policy brief

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*International Forest Carbon and the Climate Change Challenge Series – Brief No. 3**

Responding to Concerns and Questions

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Efforts to include emissions from deforestation and forest degradation in climate policy have gained considerable traction in recent years in the United States and abroad. With mounting evidence that atmospheric CO_2 concentrations cannot be stabilized at a prudent level without addressing emissions from the forest sector, policymakers are actively seeking ways to integrate international forest carbon into existing and emerging greenhouse gas compliance regimes. This brief addresses common criticisms and outstanding questions regarding the inclusion of forest carbon in climate policy.

1. Flooding the market

The Concern: *Forest carbon could "flood" the carbon market, dampening the price signal to develop and deploy clean energy technologies in other sectors.*

The Response: This concern is consistent with the use of markets which are intended to increase flexibility for compliance thus reducing overall costs of compliance. However, inclusion of forest carbon need not cause "flooding" or diversion of effort from other sectors. Instead it can be used to achieve a higher level of climate protection (increasing demand) for the same cost as a policy without forest carbon (by using the supply of low-cost forest carbon). Models show that we can move from climate stabilization at 550 parts per million (ppm) carbon dioxide equivalent (CO_2e) to stabilization at a lower target of 520 ppm CO_2e without increasing costs if forest carbon is included (see companion report by Murray et al.).[1]

Flooding occurs if the supply of inexpensive forest carbon credits is too high relative to the total demand for credits, and is dependent upon several factors:

► How many emissions from avoided deforestation can actually be achieved and credited (the supply) depends on the total costs of achieving the reductions (opportunity, transaction, and institutional costs) and which countries participate and under what crediting conditions. Current policy discussions indicate requirements for national-level accounting of forest carbon to help address concerns over additionality and national-level leakage. This will require new national capacity to measure, monitor, and manage forest carbon. It will take some time for many countries to develop national programs and begin producing large supplies of forest carbon credits. Given that Brazil and Indonesia dominate forest emissions, their ability and desire to produce credits will be critical to determining early supply. Many expect a stepwise growth in supply as forest carbon moves from early phases as a project-based approach to a national approach that can implement and credit impacts of new national policies.[2] There are institutional and cultural barriers that are likely to slow the development of forest carbon supply in many tropical forest countries.

► How many credits will be needed by capped countries (the demand) depends on how tight the caps are in these countries, how many countries allow forest credits as part of their compliance strategy, and the costs of other mitigation alternatives. Under stricter targets, there will be greater demand for forest carbon credits and for more reductions from other sectors. The U.S. is currently negotiating its national targets, the EU is slowly increasing its targets, and the new United Nations Framework Convention on Climate Change (UNFCCC) agreements are likely to push new more

* Each brief in this series corresponds to a chapter in the Nicholas Institute's report on forest carbon, titled *International Forest Carbon and the Climate Change Challenge: Issues and Options*. The full report, and each brief in the series, can be found at http://www.nicholas.duke.edu/institute.

stringent targets for all signatories, but the details are still up in the air. The ability of countries to meet strict targets called for by the science have been somewhat softened by the economic downturn. It is also unclear what countries are willing to trade forest carbon in a market. The U.S. is considering doing so while other countries are waiting on the outcome of UNFCCC negotiations. Demand is likely to increase over time as countries join the market and country targets increase in stringency.

► Rules that discount forest credits and other international offsets would lower the price of credits received by the sellers. Policy under consideration in the U.S. would discount the use of international offsets including forest carbon 20% after 5 years, which means buyers are willing to pay less for each credit generated.[3]

► Rules that restrict the use of forest credits and other mitigation options would reduce demand, potentially reducing the price of credits if there is abundant supply (if the restriction is binding). Policy under consideration in the U.S. would limit the use of international and domestic offsets including forest carbon in the compliance market.[4]

► The availability of an option for "banking" excess emission reductions to use for future obligations can raise current demand for credits lowering the potential for flooding driven by price reductions. Banking is part of current U.S. policy discussions and is likely to remain.

2. Sending U.S. dollars abroad

The Concern: *International forest carbon provisions in U.S. legislation will result in wealth transfers to foreign governments with little or poor track records in spending money wisely.*

The Response: The United States and the UNFCCC are both considering a system that provides payment after performance is demonstrated and is based on appropriate quality criteria and standards. This will significantly reduce the risk of sending money to governments with little or no guarantee of success. International forest carbon policy is designed for developed countries such as the U.S. to pay for reduced emissions or increased sequestration in developing countries, thus a transfer of funds is the intent. However, such a system can also generate low-cost mitigation opportunities for U.S. entities, thereby reducing the overall cost of compliance in the U.S., which ultimately benefits U.S. consumers. The recent EPA analysis of the Waxman cap-and-trade policy found that eliminating the use of international offsets (of which forests are a significant part) would nearly double the price of allowances and energy price impacts.[5]

3. Increased food prices

The Concern: *If programs to reduce deforestation take land out of food production or increase the price of expanding production into new lands, food prices will rise, burdening the poor in both developing and developed countries.*[6]

The Response: The objective of international forest carbon programs is to reduce deforestation by reducing the pressure to clear forests for activities such as agriculture. If successful, forest carbon policies and programs could reduce agricultural expansion, lowering food production and supply which could result in higher prices. But these policies could also lead to greater efficiency in agriculture production, which might lower prices. Intensification of agriculture in developed countries over the last few decades has allowed higher productivity on less land area.[7] While non-CO_2 GHGs can increase under intensive production,[8] this rarely exceeds the carbon emissions from the clearing of land. It is possible for rural farmers to both produce food and reduce carbon emissions/increase carbon sequestration. For example, sustainable agroforestry practices (where agricultural systems are incorporated into existing forests or enhanced by planting native trees) store significant amounts of carbon.[9]

Both consumers and producers of food could feel the impacts of higher food prices. Imported foods account for much of the food consumed in the U.S. and other developed countries and may account for a substantial

How do forests affect climate change?

Forests are the most significant terrestrial carbon reservoir, containing 77% of all carbon stored in vegetation and storing roughly twice as much carbon as the atmosphere. Forests also constantly cycle carbon: photosynthesis turns atmospheric carbon into biomass and sugars, while respiration burns up some of these sugars, returning carbon back to the atmosphere. Globally, forests are a net sink, meaning that they absorb more carbon out of the atmosphere than they emit. However, of the 2.6 billion tons of carbon that forests annually absorb, 60% (or 1.6 billion tons) is emitted back into the atmosphere by deforestation.

Deforestation leads directly to carbon emissions in the same manner as a coal-fired power plant or any other emissions source. Further, if forests are converted to nonforest land uses, the new land cover will absorb less carbon from the atmosphere. Even if forests are allowed to regenerate after clearing occurs, it will take decades to rebuild the carbon once stored in the original forest, and the loss of biodiversity and indigenous forest cultures is irreversible.

proportion of healthy produce consumed by urban communities globally. U.S. legislative climate proposals have addressed these likely increases in energy and food prices by providing financial assistance to low-income households.[10]

Agricultural producers in both developed and developing countries could see higher profits, although small-scale producers in developing countries may have difficulty moving to more intensive agricultural techniques without assistance. It can be expensive to set up, requiring new infrastructure and inputs like fertilizer that are not easily accessible.[11] Thus complementary policies may be helpful. If the U.S. allows domestic offsets from the agriculture and forestry sectors, it may also increase land and food prices.[12] Thus policies to address the costs of food are important in both developed and developing countries.

4. Reduced deforestation and biofuels policies are at cross purposes

The Concern: *Reduced deforestation efforts and policies promoting biofuels may function at cross purposes. Biofuels—those produced from oil palm, soybeans, sugar cane, corn, and other crops—have been proposed as a low-carbon alternative to conventional fossil fuels. While some promote biofuels as a clean-energy alternative and a source of revenue for tropical countries, others argue that they do more harm than good because carbon-rich tropical forests are cleared in order to produce biofuel crops.*

The Response: Biofuels do have potential as an alternative to fossil fuels, but they also require significant amounts of land for crop production. Between 1980 and 2000, more than half of the land that was cleared for biofuel crops came from intact tropical forest.[13] In Indonesia, global demand for biofuels is contributing to the explosion of oil palm plantations on peat and forest lands; in Brazil, biofuel demand is leading to increased soy production in savannas and forests.[14] There is some evidence that U.S. corn subsidies are leading to increased soy production and forest clearing in the Amazon.[15] Given global subsidies for biofuels around $15 billion per year and evidence that biofuel demand is inducing tropical deforestation, such subsidies could be at cross purposes with new international forest carbon programs designed to generate billions of dollars per year to reduce deforestation.[16]

The extent to which biofuels offer a "clean" alternative to fossil fuels depends on where they are grown and how much carbon was stored in the landscape before it was converted to biofuel crops. In the tropics, forests are the most carbon-rich land use. As a result, clearing forests to cultivate biofuel crops leads to net carbon emissions, worsening the climate crisis.[17] Even when you account for the carbon that the biofuel crop absorbs from the atmosphere, it will take decades to centuries to re-absorb all of the carbon that was released by the initial pulse of emissions into the atmosphere caused by the forest conversion. A recent study found that if peat forests in Southeast Asia are converted to oil palm plantations, it will take more than 900 years for the plantation forest to reabsorb the carbon released when the peat forest was cleared.[18]

Biofuels need not result in net carbon emissions, however. *First-generation* biofuels are produced from such food crops as soy, corn, and oil palm that have fertility requirements, which lead to their establishment on recently-cleared forest lands. *Second-generation* biofuels, such as switchgrass, can be grown on marginal lands and thus may not create as many incentives for forest clearing as first-generation biofuels.[19] When biofuel crops are grown on already degraded land, they can almost immediately begin to increase the carbon stored in the landscape. International forest carbon policies can create incentives to establish biofuel crops on degraded lands instead of forests, and thus can help ensure that biofuel is produced in a manner that benefits the climate. While marginal lands are estimated to cover an area greater than the size of India, more than half of which is in the tropics, the expectation that marginal lands can meet our biofuel needs may need to be tempered by an understanding of the multiple roles these lands are expected to play (sequestration, pasture) and their ecological limits (often lower productivity sites).[20]

Terminology

Policy discussions about forest carbon principally refer to deforestation and degradation, the two processes under which forest carbon stocks can be emitted to the atmosphere. The other main components are conservation—which maintains forest carbon stocks—and afforestation, reforestation, and forest management—which can build carbon stocks by removing CO_2 from the atmosphere. The international community is actively working to develop policy mechanisms that will incorporate tropical forests into a post-2012 climate regime. The current terminology in that process uses the phrase ***reduced emissions from deforestation and forest degradation*** or ***REDD***. Negotiations are under way regarding whether REDD will include other forest sector and land-use activities such as those mentioned above. When not referring specifically to the international negotiations, we will use the broader terms ***international forest carbon*** and ***forest carbon*** in this brief.

5. Rewarding bad actors

The Concern: *International forest carbon policies reward countries that are losing forests, not those that have been good stewards. Policies that focus exclusively on reducing deforestation rates do little to help developing countries with low rates of deforestation that would also likely be subject to increasing pressures from logging and agriculture as these sectors are turned away from other countries.*

The Response: This is generally considered a fair critique. At their core, the UNFCCC, the Kyoto Protocol, and the cap-and-trade policies proposed for the U.S. are based on changing behavior to reduce emissions and increase sequestration. This inherently means incentivizing changes in heavy-emitting countries or economic sectors. In practice this means rewarding countries or sectors that successfully reduce emissions. For many tropical forest countries (Brazil, Indonesia, and others), most of their emissions come from deforestation. Focusing on changing behavior (from heavy-emitting to lower-emitting) is an essential element of a market-based approach. Several countries are proposing compensation for simply maintaining forest cover. These proposals would essentially provide financial help to countries that maintain low (or no) rates of deforestation. Diplomatically, these concepts have some traction, but not as much as focusing on emission reductions. One way to combine incentives for both high-deforesting and low-deforesting countries is to look beyond historic rates of deforestation at projected deforestation rates. Such an approach introduces potentially more subjectivity into baselines but would provide some incentives for high-forest-cover countries to remain that way (see Chapter 4 of full report).

6. Penalizing countries for factors beyond their control

The Concern: *REDD could unfairly penalize countries that experience degradation or deforestation due to factors beyond their control (e.g., increased pest outbreaks and fire incidence due to climate change or other factors).*

The Response: This concern ultimately is one of permanence and liability in the event that forest carbon is conserved using carbon finance and later emitted. For instance, say a country voluntarily agrees to reduce its deforestation and associated emissions to receive forest carbon financing. What happens if in the future, factors cause those forests to die off or degrade? Future stresses on forests in developed and developing countries include many uncertainties (e.g., fire, climate change-induced diebacks, pest outbreaks). Would the developing country be responsible for replacing the potentially costly forest carbon credit?

Policymakers have a variety of market-tested financial tools for addressing permanence and liability for forest carbon. These tools, many which are in use in the voluntary carbon sector, include insurance, pooling credits, and buffering systems (see Chapter 4 of full report). These policy options usually add some upfront costs (or lower income from credits) but provide ways to effectively deal with liability and permanence in the event of future deforestation. It is worth noting that preventing deforestation, like preventing fossil fuel emissions, immediately helps to lower future climate-change-induced stresses on forests.

7. Restricts economic development inequitably

The Concern: *International forest carbon policies ask developing countries to constrict their development in order to offset the consequences of developed countries' emissions. International forest carbon policies and programs may be at odds with economic development (agriculture and timber production or major infrastructure) and constrain the sovereignty of tropical forest nations to make domestic land-use decisions. Developing countries want to maintain flexibility in land-use strategies and priorities to take advantage of changing markets just as developed countries did in the past.*[21]

The Response: This concern is addressed in both the international agreements and U.S. policy proposals. The framework for the roles of developed and developing countries traces back to the 1992 Earth Summit and the concept of "common but differentiated responsibility." In practice, this has meant wealthy countries were supposed to take the lead in emission reductions while offering incentives to developing countries to also reduce emissions. Developing countries thus are not committing to a restricted development in any way; they will only participate and agree to stem deforestation voluntarily. Developing countries will choose for themselves whether the incentives from developed countries through a forest carbon mechanism outweigh the costs of reigning in deforestation. It is important to recognize that almost every price signal in developing countries is in favor of cutting trees and doing something else with land. Thus, efforts to value the forest carbon in developing countries are in fact another development alternative. Developing counties already weigh various and often competing price signals, for example, by making long-term land-use commitments for timber concessions and oil palm permits—commitments that often have decades-long ramifications.

8. Restricts community access to forests

The Concern: *International forest carbon activities could negatively impact indigenous and other forest-dependent people by restricting their access to forests and associated benefits. Forest communities often lack clear rights to the forests in which they live and upon which they depend. If forest carbon policies result in significant value for governments or private developers to control forest management, forest-dependent people could suffer. Government or private entities could claim the forest and carbon rights and receive all of the benefits. New laws or projects put in place to conserve forests could limit local community use of forests. Rules could stop small-scale agriculture, the gathering of fuelwood or nontimber forest products, and perhaps even force resettlement of some communities. Exploitative carbon contracts that lead forest communities and people to unknowingly accept terms that sign away land-use rights, assume liability, or undervalue opportunity costs has also been cited as a risk.*[22]

The Response: An estimated 1.6 billion people depend on forests for various aspects of their livelihoods. Three hundred fifty million of these people, including 60 million indigenous peoples, live in or adjacent to forests and are almost wholly dependent on forests for their subsistence and income needs, collecting food, medicine, and fuelwood from the forest.[23] The risks to these communities are real due to the insecurity of property rights in many settings: even though millions of people live in tropical forests, the majority of forest area in most tropical countries is technically owned by the state, with communities typically possessing only customary land rights not codified in law (see Chapter 5 of full report). The lack of legal rights to forest resources, access to fair and transparent judicial systems, and sufficient information to make informed decisions makes many of these communities vulnerable. In addition, loss of forest access can amplify the negative impacts of climate change, as the forest-dependent poor tend to increase their reliance on forest products during economic shocks, such as failed harvests or family illness (see concern #10 below). Yet there is also great opportunity: if reduced deforestation mechanisms generate substantial revenue, these funds could be directed towards building schools, health centers, and new water systems in rural areas. This revenue could also flow directly to those living in forests if national policies permit forest people to be carbon sellers or if governments institute programs that transfer benefits to forest communities. For this to occur, clarification of property rights (to the land and/or forest carbon) will likely be critical.

Human rights dimensions of international forest carbon activities[30]

A body of instruments (declarations, principles, conventions, covenants, and operational protocols) forms the basis of international human rights law and norms. Two instruments establish the special rights of indigenous peoples regarding activity on their customary lands: the 1989 International Labor Organization's (ILO) Indigenous and Tribal Peoples Convention No. 169 and the 2007 UN Declaration on the Rights of Indigenous Peoples (UN DRIP).[31] UN DRIP outlines the human rights of indigenous peoples to include the right to free, prior, and informed consent (FPIC) for activity on or resettlement from their lands. The question of whether companies and governments must obtain FPIC from indigenous and other affected communities often comes up during mining, hydrocarbon, dam, and logging projects.[32] It also arises when new protected areas are created. The UN DRIP also obliges parties to the Declaration to legally recognize indigenous peoples' customary lands. Concerns that governments could seek to reduce deforestation by locking up forest areas for conservation or not share forest carbon revenues with communities now make FPIC and human rights relevant to international climate change policy.

Covenants or treaties, such as ILO Convention 169, are legally binding for those states that ratify them; this is not the case, however, for UN declarations, such as the UN DRIP. In recent years, some indigenous peoples who have felt that States did not respect their land rights or obtain their FPIC for activity on their lands have taken their cases to external bodies, such as the Inter-American Court on Human Rights, which has ruled extensively on this issue.[33] The ambiguity of property rights in many tropical countries (see Chapter 5 in full report) makes for a complicated situation: while some indigenous communities possess legal title to their customary lands, many do not; the absence of such legal title can hinder communities' ability to assert their right to FPIC.[34] While special protections for indigenous peoples are important, it should be noted that new forest carbon programs also present risks to many other forest communities who are not technically indigenous. Therefore, references to just the human rights of indigenous peoples may not adequately guard against the full range of risks. Other human rights instruments may also be relevant. For example, the UN Declaration on the Right to Development speaks to the rights of people to participate in the development decisions that affect their lives.[35] It could be argued that this points to the need for people to participate in land-use zoning, property rights clarifications, and decisions regarding the management of forest carbon revenues. Some also highlight the relevance of Article 1 of the International Convention on Economic, Social, and Cultural Rights, which specifies that people not be denied means of subsistence. This could be interpreted to mean that forest communities not be denied access to food, medicine, and fuelwood in forests.[36]

Already, there are concerns about how countries are clarifying rights to forests and forest carbon. A proposed reduced deforestation regulation in Indonesia appears to be at odds with indigenous peoples' rights to own, control, and consent to activities on their traditional lands.[24] Statements by the government of Papua New Guinea indicating that only the state will have the right to own forest carbon and enter into carbon market contracts have worried landowners.[25] Indigenous peoples and other communities own almost all of the land in Papua New Guinea.[26]

If countries do not address the rights of forest communities, they face risks that these communities will undermine efforts to reduce deforestation. Communities who feel unfairly treated can work to reduce national support for forest carbon programs and policies and present a reputational risk for entities paying for forest credits. In the voluntary market the majority of forest carbon projects have pursued certification under the Climate, Community, and Biodiversity Alliance standard, which requires demonstration of positive impacts on local communities and biodiversity.[27] Many investors believe forest carbon projects with positive impacts on local communities will be more efficient and effective in delivering climate benefits over the long term, given communities' proximity to the resource and their interest and ability for long-term monitoring and sustainable management.[28] International forest carbon programs outlined in previous versions of U.S. legislation have included varied provisions to avoid negative impacts on local communities—reference to human rights, requesting consultation and profit-sharing, and requiring the free, prior, and informed consent (FPIC) of affected communities. In addition policies could include criteria for transparency, participation in decision making, and dispute resolution mechanisms.[29]

9. The governance challenge

The Concern: *Weak institutional and governance capacities in tropical forest countries have been identified as obstacles to efforts to bring international forest carbon into climate policy and to use carbon finance to promote forest protection in developing countries.*[37] *Because tropical forest governments will play a critical role in implementing any successful system, concerns have been raised about the poor track records of some of these governments with regards to reforming existing practices and developing the institutional capacity to ensure transparency, accountability, and participation by stakeholders.*[38] *Specifically, critics argue that channeling large sums of carbon finance to national governments could simply reinforce and exacerbate problems of corruption, rent-seeking, and overall lack of transparency, with few benefits making it to local forest-dependent communities who must play a vital role in making such a system work. In the U.S. debates, such concerns have sometimes led to criticism that international forest carbon provisions in U.S. legislation will essentially send U.S. dollars abroad to governments with little or no track record in making sure that the money is spent wisely (see concern #2 above).*

The Response: Governance *is* a critical part of the effort to bring international forest carbon into climate policy, and there is little question that some tropical forest nations have poor track records in the area of forest governance. A well-structured international forest carbon policy, however, could operate as an incentive for improved forest governance, transparency, and accountability. First, and perhaps most important, the basic idea of performance-based payments for forest protection means that the money will not flow unless and until performance has been demonstrated, which puts an added premium on getting effective governance in place to take advantage of these market opportunities while allowing different countries to move into an international forest carbon system at different rates depending on their internal capacities. Second, the substantial and ongoing efforts to channel multilateral and bilateral financial assistance to capacity building and market readiness in tropical forest countries can be used to promote institutions and practices that will enhance governance. Third, as is already the case in some of the proposed U.S. legislation, international forest carbon provisions in a U.S. cap-and-trade system could mandate prior informed consent and respect for rights of local communities and indigenous peoples in determining the eligibility of particular activities for crediting in a U.S. system. Additional requirements could address national-level governance issues to promote transparency and citizen participation in revenue management, tenure, and land-use reforms, and the design of new forest carbon programs.[39] Fourth, third-party monitoring and certification schemes, which have been applied to industrial timber harvesting and forest carbon projects in the voluntary market, could play an important role by providing another "accountability check" on national and subnational efforts and a means of ensuring that international forest carbon activities are generating benefits for forest stewards at the local level.[40]

10. Forests also important for adapting to climate change

The Question: *Can saving forests for mitigating climate change also help countries adapt to climate change?*

The Response: Forests provide not only fuelwood, medicine, and food, but also important ecosystem services such as clean water, flood control, and disease prevention. The importance of these services for local populations may be enhanced in the context of climate change because forests provide "natural insurance" that buffer communities against some of the risks of climate change (e.g., increased flooding and disease; failed harvests). Developing countries are projected to encounter some of the most severe impacts of climate change and are least able to cope.[41] In regions that already struggle to supply adequate food, water, shelter and security resources, climate change will act as a threat multiplier, exacerbating environmental and resource crises while adding to problems of global governance.[42] As environmental conditions deteriorate, disease will increase, and populations will be forced to migrate.[43] Losing forests could further destabilize societies that climate change may make vulnerable to political upheaval, migration, and conflict.[44] Table 3.1 lists some of the ways in which forests could facilitate adaptation to climate change in developing countries. Reducing emissions from deforestation will complement efforts to adapt to climate change by helping to maintain critical services.

International forest carbon policies should consider the essential services and adaptation benefits forests provide to local communities. Limiting community forest access without providing alternative livelihoods and services that are buffered against climate change variability may lead to programmatic failures, harm to local communities, and societal instability.

Table 3.1. Types of "natural insurance" forests provide that could facilitate adaptation to climate change.

Predicted impacts of climate change	Natural insurance provided by forests
Reduced agricultural yields in seasonally dry and tropical regions. Rain-dependent crops or crops near the warm end of their suitable growth range will face challenges. Ex: Rain-fed agriculture in Africa could be reduced by 50% by 2020.[45]	***Food and economic security for the rural poor*** – Hundreds of millions of people depend on forests for subsistence and income needs, collecting food, medicine, and fuelwood from the forest.[46] Numerous studies find that the rural poor increase their collection of wild foods and other products from the forest in response to reduced agricultural yields and other economic shocks.[47]
Disruption of rainfall patterns is predicted to cause more extreme rain events making water management more difficult.[48]	***Regulation of water flow and water quality*** – Forest ecosystems store water; regulate base flows; mitigate floods; and reduce runoff, erosion, and sedimentation. Forests can reduce landslide risk, improve local and downstream water quality, maintain aquatic health and fisheries, and maintain coastal water quality and clarity.[49]
Increase in extreme weather events is predicted—specifically an increase in the intensity of tropical cyclones and hurricanes.[50]	***Protection of coastal areas*** – Mangrove and coastal forests provide protection from flooding and erosion, and buffer coastal areas from storms.[51]
Increased prevalence of vector-borne diseases is predicted as the range and breeding habit of disease-carrying agents such as mosquitoes expand. As a result, malaria, dengue, and other vector-borne diseases are projected to spread and increase. In addition, parts of Asia are expected to experience an increase in diarrhoeal disease and related death associated with increased floods and droughts caused by changes in the hydrological cycle.[52]	***Forests may reduce spread of these diseases*** – Deforestation is linked to the spread of malaria, dengue, and other vector-borne diseases.[53] A recent study considered the projected increases in vector-borne diseases in the Brazilian Amazon due to climate change and found that if forests are conserved, disease prevalence in local populations will be lower than what it will be if forests are cleared.[54]
Increased risk of fire is predicted as the frequency of heat waves increases and the areas affected by drought expand.[55]	***Protection from forest fires*** – It is harder for fires to penetrate moist, intact forests. Deforestation and degradation open up the forest lowering shade and humidity, exacerbating local climate variation, and increasing drought, desertification, and susceptibility to fires.[56]

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