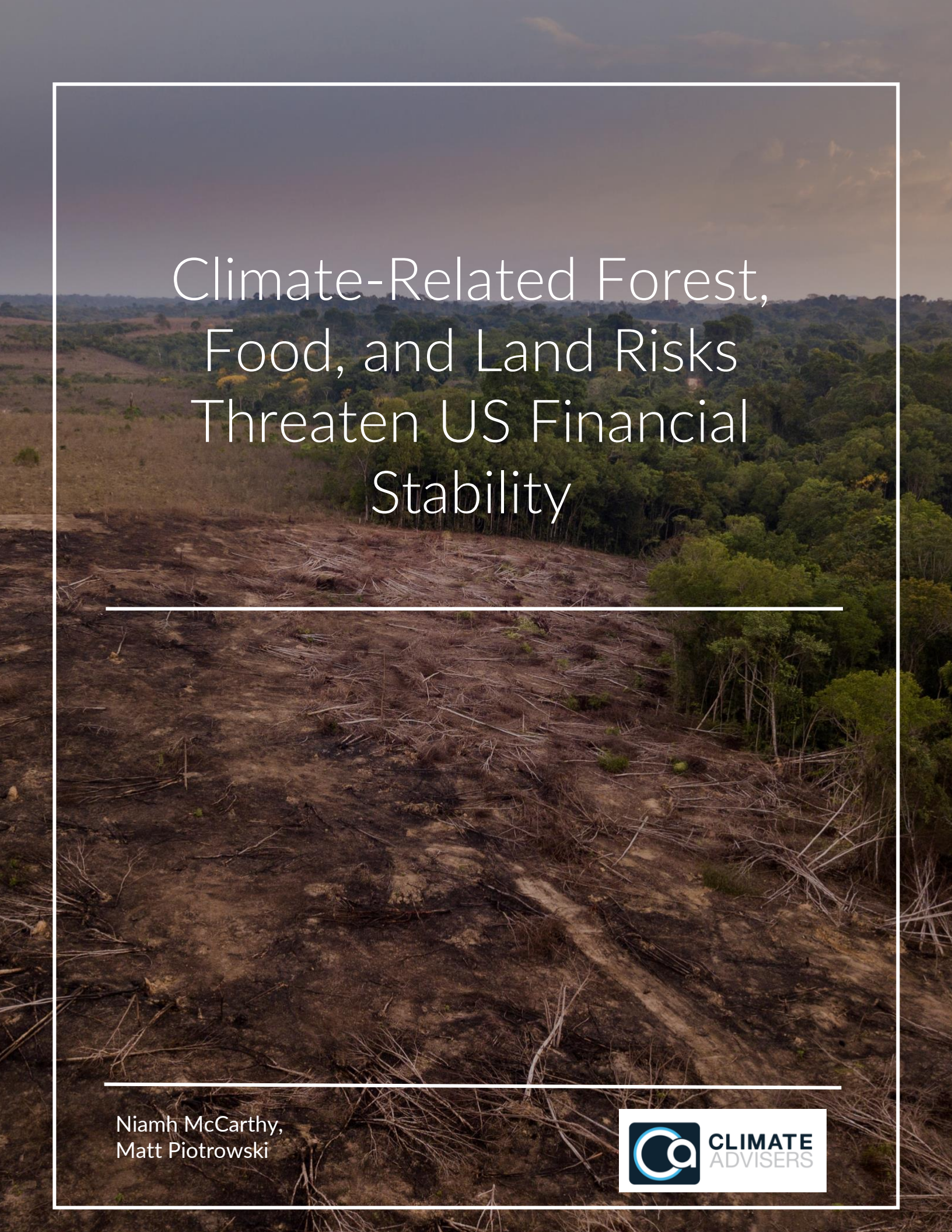

Climate-Related Forest, Food, and Land Risks Threaten US Financial Stability

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About 40 percent of US GDP is generated from sectors directly exposed to climate-related forest, food, and land use risks

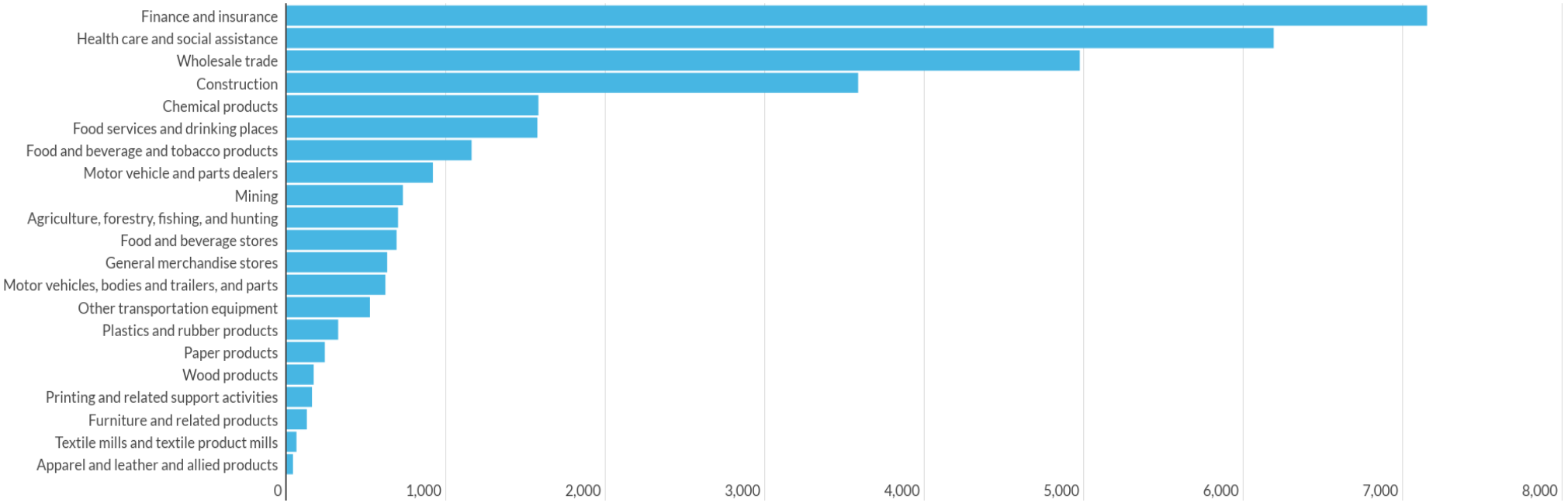
US financial institutions ties to climate-related forest, food, and land risks

US financial institutions face material physical and transition climate risks from forest, food, and land sectors that are currently not being adequately addressed. In the US, 40 percent of GDP is generated from sectors directly exposed to tropical forest, food, and land risk, but the nation's entire financial system is also exposed in more systemic ways due to the interconnected nature of global climate impacts. The material risk of significant ecosystem service losses in tropical regions and the broad cross-section of US sectors exposed increase the likelihood of political, economic, and social instability. On the other hand, action by the Biden administration, the Federal Reserve, and the Securities and Exchange Commission could have out sized climate benefits while protecting US investors from unmitigated risk. The factors outlined in this paper place climate-related forest, food, and land risks squarely at the intersection of national security, financial stability, and human rights. This paper also explains key risks to financial stability, outlines the potential benefits of US leadership, and provides recommendations for incorporating mitigation measures into the agendas of US agencies.

According to recent data from Forests and Finance, US financial institutions provided over USD 2 billion in financing to forest risk companies in 2020 and almost 12 billion thus far in 2021. However, direct financing to forest risk companies, alone, significantly underestimates the systemic threats of tropical deforestation to the US financial system. To illustrate the scale of potential financial impacts, sectors directly exposed to tropical commodity supply chain risk include food and beverage processing and production, automobile manufacturing, textiles, chemicals, pharmaceuticals, retail, food service, personal care products, print publishing, forestry, construction, energy and biofuels, and finance. Using data from the Bureau of Economic Analysis, Climate Advisers calculated that these sectors generate about 45 percent of US private-sector GDP and 40 percent of US total GDP.

Sectors at least partially exposed to tropical forest, food, and land risk

2020 GDP by sector in billions of dollars



Data sourced from the Bureau of Economic Analysis

On a larger scale, natural resource dependencies and ecosystem services are a major factor for US economic growth. More than half of global economic generation is at least moderately dependent on nature and ecosystem services, which amounts to about USD 44 trillion in GDP. The United States, specifically, is reliant on ecosystem services from healthy intact tropical forests to regulate precipitation patterns vital to agricultural production, inspire medical breakthroughs, prevent mass migration, and curb the emergence of infectious diseases like Covid-19.

Will regulators consider the role of forest, food, and land in maintaining financial stability when designing climate-related financial regulations?

The Financial Stability Oversight Council (FSOC) report published in October detailed climate-related financial risks that threaten the stability of the US economy. This report was an important development in educating regulators, investors, companies, lawmakers, and the public about the growing climate-related risks that can undermine the US financial system and bring about extraordinary costs for investors and banks.

In the report, the FSOC acknowledged agriculture's role in climate change and mentioned deforestation and biodiversity loss, an important development given that they typically receive less attention than fossil fuels. While the FSOC report was an important first step, it does not adequately consider forest, food, and land risks in supply chains or the threats these risks pose to the broader US economy and financial system. This analysis underscores why the FSOC should consider systemic risks tied to the forest, food, and land sector and propose mitigation measures to protect US investors in any future reports.

How do climate-related forest, food, and land risks impact US financial stability?

Financial stability impact categories: Climate-related forest, food, and land risk (*Source: Climate Advisers)*

Soil Degradation: Soil degradation costs an estimated USD 400 billion every year and has been linked to a potential 12 percent reduction in global food productivity and a 30 percent increase in food prices by 2030. Degradation is driven by the loss of organic matter, fertilizers, soil

erosion, pesticide and other types of contamination, salinization, acidification, and a loss of genetic diversity. Soil erosion, for example, is a major consequence of tropical deforestation because soil can no longer rely on intricate root structures to hold it in place or canopies to protect it from drying in the sun. Although recently deforested land may support productive agricultural activity, soil fertility decreases over time as it is blown or washed away. For example, a study of deforested land in Iran measured a 70-82 percent drop in soil productivity of cultivated land and a 50 percent drop in organic matter overall.

Food Shortages: Increasing temperatures, soil degradation, and changing precipitation patterns present material risks to producers, but also extend along agricultural supply chains. In total, erosion of healthy soil moderately or severely impacts 52 percent of all land used for food production. In the US alone, cultivated soil erodes ten times faster than it can be replenished. Small farmers around the world are often not sufficiently diversified to withstand climate change and may struggle to regenerate soil and adapt at the pace needed to maintain food security and prevent costly crop failures.

Biodiversity Loss: Habitat loss is causing a biodiversity crisis and threatening valuable ecosystem services. Nowhere is this more apparent than in tropical forests, which are home to more than 80 percent of animal, plant, and fungi biodiversity. Wildlife populations, including mammals, birds, fish, amphibians and reptiles, reduced by 68 percent since 1970 and about one million animal and plant species face the threat of extinction. The agriculture sector is responsible for about 80 percent of deforestation globally, but it is also among the sectors most reliant on ecosystem services, particularly pollination. Pollinator loss is currently placing USD 235 billion to 577 billion of annual agricultural production at risk. The economic cost of biodiversity loss is already estimated to be between USD 2.0 trillion and 4.5 trillion per year.

Drinking Water: Deforestation and land use change can have devastating implications to the availability and quality of clean drinking water to populations both locally and regionally. Forested land covers about 31 percent of watersheds worldwide and provides essential storage and filtration services. By absorbing nutrients and sediment, forests provide clean drinking water to large populations in urban centers downstream and can reduce infrastructure investments and water management costs. For example, New York city saved between USD 4.5 and 6.5 billion through conservation efforts in the Catskill Mountains. By storing water in roots, branches, and canopies, forests can also reduce the intensity of flooding and mitigate irregular rainfall patterns. Conversely, deforestation and land use change can lead to devastating flooding, increased need for costly infrastructure, and significant pollution because of the loss of ecosystem services and preventing the previously discussed runoff agricultural fertilizers and pesticides.

Global water cycles: As deforestation and land use change lead to the conversion of tropical forests to grasslands or savanna, less moisture is stored and released into the atmosphere. Thus, the hydrological cycle is disrupted with a major ripple effect on precipitation patterns around the world. Climate scientists have predicted a tipping point when 20–25 percent of the Amazon is cut down, warning that the rainforest's hydrological cycle will be unable to support itself and the biome will convert to a savanna. Since the Amazon provides water to a region in South America responsible for 70 percent of the continent's GDP, the risk to the continent's financial sector is sizeable. This problem is not limited to South America. Deforestation in the Amazon

could lead to a 25 percent reduction in rainfall in Texas, for example. Meanwhile, deforestation in Central Africa could reduce rainfall in the US Midwest by 5-35 percent and deforestation in Southeast Asia can influence rainfall in Europe.

Medicine: Future medical breakthroughs are dependent on the conservation of plant biodiversity today. The market for medicinal plant products is valued at over 100 billion USD and approximately 80 percent of the global population is reliant on botanical drugs. Moreover, a quarter of modern medicine originates in tropical forests. Yet, scientists have only scratched the surface of cataloging and understanding the vast biodiversity of the world's forests. It is estimated that up to 100 species of animal and plant species disappear per day as tropical forest habitats are destroyed. A loss of plant biodiversity before medicinal impacts are understood is likely to lead to adverse impacts on human health and a slowdown in innovation in the pharmaceutical industry globally.

Infectious disease outbreak: Deforestation and land use change lead to habitat loss and increase the likelihood of zoonotic infectious diseases that result from close proximity between humans and animals. Infectious disease emergence is driven primarily by land use change (31 percent), followed by agriculture (15 percent). The Covid-19 pandemic has provided some insight into the potential costs of infectious diseases to humans and the economy. Over 4.5 million lives have been lost to date with no clear end in sight to managing the disease's variants. Furthermore, as early as October of 2020, the International Monetary Fund estimated that the pandemic cost the global economy 28 trillion in lost output. According to some studies 75 percent of emerging infectious diseases are zoonotic compared to 60 percent of all existing infectious diseases. Without halting deforestation, the likelihood of society being exposed to more costly zoonotic diseases we are unprepared to manage will continue to increase.

Energy: Many economies risk productivity loss due to a reduction in reliable access to electricity. In addition to the increasing vulnerability of electrical grids and the growing need for infrastructure weatherization, countries that rely on hydroelectric power and some biomass feedstocks may face intermittent natural resource shortages or fluctuating prices due to deforestation and unsustainable land use change. In regions with high rates of deforestation, for example, hydroelectric power is transitioning from a baseload power source to an intermittent one, due to the reduction in the water storage and regulation services once provided by forests.

Pollution: In addition to absorbing CO2, trees absorb toxic chemicals and filter the air providing noteworthy benefits to human health. Despite only covering 6 percent of land, tropical forests produce 40 percent of the world's oxygen alongside the absorption of harmful pollutants. Furthermore, particulate matter from fires linked to longer dry seasons and land clearing for agricultural use has been shown to increase pollution-related hospitalizations by 65 percent and to cost the Brazilian public healthcare system the equivalent of USD 660,000 during the 2019 fire season. With wildfire seasons in the US increasing in severity and longevity, driven by climate change and the effects of global deforestation, a major step in addressing in mitigating the potential pollution impacts must include curbing global deforestation.

Environmental refugees and local conflict: By depleting the ecosystem services that millions of people rely on for food, clean water, and energy, deforestation and land use change are likely to create climate change refugees and exacerbate geopolitical conflict. The inevitable floods, droughts, and repeated crop failures are likely to destabilize economies as they become unable

to support their populations. Over 1.2 billion people could become climate change refugees by 2050. The world is already experiencing climate refugees and will continue to see an increase of this tragedy in the near-term. For example, the 90 percent reduction in the size of Lake Chad has provided some insight into the scale of potential migration patterns with 2.4 million displaced people and increased geopolitical conflict in the region.

Indigenous People and Local Communities: Displacement of Indigenous People risks the loss of traditional cultures and valuable expertise in maintaining healthy ecosystems that aid in mitigating climate change. Receding tropical forests have already led to frequent land disputes between commodity producers and Indigenous Peoples and local communities. Illegal encroachment onto Indigenous territories and land insecurity have also heightened violence against environmental defenders defending their homes.

Illegal activity: The lack of transparency into complex supply chains provides a cover for illegal activities, including deforestation, intentional fires, and human rights abuses. Most deforestation in the developing world linked to internationally traded commodities is illegal (violates local law) and connected to organized crime. Corruption, bribery, money laundering, illegal logging, and other illegal acts referred to as "forest crimes" are common in the forest and land-use sectors in many developing countries. The potential consequences, which can be widespread, include social conflict, injustice, poverty, economic stagnation, and carbon emissions. Forest crime is rampant in large part because often local and international environmental laws fail to address the root of forest crime.

Benefits of US leadership in addressing climate-related forest, food, and land risk

By taking a leadership role in incorporating climate-related forest, food, and land risk into financial regulations, the United States can:

a) Increase the resiliency of the US government and financial system to climate-related financial risk.
b) Give companies and financial institutions an advantage in developing the processes necessary for carbon accounting, scenario analysis, and risk mitigation.
c) Drive the direction of assessment and reporting standards globally.
d) Build up data on the carbon intensity of US industries to enable beneficial agreements in carbon border adjustment mechanism discussions.
e) Accelerate climate action internationally and reduce global climate-related financial instability.
f) Use comparative carbon intensity data to advocate for lower emission domestic manufacturing and agriculture, where relevant.
g) Expand US company participation in rapidly growing environmental, social, governance funds and access to responsible investors.
h) Improve competitive advantage for US companies in increasingly climate-conscious consumer markets.

Recommendations for incorporating climate-related forest, food, and land risk into Executive Order actions, by US agency

In support of the Executive Orders on "Tackling the Climate Crisis at Home and Abroad" (January 27, 2021) and "Climate-Related Financial Risk" (May 20, 2021), Climate Advisers has developed the following set of recommendations.

The White House

1) Recognize publicly that climate-related financial regulations should apply with equal force to financial risks associated with the forest, food, and land sector, as well as to fossil fuels and industrial emissions.
2) Explicitly release a strategy for mitigating and disclosing climate-related forest, food, and land risk in US supply chains and government procurement, including scope 3 emissions.
3) Announce a plan to pursue forest-friendly regulations on US imports, like the recently introduced bipartisan FOREST Act.
4) Building off of the commitment made at COP26 to eliminate deforestation by 2030 and initiatives such as the LEAF Coalition, collaborate internationally on financing the protection of tropical rainforests.
5) Consult with NGOs to ensure that forest, food, and land risk is adequately considered in strategy planning, risk assessments, and government disclosures.

Secretary of the Treasury

1) In assessing the impacts of climate-related risk to the US financial system, ensure that climate-related forest, food, and land risk, both domestic and international, is included in the analysis.
2) Advocate for quantifying and disclosing greenhouse gas emissions associated with tropical commodity supply chains through scope 3 emissions requirements.
3) Climate-related financial risk mitigation strategies should undergo gap analyses to ensure that high emission sectors and supply chain roles are covered by financial regulations.
4) Approach regulations aimed to combat deforestation in combination with other efforts to prevent illegal activities, including anti-trafficking.
5) Advocate for the Federal Reserve, a member of the FSOC, to conduct stress testing on natural resource dependencies and to release guidelines for banks to assess climate-related forest, food, and land risk.
6) Direct the FSOC to work with the Task Force on Climate-Related Financial Disclosures (TCFD) to strengthen guidance on the forest, food, and land sectors; engage with the work of the Taskforce on Nature-Related Financial Disclosures (TNFD); and work with members to identify datasets and methodologies that can support the integration of nature-related financial risks, including deforestation, into financial decision-making.

7) Encourage the Security and Exchange Commission to use mine safety disclosures as a model for mandating high-risk climate-related forest, food, and land disclosures, as a result of its high environmental and social impacts including human rights abuses and illegal activities.
8) Consult with NGOs to ensure that forest, food, and land sectors are adequately considered in plans to mitigate climate-related financial risk.
9) Collaborate with other countries to ensure that they also incorporate financial risks associated with forest, food, and land sectors into their analysis and regulations.

Secretary of Labor

1) Consider Orbitas scenario analysis on the long-term risks associated with tropical commodity supply chains, along with the Climate Advisers better palm oil index, to understand the long-term financial risks of unsustainable tropical commodity supply chains;
2) Ensure that climate change is incorporated when calculating the long-term risk of US pensions, including in forest, food, and land-dependent supply chains; and
3) Consult with NGOs to ensure that forest, food, and land sectors are adequately considered in the Secretary of Labor report on climate-related financial risk.

Office of Management and Budget

1) Incorporate climate-related forest, food, and land risk into forward-looking planning processes.
2) In collaboration with the FSOC, work with the TCFD to strengthen guidance on the forest, food, and land sector; engage with the work of the TNFD; and identify datasets and methodologies that can support the integration of nature-related financial risks, including deforestation, into budget decisions.
3) Communicate processes for quantifying climate-related risk by sector and process.
4) Consult with NGOs to ensure that forest, food, and land sectors are adequately considered in planning, assessment, and disclosure decisions.

Federal Acquisition Regulatory Council (FARC)

1) Require contractors to disclose scope 1, 2, and 3 emissions, including tropical commodity supply chain emissions.
2) Specifically request disclosures for the climate-related forest, food, and land risks, especially in tropical commodities with high illegality risk; and
3) Consult with NGOs to ensure that forest, food, and land sector associated risks are adequately considered in procurement decisions.

Federal Lending Programs

1) Make US agency loans and guarantee dependent on adequately mitigating climate-related forest, food, and land risks.

2) Create incentives for sustainable land use initiatives.
3) Consult with NGOs to ensure that loans and guarantees do not inadvertently support deforestation, unsustainable land use, human rights abuses, and other illegal activities.

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Climate Advisers works to strengthen climate action in the United States and around the world through research, analysis, public policy advocacy and communications strategies. We partner with governments, non-profits, philanthropies, international organizations, financial institutions and companies to help deliver the clean economy. We develop and promote sensible, high-impact initiatives that improve lives, enhance international security and strengthen communities. Climate Advisers currently consists of several independent organizations collaborating to advance the same mission, including: Climate Advisers Trust, a U.S. non-profit, Climate Advisers United Kingdom, a U.K. non-profit, and Climate Advisers Incorporated, a global consultancy. Further information is available at climateadvisers.org