligible.

[6] For example, see Robin Chazdon, "Tropical Forest Recovery: Legacies of Human Impact and Natural Disturbances," *Perspectives in Plant Ecology, Evolution, and Systematics*, vol. 6, no. 1-2 (2003): 51-72.

Authorization for Funding

Allocation for funding countries under each category varies among the bills. For international forest activities, countries under the first category would receive all funds provided by S. 3036, at least 60% of the funds provided by H.R. 6186, and up to 50% of the funds provided by H.R. 6316. The percentages of funding for countries in each of the two categories does not change over time, yet presumably the intent of the policy is to assist countries in Category II to reach Category I status.

Standards for Forest Carbon Activities

Some policies support standards for forest carbon activities. All three bills provide for the Administrator of the U.S. Environmental Protection Agency (EPA), along with other agency heads, to develop standards for forest carbon activities. These standards include implementing activities according to widely accepted sustainable environmental practices, promoting native species and ecosystems, promoting fair compensation, and involving public and indigenous participation and consent. These standards address, in part, potential negative collateral effects of forest restoration and afforestation activities (e.g., unfair treatment of indigenous people who use forest resources, and the introduction of non-native species). The bills also require that forest carbon activities be "real, permanent, additional, verifiable, and enforceable, with reliable measuring and monitoring." (See **Table 1** for definitions; also see CRS Report RL34560, *Forest Carbon Markets: Potential and Drawbacks*, by Ross W. Gorte and Jonathan L. Ramseur.)

Existing Programs

Some contend that deforestation and climate change legislation should integrate forest carbon activities with existing federal programs. This would provide established infrastructure for programs, offer a framework for implementation and monitoring, and avoid duplication with other initiatives. Others counter by suggesting that existing programs are not broad enough to address all forest types and all potentially eligible countries with forests. None of the bills attempts to integrate forest carbon activities with existing U.S. international forestry programs.

Table 1. Definitions of Terms Related to Forest Carbon Activities

Term	Definition
Real	A requirement that a forest carbon activity must be *real* means that the activity must actually occur and must sequester a quantifiable amount of carbon.
Permanent	*Permanent* is a requirement that a forest carbon activity achieve reductions in emissions or sequestration that last permanently. This addresses concerns that forestry-related projects might be halted or reversed by a range of factors related to human activities or natural causes (e.g., disease, forest fires, and decomposition). Some contend that true permanence is difficult to achieve with forest projects and that alternative approaches might be necessary.
Additional	*Additional* is used to define carbon sequestration in addition to that realized under business-as-usual activities. The purpose of additionality is to assure new carbon sequestration activities that otherwise would not have occurred, rather than providing payment for activities that would have happened anyway.
Verifiable	*Verifiable* carbon sequestration implies that sequestration must be real and measurable. Techniques for measuring and monitoring include the use of satellite imagery and remote sensing to quantify forest cover, and on-the-ground measurements to confirm carbon stocks in forests.
Enforceable	*Enforceable* means that GHG reduction and carbon sequestration activities can be enforced by authorities or through contracts. Enforcement can be accomplished through a contract, such as an

Term	Definition
	easement to require continued forest cover, or through the creation of federal laws that create enforcement authorities. This would depend on the quality and stability of a country's legal system.

Source: Definitions derived by CRS from terms used in S. 3036, H.R. 6186, and H.R. 6316.

The U.S. government is involved in several international programs that address forest degradation and deforestation. Particular programs include the International Tropical Timber Organization, the Tropical Forest Conservation Act, and two regional U.S. initiatives. The International Tropical Timber Organization (ITTO) was founded in 1986 because of concerns over tropical deforestation.[7] The organization has 60 members (including the United States)[8] that together have about 80% of the world's tropical forests and conduct 90% of the global tropical timber trade. ITTO promotes sustainable forest management and forest conservation strategies, and assists tropical member countries to adopt such strategies in timber harvesting projects.

The Tropical Forest Conservation Act (TFCA; P.L. 105-214; 22 U.S.C. §2431) authorizes debt-for-nature transactions, where developing country debt is exchanged for local funds to conserve tropical forests. Conservation funds (in local currency) from these transactions are deposited in a tropical forest fund for each country. Interest earned from this principal balance and the principal itself is usually given in the form of grants for tropical forest conservation projects. Eligible conservation projects include (1) establishing, maintaining, and restoring forest parks and protected reserves; (2) training to increase the capacity of personnel to manage reserves; (3) developing and supporting communities near or within tropical forests; (4) developing sustainable ecosystem and land management systems; and (5) identifying the medicinal uses of tropical forest plants and their products. To date, 12 countries have participated in this program, establishing 13 agreements that will reduce at least $20.0 million from the face value of their debts to the United States and generate $162.5 million in local currency in the next 12-26 years for tropical forest conservation projects.

The United States has two regional initiatives that involve restoring and conserving tropical forests. The Amazon Basin Conservation Initiative and the Congo Basin Forest Partnership are both managed by the U.S. Agency for International Development.[9] The Amazon Initiative aims to conserve biodiversity managed by indigenous and traditional groups and promote regional cooperation for sharing knowledge and improving governance to help conserve resources in the Amazon Basin. These objectives include maintaining forest cover and maximizing use of non-timber forest products (e.g., fruits and nuts). The Congo Partnership is a similar initiative, but focuses specifically on projects supporting a network of managed protected areas, improving forest governance, and developing sustainable management practices for resource use in the Congo Basin. The U.S. Agency for International Development and the U.S. Department of Agriculture have a number of additional, related programs and activities.

Challenges for Implementing Proposed Legislation

Implementing forest protection programs in the tropics can be challenging for several reasons. Some assert that the causes of deforestation vary in different regions and that a "one size fits all"

[7] For more information, see http://219.127.136.74/live/PageDisplayHandler?pageId=225.

[8] The United States provides approximately $1.0 million annually to the ITTO.

[9] The Amazon Initiative is a five-year, $50 million program, and the Congo Initiative is a four-year, $53 million program.

approach to reduce deforestation might not be successful.[10] For example, deforestation in the Amazon Basin is driven, in part, by livestock and soybean production, which leads to the conversion of forests to pastures and farms.[11] In contrast, in parts of Central Africa, deforestation is driven, in part, by fuelwood extraction and charcoal production. Policies that are flexible and address diverse economic, social, and cultural influences are expected to be most successful, according to some.[12]

Observers also contend that deforestation programs will require consistent and effective monitoring and measuring systems that quantify changes in forest cover and provide accurate accounting of forest carbon stocks.[13] For example, some contend that the coverage and quality of satellite imagery in tropical countries is inadequate to estimate forest cover and rates of deforestation on small scales. Some also suggest that consistent and tested methods for establishing baseline and historical changes in forest cover and carbon stocks need to be implemented in any global plan to address deforestation.[14] In some developing countries, monitoring and enforcement capacity may be lacking. Some contend that funding should be first directed at improving infrastructure and the capacity to measure carbon stocks, monitor emissions and land use, and enforce forest carbon activities.

Enforcement obligations to prevent deforestation might be a challenge in developing countries. If a multilateral program is implemented, with individual countries responsible for enforcing and monitoring forest cover obligations, problems related to corruption, weak governance, and inconsistent enforcement may hinder the program. There are few, if any, models for an international entity to successfully enforce natural resource laws or policies in other countries.[15]

Some argue that programs to reduce deforestation should cause minimal disruptions to rural livelihoods. Some rural people in tropical countries depend on forest resources for subsistence and economic gain. Forest uses include fuel wood, charcoal, wild game, fruit, and timber. Strict forest protection programs may affect subsistence use of forest products and cause significant economic harm to rural and indigenous peoples who depend on forests. Some examples demonstrate success where local populations benefit directly and there are incentives to enforce forest protection.

[10] Markku Kanninen et al., *Do Trees Grow on Money? The Implications of Deforestation Research for Policies to Promote REDD* (Bogor, Indonesia: Center for International Forestry Research [CIFOR]: 2007), 61 pp. Hereafter referred to as *Implications of Deforestation*.

[11] William Laurance et al., "Deforestation in Amazonia," *Science*, vol. 304 (2004): 1109-1111.

[12] For example, addressing corporate drivers of deforestation is supported by Rhett Bulter and William Laurance, "New Strategies for Conserving Tropical Forests," *Trends in Ecology and Evolution*, article in press (2008).

[13] *Implications of Deforestation*.

[14] Ibid.

[15] The Convention on the International Trade of Endangered Species of Wild Flora and Fauna (CITES) attempts to monitor the implementation of the Convention through a centralized office. However, each country is responsible for implementing and enforcing the provisions of the treaty individually.

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