ORBITAS

Navigating climate transitions

The High Cost of Ignoring Imported Scope 3 Deforestation Emissions

September 2023

Deforestation emissions from raw materials imported into the United States present material financial risks for investors and concerns for importing companies.

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Executive Summary

This report sheds light on the significant climate-related financial risks of deforestation emissions tied to commodities imported into the United States.

This report by Orbitas, an initiative of Climate Advisers, developed in partnership with AidEnvironment and Profundo sheds light on the significant climate-related financial risks of deforestation emissions tied to commodities imported into the United States. By revealing the high levels of value at risk, this analysis presents a clear case for investors to work with producers and traders of agricultural commodities critical to U.S. and global food systems to identify Scope 3 supply chain emissions (those emissions occurring within a company's supply chain or through use of its goods and services) for these goods specifically linked to deforestation and work collaboratively to reduce them. Maintaining a business-as-usual approach to imported forest risk commodities (FRCs) leaves investors in the dark regarding future financial risk, potentially exposing their broader portfolios to harsher impacts from climate change.

As the U.S. Securities and Exchange Commissions (SEC) finalizes its climate-related financial disclosure rule for investors, much debate has focused on Scope 3 measurement and disclosure, which includes the emissions of a company's external suppliers. For investors, the rule's potential to provide meaningful data to manage material risks from Scope 3 emissions has been a widely supported part of the rule. Analysis of investor comments on the proposed SEC rule found 97% of investors support some form of mandatory disclosure of Scope 3 emissions.[1]

While some actors contest the value of Scope 3 emission reporting, our analysis shows there are significant material investor risks from deforestation emissions, alone, worthy of disclosure and action.

For many of the world's largest and most well-known corporations, Scope 3 emissions can be greater than 80% of their estimated total emissions.[2] Mars Inc., one of the few companies to voluntarily report Scope 3 emissions from deforestation, has estimated that 29% of the company's total Scope 1, 2, and 3 emissions are generated from deforestation driven by imported FRCs.[3]

Even if all other emissions were halted, unchecked deforestation puts the world on a path to exceed two degrees Celsius of global warming within this century, inducing trillions of dollars in damage to the global economy if it continues. Agricultural expansion for imported FRCs such as beef, soy and palm oil are the primary drivers of forest loss, causing 83% of non-wildfire forest loss in 2021.[4] Deforestation shrinks the world's carbon sinks, impeding carbon sequestration opportunities for years to come. The climate transition risks for this sector are growing as governments, consumers and private sector actors work to penalize further deforestation in response to the accelerating impacts of climate change. Scope 3 disclosure mandated by the SEC would allow U.S. investors to make informed decisions around these growing financial risks.

Already, the California legislature has passed The Climate Corporate Data Accountability Act, which would require companies that do business in California and have revenue of $1 billion or more to report their Scope 1 and 2 emissions, starting in 2026. All companies that operate in California, whether their headquarters are there or not, would be required to disclose their Scope 3 emissions, starting in 2027. The bill has passed the state legislature and is awaiting signature by the governor. As climate-related disclosures advance around the world, global companies will be increasingly accountable for providing investors clear and comparable data on Scope 3 emissions even if the SEC fails to lead in this area.

[1] Rothstein, Steven M. "Analysis Shows That Investors Strongly Support the SEC's Proposed Climate Disclosure Rule." Ceres, October 11, 2022. https://www.ceres.org/news-center/blog/analysis-shows-investors-strongly-support-secs-proposed-climate-disclosure-rule.
[2] World Economic Forum and Boston Consulting Group, "World Economic Forum - Home," www3.weforum.org, January 2021, https://www3.weforum.org/docs/WEF_Net_Zero_Challenge_The_Supply_Chain_Opportunity_2021.pdf.
[3] Mars CDP, "Welcome to Your CDP Climate Change Questionnaire 2019," Mars, 2019, https://www.mars.com/sites/g/files/jydpyr316/files/2019-09/Mars%20CDP%20Climate%20Change%20Questionnaire%202019%20Final.pdf.
[4] Mikaela Weisse, Elizabeth Goldman, and Sarah Carter, "The Latest Analysis on Global Forests & Tree Cover Loss | Global Forest Review," research.wri.org, 2022, https://research.wri.org/gfr/latest-analysis-deforestation-trends.

This report sheds light on the role U.S. importers play in driving raw imported FRC deforestation emissions, as well as the potential material financial exposures that investors will need to navigate as a result. Disclosures would not mitigate the risks faced by investors, but would allow them to make informed decisions around the risks and opportunities linked to key investments.

Recommendations

Companies, governments and investors can work to avoid the losses discussed in this report by changing behavior through leaning into climate transition opportunities and mitigating risks:

- Importing/trading companies with no substitution opportunities are most exposed to the risks discussed in this report, while downstream companies have more flexibility to improve sourcing due diligence or substitute inputs with lower risk alternatives. If downstream companies proactively react or change sales prices to compensate for the potential loss of gross profit, they can mitigate financial losses.
- Under these scenarios, companies could source commodities from countries with less deforestation-risk or enact measures to more closely monitor their supply chains to avoid links to deforestation. Companies in these supply chains would benefit from higher revenues, profits and value, while experiencing lower interest rates and improved brand image.

Governments and regulators should still consider the cost of climate damage even if companies are not required to internalize them in the short term. Without change, intensifying climate impacts will cascade across the global economy, leading to escalating costs for society, governments and companies.

Summary of Key Findings

1. In three climate cost scenarios, our analysis finds the total value at risk for imported FRC (Beef, Coffee, Rubber, Palm Oil, Cocoa and Soy) deforestation emissions ranges from USD 7.28 billion to USD 114.98 billion.

Figure 1. Total Risk: U.S. Scope 3 Imported Deforestation Emissions

Total risk: operational business risks + reputation + financing risk ($ in millions unless noted)	Scenario 1	Scenario 2	Scenario 3
CO_2 price/ton (USD)	34.1	96.3	1,160
Operational business risk annually	-404	-1140	-7452
Value impact based on DCF	-4,479	-12,650	-82,713
Financing risk (DCF-based)	Negative	Negative	Negative
Reputation risk	-2,399	-12,159	-24,814
Pricing and economic activity domestic market	Negative	Negative	Negative
Impact on government finances	Negative	Negative	Negative
Total value-at-risk	-7,281	-25,948	-114,979
US assets under management	54,000,000	54,000,000	54,000,000
Bank assets	23,700,000	23,700,000	23,700,000
Total assets	77,700,000	77,700,000	77,700,000
As % of USA financed assets 2022/23	-0.01%	-0.03%	-0.15%

2. Gross profits for the commodities assessed could decline by USD 366 million to USD 6.9 billion, according to our scenario analysis. Value chain costs would be significant. For example, retail prices of imported beef would increase 700% if climate costs of emissions from deforestation were factored into pricing.

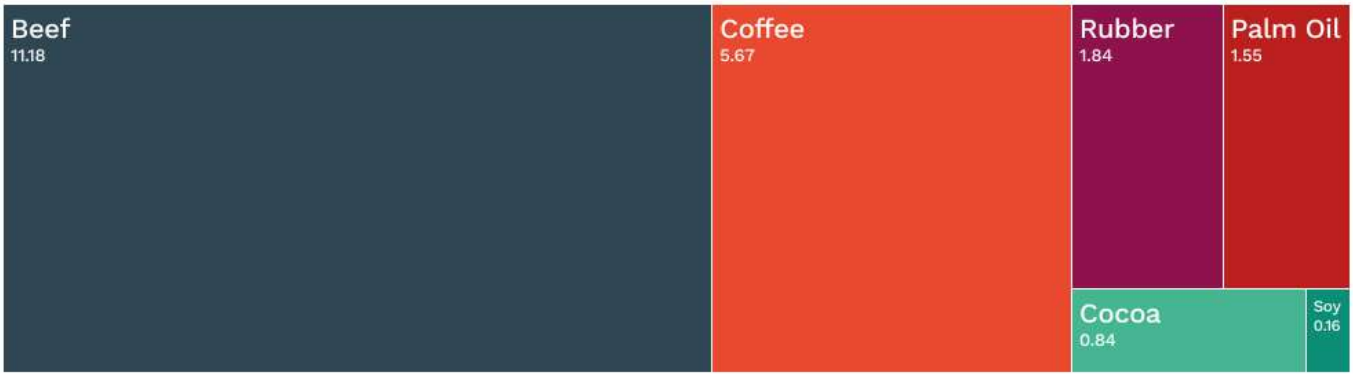
3. The total value of the Scope 3 embedded deforestation emissions in U.S. imports for retail sale is USD 13.25 billion from an import value of USD 5.80 billion. The financial risks range from 5% to 21% of the entire value chain for some commodities across our three carbon price scenarios.

4. The operational business risks of incorporating imported emissions from deforestation in the U.S. supply chains are material. Based on an average 56% gross margin in supply chains dependent on deforestation risk commodities, gross profits decline from USD 404 million to as much as USD 7.45 billion in the three scenarios, mainly due to civil society pressure. In a discounted cash flow (DCF) context and assuming the losses are structural, this adds up to USD 4.48 billion to USD 82.71 billion.

5. The reputational risk of deforestation compounds the civil society climate transition risk with reputation value at risk ranging from USD 2.4 billion to USD 24.81 billion across the three scenarios. Considering the dependence of certain industries on imported FRCs, some downstream segments could face a relatively high reputation value at risk. Brands that sell fast-moving consumer goods and have established climate goals are especially vulnerable to reputation value risk. (Fast-moving consumer goods are nondurable products that sell quickly at high volumes and low profit margins.)

6. Scope 3 emissions from deforestation for the production of commodities imported to the U.S. totaled 21.24 $mtCO_2$ in 2019. This rivals the total 2020 annual emissions of countries like Croatia and Honduras, while outpacing Congo, Nicaragua, and Panama.[5] Figure 1 shows the share of these emissions by commodity, with imported beef accounting for 53% of the total (11.18 $mtCO_2$), followed by coffee at 27% (5.67$mtCO_2$) and rubber at 9% (1.84 $mtCO_2$).

Figure 2. U.S. Imported Deforestation Emissions by Raw Material Commodity ($mtCO_2$)



7. Analysis of the top 15 importers within each commodity sector reveals that deforestation risk is concentrated among just a few companies for most commodities. These sectors rely on only a few companies that are exposed to significant risk in order to maintain the flow of supply. Thus, the risk from climate transitions, such as policies banning commodity imports tied to illegal deforestation, are highly concentrated and could have significant financial impact throughout the supply chain.

8. According to Forests & Finance (F&F), from 2018-2023, U.S. financial institutions have provided USD 23.72 billion in financing to imported forest risk commodities (excludes financing to downstream companies dependent on imported FRCs). F&F traced USD 4.94 billion in adjusted financial flows to some of the top importers of FRCs to the United States. More than half of this financing is directed to companies linked to Southeast Asia.

9. Imports for the commodities analyzed in this report are largely sourced from a few countries, many in locations known for their high deforestation risk. Indonesia, for example, was the source of nearly half of natural rubber imports and 55% of the deforestation risk related to palm oil.[6] Any U.S. or domestic Indonesian policies impacting imports regarding emissions, or other policies related to climate transitions, could quickly disrupt the supply of these critical goods used across numerous industries.

[5] World Bank, "Total Greenhouse Gas Emissions (Kt of CO2 Equivalent) | Data," Worldbank.org, 2022, https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE.
[6] World Wildlife Fund, "Transforming the Global Rubber Market | Projects | WWF," World Wildlife Fund, 2017, https://www.worldwildlife.org/projects/transforming-the-global-rubber-market.

Introduction

Scope 3 emissions account for 75% of company emissions on average, and their omission from disclosures means that investors lack transparency into the vast majority of the climate-related risk associated with their investments.

Scope 3 emissions account for 75% of company emissions on average, and their omission from disclosures means that investors lack transparency into the vast majority of the climate-related risk associated with their investments.[7] Unless a company is entirely vertically integrated, emissions from deforestation are almost always considered part of Scope 3 emissions, and are often excluded from company emission disclosures. However, deforestation is only one component of a company's overall Scope 3 footprint. While this analysis quantifies the risk associated with deforestation emissions from major raw material commodities imported into the United States, the comprehensive Scope 3 emissions driven by these commodities would be orders of magnitude larger than those solely associated with deforestation. Moreover, embedded deforestation emissions from finished goods are not included due to the lack of traceability in many of these value chains.

This report analyses six key commodity sectors — beef, coffee, soy, rubber, palm oil and cocoa. It delves into the scale of imported raw material emissions due to deforestation in each sector, including financial analysis to quantify the risks associated with their Scope 3 deforestation emissions.[8]

The financial analysis is based on three carbon pricing scenarios:

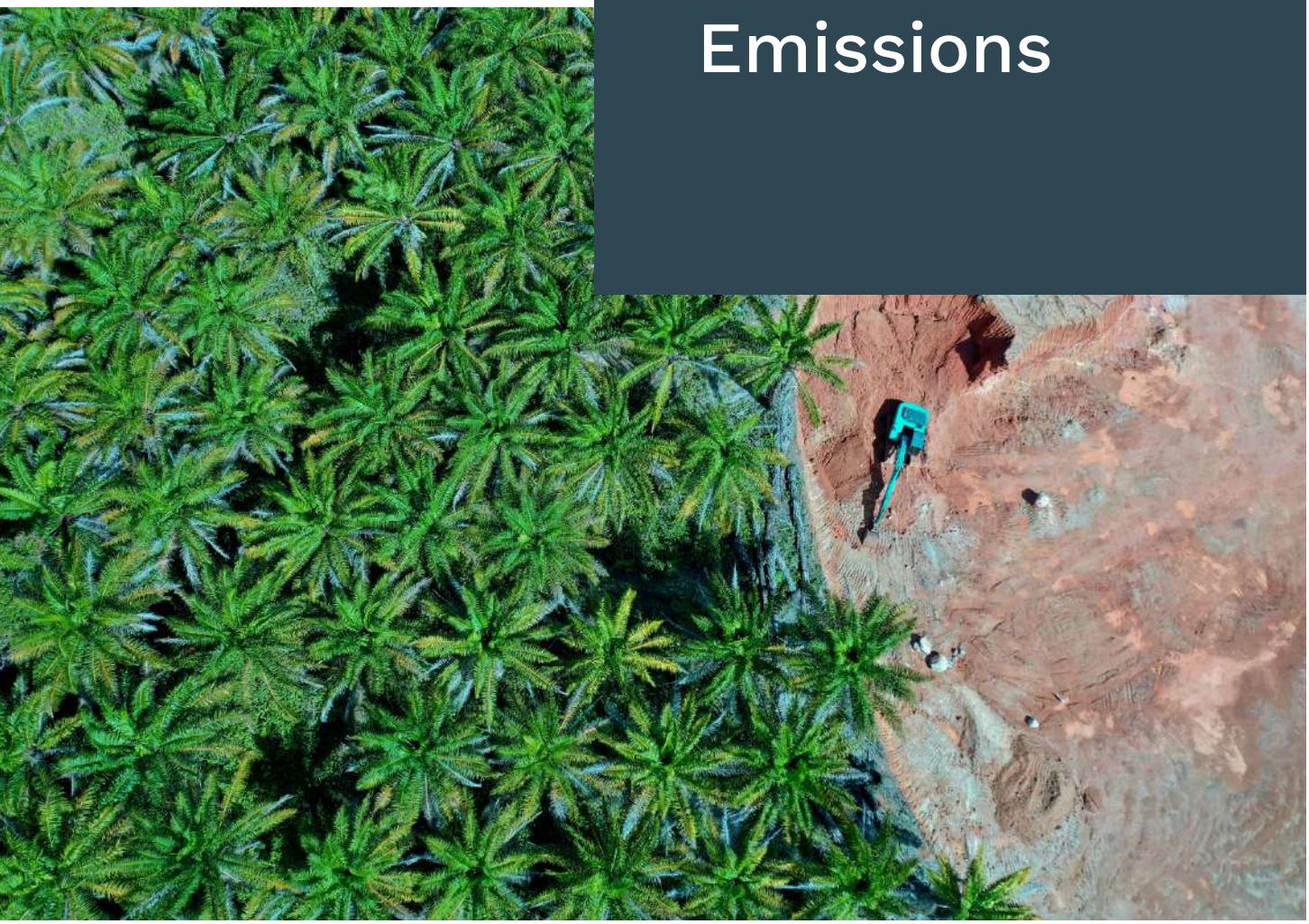
- **Scenario 1:** Price based on North American jurisdictions.
- **Scenario 2:** Price based on the EU Emissions Trading System (ETS)
- **Scenario 3:** Societal cost of carbon ($SCCO_2$) measure.

These scenarios are described in more detail in the report quantification section. Our analysis utilizes carbon pricing as a method for measuring different levels of climate transition penalties on emissions. While carbon prices aren't the only form of climate transition risks threatening these commodities, a proxy price serves to simulate how climate action will create transition risks with implications for the financial outlook of forest-risk commodities.

[7] Shannon M. Lloyd et al., "Trends Show Companies Are Ready for Scope 3 Reporting with U.S. Climate Disclosure Rule," www.wri.org, June 24, 2022, https://www.wri.org/update/trends-show-companies-are-ready-scope-3-reporting-us-climate-disclosure-rule.
[8] While the case studies do not address wood due to a lack of data, the financial analysis does include the sector.

Emissions from deforestation globally make up 11% of annual carbon emissions, which create both physical and transition risks from climate change for companies.

II. The Role of Physical and Transition Risks in Deforestation Emissions



Emissions from deforestation globally make up 11% of annual carbon emissions, which create both physical and transition risks from climate change for all companies operating along imported FRC supply chains.[9] Physical risks occur because Scope 3 deforestation emissions cause increasing climate damage. The most important factors creating physical climate damage are rising temperatures, higher sea levels, extreme weather conditions, and unstable water supply. Transition risks result from market, technology, reputation, and policy and legal forces driven by consumer, private sector and government responses to climate change.

Examples of material transition risks for imported FRCs include:

1. Operational business risks and regulation risks

- Customers along supply chains can decide not to purchase products with high Scope 3 emissions from imported FRCs due to company policies or civil society pressure.
- Regulation on Scope 3 emissions could have an impact on market relations, inducing bans, fines, emission prices, or the need to monitor and verify commodity origins.

2. Consumer demand changes and civil society pressure

- Societal pressure can lead to a reluctance toward purchasing products with embedded imported FRCs, driving downstream companies to increase due diligence. Zero-deforestation policies of companies and investors have a similar impact.
- Customer reluctance can occur in every part of the value chain. For instance, when a brand manufacturer issues a zero-deforestation policy, this could affect the sales of a palm oil trader, introducing various risks:
    - Market access risk, leading to revenue loss and gross profit pressure.
    - Operating profit risk, as lower revenues mean lower gross profits and fixed costs are distributed over lower volumes.
    - Financing risk, as lower operating profit and lower free cash flows from operations can lead to a deterioration of interest-cover ratios and subsequently to higher interest rates on debt. Financiers with zero-deforestation policies can also require adherence to zero-deforestation reduce lending in response to non-compliance.
    - Valuation risk, due to lower profits and dividends. Financiers with a zero-deforestation policy may divest from shares or bonds. This value risk can occur on public markets, but also in private equity markets and other markets.
    - Default risk, as banks may not be able to recover outstanding loans to forest-risk clients.
    - Reputation risk, as links to deforestation can damage brand reputation, reducing the value of intangible brand assets.

[9] U. N. Environment, “Deforestation,” UNEP - UN Environment Programme, April 20, 2021, https://www.unep.org/resources/factsheet/deforestation.

3. Policy risks driven by regulatory changes

- Regulation on Scope 3 emissions from imported FRCs can intensify changes in consumer demand. The impacts are often more intense, abrupt, and widespread at the time of implementation.
- Regulation can siphon demand from entire segments of importers, traders and downstream companies, leading to stranded assets and even bankruptcy.
- If regulation requires pricing in the true financial risk from Scope 3 emissions from imported FRCs, then margins and volumes could be affected.
- Regulation could require higher policy execution, monitoring and verification costs. It could also lead to fines if companies break the law.

4. Sector-wide effects on reputation

- When emissions are material, they could affect the reputation of an industry, and when dominant in a country, even the reputation of a country. Examples include the palm oil and biofuel industries in Indonesia, along with the soy and cattle industries in Brazil. Civil society plays a key role in amplifying these risks, and they are further exacerbated when investors and customers do not have a method for differentiating between suppliers in industries with opaque supply chains.
- A negative industry reputation can trickle down to customers or downstream companies. Even financiers with a core business in financing risky industries could face reputation risk and lose deposits to other banks. This could lead to a financial system risk through outflow of deposits or a bank run.
- A negative industry reputation could also spur consumers to seek alternatives and discourage future investment.

5. Risk to financial institutions

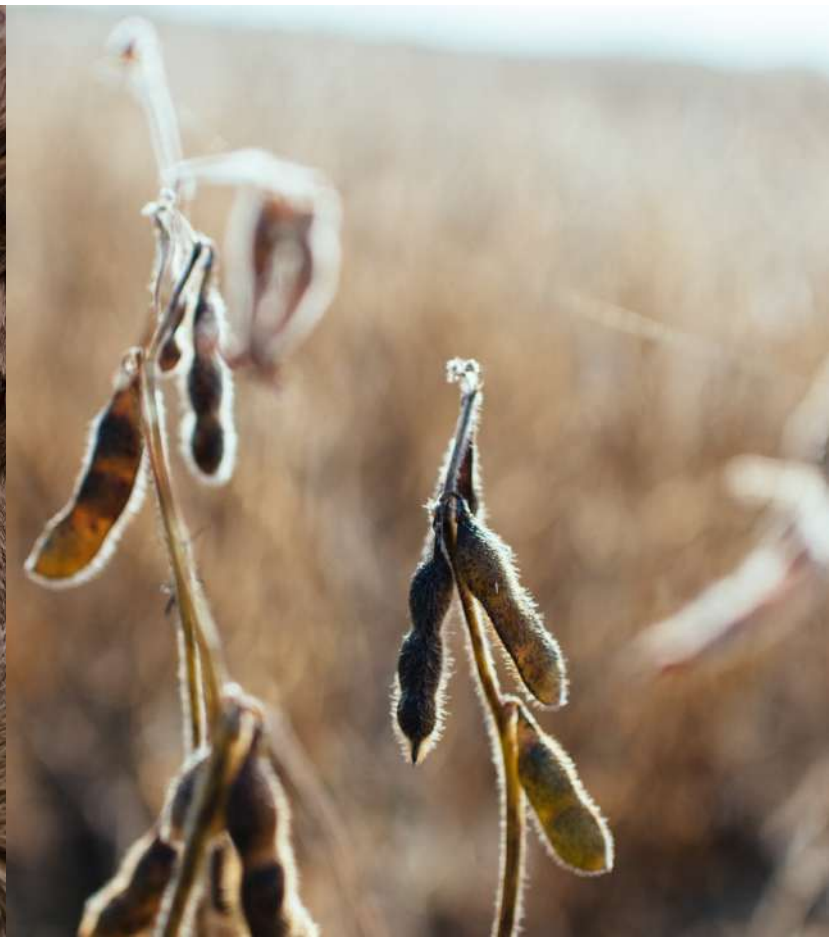
- U.S. financial institutions can experience financial risks in the form of value loss as well as reputation risk if key clients or sectors are heavily affected by changing consumer preferences and/or regulations related to imported FRCs.
- Although financial institutions have so far been excluded from zero-deforestation regulations in leading jurisdictions like the EU and the U.S., they still face multiple financial risks along these supply chains, including value and reputation risk.
- U.S. financial institutions are estimated to have low exposure to upstream actors linked to imported FRCs; medium exposure to importers and traders; and high exposure to processing companies, brand manufacturers, retailers, and food service companies.
- While U.S. financial institutions may have limited loans and investments in upstream supply chains, exposure to downstream companies is significant and embedded in financial networks (banks, funds, pensions) in the U.S.

Regulations In the Real World

The European Union Deforestation Regulation (EUDR) applies to imports of six commodities: cattle (beef and leather), cocoa, coffee, oil , rubber, soy and wood. This means that finished goods produced in the US contain FRCs, have a high risk of being import into the EU.

The accumulation of these impacts can lead to systematic financial risk, including:

1. Reputation and value risks could impact the value of loans and investments of financers. This could lead to financial instability and impact consumer confidence, causing economic damage and increasing the need for unemployment benefits.
2. The financial risks at companies, sectors and financial institutions can decrease the tax proceeds of local, state and federal government entities.
3. Scope 3 emissions from imported FRCs could increase the investment needed to achieve the carbon reduction targets set by the 2015 Paris Agreement.
4. Risks to crucial industries could affect U.S. financial performance and eventually lead to downgrades of government debt by rating agencies.



Imported Scope 3 Emissions from Deforestation

According to the data available, U.S. Scope 3 deforestation emissions from imported forest risk commodities (FRCs) totaled 21.24 $mtCO_2$ in 2019 or 0.35% of total U.S. emissions. That is equivalent to the total 2020 greenhouse gas emissions of countries like Croatia and Honduras, and larger than national emissions from countries like Congo, Nicaragua, and Panama.

III. Quantitative Results: Imported Deforestation Emissions and Associated Financial Risks

Beef was the largest contributor to imported Scope 3 deforestation emissions at 53%, followed by coffee at 27%, and rubber at 9%. Palm oil, cocoa, and soy made up the remaining 11% of total Scope 3 emissions from imported FRCs.

Figure 3. Relative Size of U.S. Imported Scope 3 Emissions: Agricultural Commodities

Relative Importance of U.S. Imported Scope 3 Emissions MtCO2-eq	2019	As % of U.S. Emissions	As % of Imported FRC Emissions
Beef	11.18	0.19%	53%
Soy	0.16	0.00%	1%
Palm Oil	1.55	0.03%	7%
Rubber	1.84	0.03%	9%
Cocoa	0.84	0.01%	4%
Coffee	5.67	0.09%	27%
Group Total	21.24	0.35%	100%
Overall U.S. emissions in 2019	6,040.00	100%	--

Note: Million tons carbon dioxide equivalent; Leather emissions are covered under beef; Paper/pulp/wood are not covered in most tables due to lack of data.

Gross emission numbers alone do not tell the whole story of the impact imported FRCs have on climate change, and are difficult to compare across countries and commodities.

IV. Quantifying the Climate Costs of Imported Deforestation Emissions

The goal of this report is to quantify the financial risks associated with deforestation emissions from imported FRCs.

Gross emission numbers alone do not tell the whole story of the impact imported FRCs have on climate change, and are difficult to compare across countries and commodities. The goal of this report is to quantify the financial risks associated with deforestation emissions from imported FRCs. However, there is no international standard for quantifying the climate cost of these emissions. The U.S. government and International Monetary Fund (IMF) use the $SCCO_2$ approach of CO_2 pricing per ton. The $SCCO_2$ is a measure that is conditional on the level of CO2 in the atmosphere and is a good way to value climate damage. The higher the CO_2 level, the more powerful the greenhouse effect. As a result, the physical damages from climate change are expected to be greater. For simplicity, the $SCCO_2$ (or carbon price) per ton was held constant over time in this analysis. The concept of using CO_2 costs to measure climate damage has been verified and is widely used by other studies[10, 11] In order to approximate the $SCCO_2$, we applied three scenarios with different underlying assumptions about the price.

Scenario Summaries: In Scenario 1, a price is applied based on various North American jurisdictions, assuming that the calculated emissions would be charged with a CO_2 price as a proxy for climate damage costs.[12] Scenario 2 uses the EU ETS price as of March 31, 2023. Scenario 3 uses a societal cost of carbon dioxide price ($SCCO_2$), which includes a wider societal cost concept and partly includes economic feedback loops in the Global South and an impact until 2100.

Scenario 1: While the United States does not apply a CO_2 cost for Scope 1, 2, and 3 emissions at a national level, various North American jurisdictions have implemented, scheduled or considered using carbon pricing models.[13] Scenario 1 is based on the average of these carbon prices, which according to the World Bank Carbon Pricing Dashboard, is USD 34.05 per ton of CO2.[14]

Figure 4. North American Carbon Pricing Initiatives

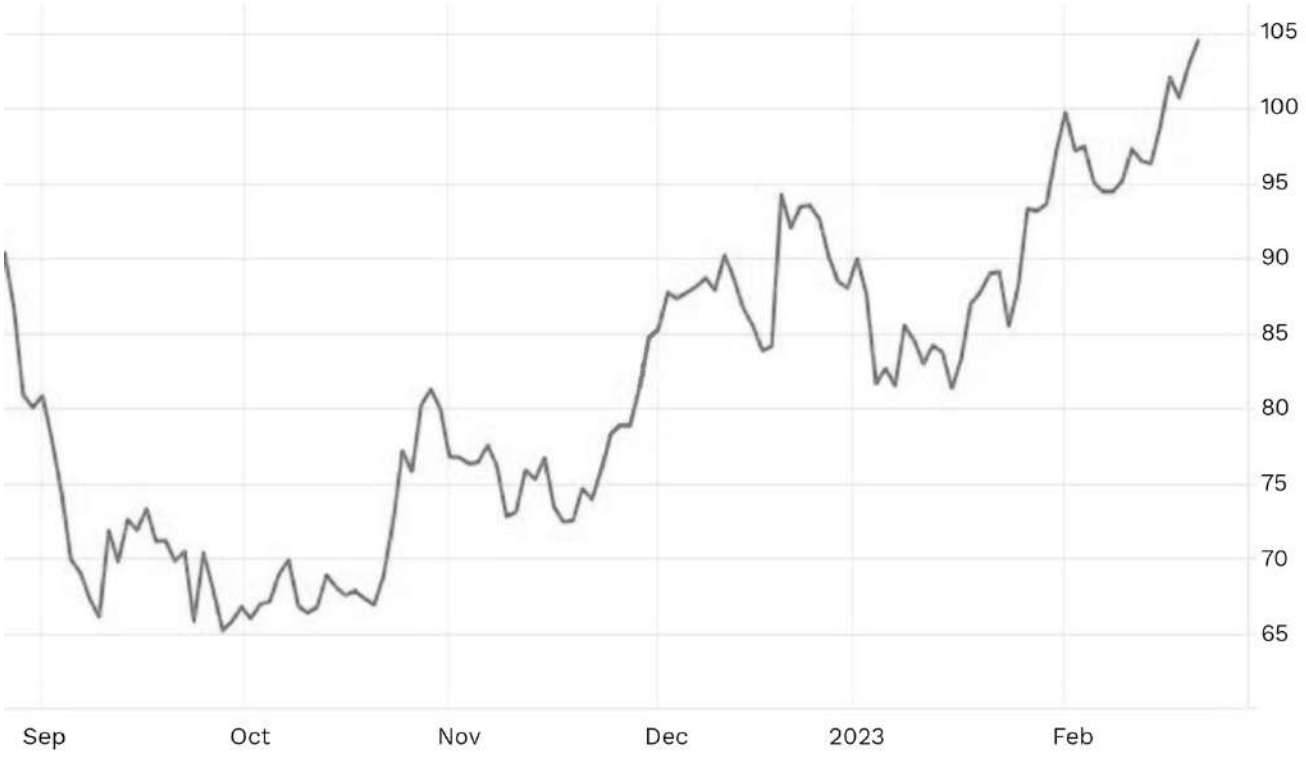
North America Carbon Pricing Initiatives 7/8/23	USD/ton CO_2e
Massachusetts	12.05
RGGI (Regional Greenhouse Gas Initiative)	15.39
Alberta	48.03
California	29.84
New Brunswick	48.03
Newfoundland and Labrador	48.03
Northwest territories	48.03
Nova Scotia	20.87
Ontario	48.03
Washington	22.2
Average	**34.05**

Source: World Bank's Carbon Pricing Dashboard, Profundo

[10] Rijk, G. and B. Kuepper (2023, July), € 0.7 Billion in profits, € 66 Billion in damages, Amsterdam, Netherlands: Profundo, report commissioned by Greenpeace Netherlands.
[11] Pham Van, L. and G. Rijk (2022, April), European Big Oil – Big Liability in Carbon, Pollution and Health Care Costs, Amsterdam, Netherlands: Profundo, report commissioned by Transport & Environment.
[12] Price as of March 31, 2023.
[13] The World Bank, "Carbon Pricing Dashboard", online: https://carbonpricingdashboard.worldbank.org/map_data, viewed August 2023.
[14] "Carbon Pricing Dashboard", The World Bank, May, 2017, https://carbonpricingdashboard.worldbank.org/.

Scenario 2: The European Union Emission Trading System (ETS) is the world's first and largest carbon market. The system, often referred to as "cap-and-trade," was established for specific high-emission industries. While it excludes Scope 3 emissions, it is a useful reference point for carbon pricing models. Within this system, price per ton of CO_2 has trended up since its introduction in 2004, reaching USD 96 per ton on March 31, 2023 (Figure 19). This price is used for Scenario 2.

Figure 5. EU ETS End of Year Prices (Euro/€)



Source: Carbon Herald[15]

While it can be argued that the EU CO_2 price per ton is relatively high due to the competition for emissions rights in a crowded continent, these prices are generally in line with global recommendations in multiple ways:

- Policymakers generally underestimate global CO_2 emissions prices because these costs often do not account for Scopes 1, 2, and 3 emissions. Moreover, policymakers often underestimate impacts by significantly discounting future damages, meaning that future damages are assumed to have a relatively low present value. Consequently, the future costs do not have a large impact on Discounted Cash Flow calculations, which is how companies compare current to proposed investments and costs.
- Current carbon price policy recommendations range from USD 51 to USD 202 per ton, making a price of USD 96 per ton a conservative and realistic figure.

Conservative societal cost models focus on short-term damage and assume climate change will have little or no lasting effect on economic growth, despite growing evidence to the contrary.

[15] "EU Carbon Price At All-Time High, Trading Over 100 euros/tonne", Carbon Herald, February 21, 2023, https://carbonherald.com/eu-carbon-price-at-all-time-high-trading-over-100-euros-tonne/.

Scenario 3: More recent calculations of the societal costs of climate change have ranged widely from USD 171 to USD 3,000 per ton. Expert groups of economists and climate scientists have calculated values of USD 171 and USD 310 per ton, respectively. Moreover, recent calculations for economic damage have increased due to the inclusion of higher damages in the Global South.[16] These latest $SCCO_2$ measures have a more forward-looking component, based on the projected cost to society of releasing an additional ton of CO_2, including climate damage costs and economic damages, which can increase as events interact, amplifying impacts across economies in a feedback loop.

One study shows that by 2100, global GDP could be 37% lower than it would be without the impacts of global warming, when taking the effects of climate change on economic growth into account. Without accounting for lasting damages, which are excluded from most estimates, GDP would be around 6% lower.[17] This means that in a broader societal cost concept, the impacts on growth may increase the economic costs of climate change by a factor of six. When taking more robust climate science and updated models into account, one study suggests that the economic damage could in fact be over USD 3,000 per ton of CO_2.[18] Scenario 3 is based on a $SCCO_2$ of $1,160 per ton of CO_2, which is the average of the USD 171, USD 310 and USD 3,000 calculations referenced above.

Figure 6. Carbon Costs of Deforestation Emissions from Imported FRCs in the Context of U.S. GDP

While Scope 3 emissions due to deforestation from imported FRCs represent the equivalent of around 0.35% of overall annual emissions generated in the United States, the economic value of these emissions is between 0.003% to 0.097% of the GDP depending on which scenario is used. This represents between USD 699 million and USD 1.866 billion annually.

CO_2 costs Imported FRCs			
	Scenario 1	Scenario 2	Scenario 3
Scope 3 emissions ($MtCO_2$-eq)	21.2	21.2	21.2
CO_2 price/ton (USD)	34.1	96.3	1,160.0
Total CO_2 costs (USD billion)	0.72	2.05	24.64
U.S. GDP (2022, USD billion)	25,463	25,463	25,463
Scope 3 imported FRC costs as % of GDP	0.003%	0.008%	0.097%

Source: AidEnvironment, Profundo, The World Bank, Tradingeconomics.

Revenue at Risk in Imported FRC Value Chains

The table below shows the financial risks that each sector's key importers could face based on their exposure to countries and sectors with high levels of deforestation risks. Notably, over 90% of rubber, palm oil, and cocoa imports originate from deforestation-risk countries, while paper/pulp carries the least amount of exposure at 9%.

Analysis of the top 15 importers within each commodity sector studied reveals that deforestation risk is most concentrated within Brazil, Indonesia and Cote d'Ivoire, which are the main sourcing countries for beef, coffee, rubber and

[16] Kikstra, J.S., P. Waidelich, J. Rising, D. Yumashev, C. Hope and C.M. Brierley (2021, September 6), "The social cost of carbon dioxide under climate-economy feedbacks and temperature variability", Environmental Research Letters, 16: 094037.
[17] UCL News (2021, September 6), "Economic cost of climate change could be six times higher than previously thought", online: https://www.ucl.ac.uk/news/2021/sep/economic-cost-climate-change-could-be-six-times-higher-previously-thought, viewed July 2023.
[18] Ibid.

cocoa. For example, 54% of the global beef market is sourced from countries with high deforestation risks, and as the leading beef supplier, Brazil represents 37% of the global deforestation risks tied to beef. This environment means that if certain commodities tied to illegal deforestation are banned from importation into the U.S., this could significantly impact the financial outlook of major stakeholders across the value chain.

Figure 7. U.S. Imported Forest Risk Commodities and Top 15 Importers (2022)

Total imports and top-15 importers 2022						
Metric tons	Global	From forest-risk countries	% of supply from forest-risk countries	Top-15	Main sourcing country	% of forest-risk (by country)
Beef (HS 0202 and HS 160250—frozen, prepared, and preserved beef)	551,098	298,862	54%	109,953	Brazil	37%
Coffee (HS 0901)	1,625,154	1,291,166	79%	282,969	Brazil	22%
Rubber, natural (HS 4001)	1,073,450	993,433	93%	340,536	Indonesia	34%
Palm oil (HS 1511)	1,692,001	1,673,181	99%	913,174	Indonesia	55%
Cocoa (HS 1801)	343,802	320,324	93%	277,552	Côte d'Ivoire	87%
Paper and paper pulp	12,426,971	1,167,952	9%	N/A	N/A	N/A

Source: AidEnvironment, Profundo. Leather and wood are not considered due to lack of data from AE

Figure 8. Value of Imports of Forest-Risk Commodities in the U.S. (2022)

Total value forest-risk							
Value	Per unit (end 2022)	Per ton (USD)	Top-15 (mln ton)	Top-15 (USD M)	Top-15% of forest-risk	Total forest-risk (USD M)	As % of total
Beef	BRL 19.62/kg	3,709	0.109953	408	37%	1,108	19%
Coffee	USD 1.673/lbs	759	0.282969	215	22%	980	17%
Rubber, natural	USD 130.2 c/kg	1,302	0.340536	443	34%	1,293	22%
Palm oil (HS 1511)	MYR 4,174/ton	949	0.913174	867	55%	1,588	27%
Cocoa (HS 1801)	USD 2,600/ton	2,600	0.277552	722	87%	833	14%
Total				2654		5,803	100%

Source: AidEnvironment, Trading Economics, Profundo. Leather and paper/pulp/wood are not considered due to lack of data.

The total value of the imported FRCs analyzed (beef, coffee, natural rubber, palm oil and cocoa)[19] can be calculated at USD 5.803 billion.[20] However, this does not factor in the total revenue at risk when considering how price markups affect commodities across the value chain. For example, importing companies mark up prices when selling their products to other, often larger, companies that then sell the processed and branded products to consumers at yet a higher price. Value-adding processes, such as processing, labor, marketing and financing, contribute to markup and can lead to a higher value at risk for products downstream in the supply chain that are dependent on forest-risk commodities. These factors are significant when considering a commodity that represents a relatively small input in a high-margin finished good, because risk to that input can jeopardize the entire value of that product. To understand the total revenue at risk, this analysis multiplies the value of imported FRCs by the markup ratios in the value chain.

Price markup in a supply chain is calculated by comparing the net sales price (net revenues) of the end product with the cost of goods sold (variable input costs).

Price markups and profit distribution models explain how the value of an embedded commodity increases with every step of the downstream segments in the chain for commodities including beef, palm oil, soy and sugarcane. Each step in the supply chain earns a gross profit and an operating profit. For this analysis, the price markup factor is important when analyzing the total impact that emissions from deforestation can have on U.S. supply chains in the commodity sectors studied.

The table below shows how embedded commodity prices are marked up by over 100% across the supply chain. In some cases, the total value is doubled and even tripled.

[19] In the rest of this section, the operational and regulatory risks are calculated as a total number for the whole sector. This is because specific data on each company mentioned in the top-15s are not available. Company specific gross margins, added value, and volumes were not available.
[20] Based on prices from 2022.

Figure 9. Price Markups in Key Commodity Value Chains

Value chain Index = 100	Beef	Soymeal	Sugarcane	Palm	Average
Farmer	100	100	100	100	100
World price soy/resp beef		100			
Average trader/cruncher		111	130	115	119
Animal feed		139			
Farmer in sourcing country		139			
Midstream/downstream animal products	123	183			
Downstream dairy		198			
Egg packer		162			
Average downstream, or brand company		181	280	160	207
Retailer/food service	202	302	350	194	262

As a next step, the markup ratios from import to retail are applied to the import values of the various commodities. The table below shows this value enhancement. Various markup ratios affect each individual value chain. As a result, the total value of these imported FRCs skyrockets to USD 13.25 billion.

Figure 10. Value Enhancement in Key U.S. Import Value Chains

Value enhancement in chain				
	Total forest-risk (USD Million)	Markup factor (x)	Chain value (USD Million)	As % of total
Beef	1,108	1.64	1,818	14%
Coffee	980	2.69	2,636	20%
Rubber, natural	1,293	2.69	3,479	26%
Palm oil (HS 1511)	1,588	1.94	3,080	23%
Cocoa (HS 1801)	833	2.69	2,240	17%
Total	5,803		13,254	100%

Source: Chain Reaction, Profundo
Note: Beef includes the markup up from midstream to retailers; for coffee, cocoa and rubber the escalation from 130 (trader) to 350 (or 2.69x) of sugarcane is used because brand marketers are very strong in this chain and generate high gross margins.

Risks to Financial Stability

With 40% of U.S. GDP generated in sectors with exposures to commodity-driven deforestation, the related emissions risks can have sizable impacts on the U.S. financial system.[21] In addition to the wide variety of risks driven by the physical risks

[21] "Climate-Related Forest, Food, And Land Risks Threaten US Financial Stability", Climate Advisers, January 13, 2022, https://www.climateadvisers.org/insightsfeed/climate-related-forest-food-and-land-risks-threaten-us-financial-stability/.

of deforestation outlined in the figure below, we can analyze each imported FRC value chain to understand the risks that deforestation emissions pose for U.S. financial stability.

Figure 11. Financial Stability Impact Categories: Climate-related Forest, Food and Land Risk

Source: Climate Advisers

We calculated the monetary value of deforestation emissions in imported FRC supply chains as a reference to better understand the climate damage they cause.

In Scenario 1 (using the climate costs of North American jurisdictions), the total climate costs are USD 718 million from imported FRCs. This is 5% of the total value chain. Beef is the segment with the highest relative climate damage costs, at 21%. Note that these percentages are relative to the quantity of the commodity input used to produce a finished product, not to the full finished product. For example, for a bottle of shampoo containing 10% palm oil products, climate damage costs would be 10% of the final price, as the full price of a shampoo bottle contains more ingredients outside of the palm oil content. However, the total value of the finished product may also be at risk if there is a lack of viable substitutes for commodity input.

Figure 12. U.S. Climate Damage Costs as percentage of Total Revenue at Risk: Scenario 1

Value Chain & Emission Damage (Scenario 1) USD million $	Chain value	Scope 3 emissions (Mt CO_2-eq)	Pricing CO_2/ton (USD)	Climate costs	% of chain value
Beef	1,818	11.18	34.05	381	21%
Coffee	2,636	5.67	34.05	193	7%
Rubber, natural	3,479	1.84	34.05	63	2%
Palm oil (HS 1511)	3,080	1.55	34.05	53	2%
Cocoa (HS 1801)	2,240	0.84	34.05	29	1%
Total	13,254	21.08	34.05	718	5%

Each scenario has a different CO_2 price, which means that climate costs increase across each scenario. For example, imported deforestation-risk beef has climate damage representing 21% of its value chain revenue at risk in Scenario 1, but

in Scenario 3, this jumps to 712% due to the extremely high societal cost of CO_2 used in this scenario. That is, including externalized climate costs would raise the retail price of imported beef by more than 7 times. In total, the climate damage costs in the three scenarios range from 5% of the value of all chains in Scenario 1 to 184% in Scenario 3.

Figure 13. U.S. Climate Damage Costs as percentage of Total Revenue at Risk: All Scenarios

Chain value, damage, all scenarios	Scenario 1	Scenario 2	Scenario 3
CO_2 price/ton (USD)	34.1	96.3	1,160
Beef	21%	59%	712%
Coffee	7%	21%	249%
Rubber, natural	2%	5%	61%
Palm oil (HS 1511)	2%	5%	58%
Cocoa (HS 1801)	1%	4%	43%
Total/higher climate damage costs in value chain as a % of total	**5%**	**15%**	**184%**

Civil Society Pressure: Consumer Demand Changes from Climate Transitions

Operational business risks from climate transitions stem from civil society pressure, changes in customer preferences and regulation. Granular data on demand elasticity is not available, but we can still use relative CO_2 pricing to understand the market reaction and simulate civil society risks from climate transitions. This aligns with projections for consumer demand shifts away from emissions intensive production as climate impacts intensify. This reaction would translate to a 5% decline in embedded imported FRC sales in Scenario 1, a 15% decline in Scenario 2, and a 184% decline in Scenario 3.

Based on an average 56% gross margin[22] in the supply chain of the embedded imported FRCs, gross profits would decline by USD 404 million to USD 7.45 billion due to civil society pressure. In a discounted cash flow (DCF) context, and assuming the losses are structural, the decline in profits would range between USD 4.48 billion and USD 82.71 billion.[23]

[22] Based on Table 8 by dividing the value enhancement in the chain by the total chain value, or USD 13.254 billion minus USD 5.803 billion, divided by USD 13.254 billion.
[23] A discount rate is used to calculate the Net Present Value (NPV) of a business or activity as part of a Discounted Cash Flow (DCF)analysis. The principal thought is that 1 Euro in year 2 is seen as less valuable than 1 Euro in year 1. By using a 7% discount rate and no growth, a gross profit or cash flow of 1 Euro, with a 25% tax rate deduction, would lead to a value of 11.1 Euro.

Figure 14. Civil Society Transition Risk from Imported Forest-Risk Commodities: All Scenarios

Impact on financial system USD (millions)	Scenario 1	Scenario 2	Scenario 3
CO_2 price/ton (USD)	34.1	96.3	1160
Total impact	-718	-2,027	-13,254
Gross margin in chain/added value	56%	56%	56%
Change in gross profit	-404	-1,140	-7,452
Multiply factor for DCF value (x)	11.1	11.1	11.1
Value impact based on DCF	-4,479	-12,650	-82,713

Reputation Value Risk

Reputation loss occurs on top of the related losses in revenues, profits, and the calculated loss in value.

Chain Reaction Research studies have calculated the potential reputation loss for individual companies, showing that reputation events can impact a company's value by up to 30%.[24] Potential reputation impacts have increased exponentially because of the acceleration of information dissemination and greater transparency brought by social media. Reputation damage related to negative events can have a negative material impact on company value through intangible assets in the form of brand value. Companies can work to mitigate reputational impacts through transparency and proactive supply chain management. In the long term, a good reputation can improve stakeholder relationships, talent retention, and ultimately, earnings capacity. Companies with stronger reputations also tend to benefit from lower costs of capital.

As consumers become more aware of deforestation's climate impact, fast-moving consumer goods (FMCGs) companies could experience impacts of up to 70% of total value based on reputation.[25] In response, more companies are adopting commitments related to industries linked to deforestation, such as palm, soy and cattle. With increased transparency, differences in climate and deforestation policies and governance among FMCGs become more obvious. The leaders in these industries could outperform laggards substantially as transparency continues to increase, highlighting the investment hazard related to reputation risk from links to deforestation.

Chain Reaction Research reports also noted that lagging efforts of FMCG companies in executing on their No Deforestation, No Peat and No Exploitation (NDPE) commitments led to deforestation and reputation risks ranging between USD 16 billion and USD 82 billion.[26] This methodology is best suited for companies focused on one product, such as oil and gas majors, and yields a reputation risk of 0.1 to 30% of market cap. A second Chain Reaction Research methodology is more relevant for diversified companies and shows reputation risk ranging from 2.9% to 14.7% of market cap.[27]

[24] Gerard Rijk, Tim Steinweg, Matt Piotrowski, Chain Reaction Research (2020, 9 May), "Deforestation-Driven Reputation Risk Could Become Material for FMCGs", online: https://chainreactionresearch.com/report/deforestation-driven-reputation-risk-could-become-material-for-fmcgs/, viewed July 2023
[25] Gerard Rijk, Tim Steinweg, Matt Piotrowski, Chain Reaction Research (2020, 9 May), "Deforestation-Driven Reputation Risk Could Become Material for FMCGs", online: https://chainreactionresearch.com/report/deforestation-driven-reputation-risk-could-become-material-for-fmcgs/, viewed July 2023
[26] Gerard Rijk, Tim Steinweg, Matt Piotrowski, Chain Reaction Research (2020, 9 May), "Deforestation-Driven Reputation Risk Could Become Material for FMCGs", online: https://chainreactionresearch.com/report/deforestation-driven-reputation-risk-could-become-material-for-fmcgs/, viewed July 2023
[27] Gerard Rijk, Christopher Wiggs, Matt Piotrowski (2020, 2 July), "FMCGs' Lagging Efforts in NDPE Execution Lead to Deforestation, USD 16-82B Reputation Risk", online: https://chainreactionresearch.com/report/fmcgs-laggingefforts-in-ndpe-execution-lead-to-deforestation-usd-16-82b-reputation-risk/, viewed July 2023.

Considering the dependence that certain industries such as coffee, palm oil and rubber have on imported FRCs, some downstream industry segments could face a relatively high reputational risk. For example, coffee brands and coffee retail/food service. Further research on this stream is needed to quantify the extent of this risk.

This analysis applies 2.9%, 14.7%, and 30.0% of reputation risk to Scenarios 1, 2 and 3, respectively. Using these inputs, total reputation value at risk ranges from USD 2.39 billion to USD 24,814 billion, as seen in the figure below.

Figure 15. Reputation Risks: All Scenarios

Reputation value-at-risk USD (millions)	Scenario 1	Scenario 2	Scenario 3
Total forest-risk	5,803	5,803	5,803
Chain value	13,254	13,254	13,254
Added value	7,452	7,452	7,452
Multiply factor for DCF value (x)	11.1	11.1	11.1
Market value	82,713	82,713	82,713
Reputation risk percentage	2.90%	14.70%	30.00%
Reputation value risk of imported FRC supply chain actors	2,399	12,159	24,814

Figure 16. Summary of Financial Risks

Across the three climate cost scenarios, the total financial risks associated with deforestation-risk supply chains range from USD 7.28 billion to USD 114.98 billion. This represents between 0.01% to 0.14% of all U.S. bank assets and assets under management.

Total risk: Operational business risks + reputation + financing risk USD (millions)	Scenario 1	Scenario 2	Scenario 3
CO_2 price/ton (USD)	34.1	96.3	1160
Operational business risk annually	-404	-1140	-7452
Value impact based on DCF	-4,479	-12,650	-82,713
Reputation risk	-2,399	-12,159	-24,814
Total value-at-risk	-7,281	-25,948	-114,979
Total assets	77,700,000	77,700,000	77,700,000
As % of U.S. financed assets 2022/23	-0.01%	-0.03%	-0.15%
Total value-at-risk, annualized	(655.99)	(2,337.67)	(10,358.44)
U.S. GDP 2022	25,463,000	25,463,000	25,463,000
As % of U.S. GDP 2022	0.003%	0.009%	0.041%

Risk for Financial Institutions Directly Invested in Imported FRCs

From 2018 to 2023, U.S. financial institutions provided USD 23.72 billion in financing to deforestation-risk palm oil, beef, soy, and pulp/paper sectors. Analysis results in this section are adjusted based on the percentage of activities in a specific commodity and only contain identified flows based on public information.

It should be noted that the analysis may significantly underestimate the value of deforestation-related financial risks that financial institutions face, because it does not factor in financial flows to downstream industries. While financial institutions typically have limited loans and investments in the upstream supply chain, exposure to downstream industries is more widespread and often more embedded within the U.S. financial network, including banks, funds and pensions. These numbers would need to be adjusted for the relative magnitude of imported FRCs embedded in their supply chain.[28]

Figure 17. U.S. Financial Institution Financing to Forest-Risk Sectors

U.S. financial institution financing to forest-risk commodities							
USD (millions)	Beef	Palm oil	Pulp & paper	Rubber	Soy	Timber	Total
Bond issuance	279	433	3,645	68	175	108	4,708
Bondholding	98	327	1,566	0	175	19	2,185
Corporate loan	683	106	1,476	23	778	63	3,131
Revolving credit facility	0	1,005	631	69	617	264	2,586
Share issuance	387	857	399	8	17	1	1,669
Shareholding	454	4,484	2,808	281	1,253	169	9,447
Total	**1,901**	**7,212**	**10,526**	**449**	**3,015**	**624**	**23,727**

Source: Profundo based on Forests & Finance - global forest-risk sectors, including forest-risk countries

Nearly two-thirds of the total forest-risk financing by U.S. financial institutions is related to forest-risk activities in Latin America. In total, equity-related activities (shareholding, share issuance, etc.) are as large as debt-related flows.

Figure 18. U.S. Financial Institution Financing to Forest-Risk Sectors by Financial Vehicle and Region

US Financial Institutions financial flows					
USD (millions)	Central & West Africa	Latin America	Southeast Asia	Total	% of total
Bond issuance	29	4,169	511	4,708	20%
Bondholding	11	1,844	331	2,185	9%
Corporate loan	5	3,011	115	3,131	13%
Revolving credit facility	49	1,318	1,219	2,586	11%
Share issuance	13	408	1,247	1,669	7%
Shareholding	137	4,380	4,931	9,447	40%
Total	244	15,129	8,354	23,727	100%
% of total	**1%**	**64%**	**35%**	**100%**	

Source: Profundo based on Forests & Finance - global forest-risk sectors, including forest-risk countries. Note: See Appendix

[28] Example: if 10% of a branded company's input is related to embedded forest-risk palm, the assumption is that 10% of its debt and share value is committed to financing activities linked to this commodity.

Specifically, Forests & Finance identified USD 4.93 billion in adjusted financial flows of several companies identified among the top 15 importers of forest-risk commodities into the U. S. More than half of these financing flows were directed to the companies' activities in Southeast Asia.

Figure 19. U.S. Financial Institutions Financing to Forest-Risk Sectors: Top 15 Importers by Financial Vehicle and Region

Top 15 companies USD (millions)	Central & West Africa	Latin America	Southeast Asia	Total	% of total
Bond issuance	4	92	101	197	4%
Bondholding	8	178	216	402	8%
Corporate loan	0	4	4	8	0%
Revolving credit facility	17	305	469	792	16%
Share issuance	5	109	59	174	4%
Shareholding	88	1,280	1,994	3,362	68%
Total	123	1,968	2,844	4,935	100%
% of total	**2%**	**40%**	**58%**	**100%**	

Source: Profundo based on Forests & Finance - global forest-risk sectors, including forest-risk countries and top 15 importers by commodity. Note: See considerations on Forests & Finance data in Appendix.

Commodity-Specific Summary Results

Beef

1. Across the three carbon price scenarios, climate costs of deforestation emissions in the imported beef value chain ranges from **USD 381 million to USD 2.24 billion.** If the climate costs of emissions from deforestation were factored into pricing, **retail prices of imported beef would increase by 7 times.**
2. Between 2018 and 2023, U.S. financial institutions financed **USD $1.9 billion** related to beef imports with deforestation risks.
3. The value of the beef supply chain involving imported FRCs, including pricing markups, is nearly **USD 1.82 billion, 14% of the value** of all imported FRC chains analyzed.
4. Beef imports account for **11.18 $mtCO_2$** of imported deforestation emissions, with 7.194 $mtCO_2$ **(64%)** of these imported emissions originating from Brazil's bovine sector.
5. The U.S. imported **1.256 billion kg of beef and leather products** in 2022.
6. **Nearly half (49.81%)** of imports from the top three categories (frozen bovine, prepared/preserved meat and fresh/chilled bovine) came from deforestation-risk countries.
7. Major Brazilian meatpackers have taken action to reduce deforestation in supply chains in recent years, but indirect suppliers remain a major source of exposure to deforestation emissions. Pasture occupies **90% of deforested area in the Amazon** and major meatpackers have seen

thousands of indirect suppliers clear **over 50,000 hectares between 2008 and 2019.**[29, 30]

8. Ten out of the top 15 U.S. beef importers, accounting for **61% of U.S. beef imports**, have headquarters in the United States.
9. Chinese multinational firms make up a large portion of the U.S. imports of beef from Brazil due to large consumer appetites for Brazilian beef.
10. Brazil is still recovering from Bolsonaro's tenure, where budget cuts led to rising deforestation until 2020. **In the first half of 2023 deforestation fell by 34%.**[31]

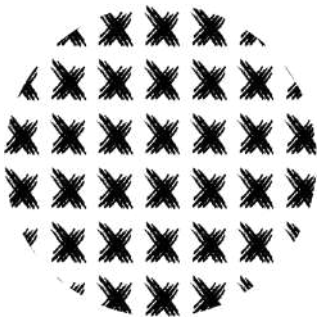
Coffee

1. Across our three carbon price scenarios, climate costs of deforestation emissions in the value chain of imported coffee ranges from **USD 193 million to USD 6.87 billion.**
2. The value of the coffee supply chain involving imported FRCs is nearly **USD 2.64 billion, around 20% of the value** of all imported FRC chains analyzed. This includes price markups, which are much higher in coffee than sectors like beef, because of higher differentiation values in coffee finished goods.
3. Coffee imports to the U.S. total 1.63 billion kg and result in **5.67 mtCO_2** of emissions due to deforestation every year.
4. **Brazil (29%) and Colombia (19%)** contribute to nearly half of U.S. coffee imports, but account for **80.3% of imported emissions** due to deforestation.
5. **Brazil's Atlantic Forest has been reduced to just 12.4%** of its once vast size, due to deforestation driven by coffee cultivation and other development. In Colombia, the smallholder-driven coffee market has seen its coffee growing region lose 20% of its sunlight due to increasing cloud cover.[32]
6. Four out of the top 15 U.S. coffee importers, accounting for **34% of U.S. coffee imports**, have headquarters in the United States.
7. Major importers, such as Folgers (15% of imports) and Starbucks (10% of imports), have partnered with third parties and committed to pledges of transparency and traceability. Starbucks reports that 98% of the company's coffee farms have not converted forest into agricultural land since 2004.[33]
8. Major initiatives in reforestation and lawmaking processes are ongoing in Brazil and Colombia, reducing deforestation in both countries and advancing zero-deforestation commitments.

[29] P. Barreto, "Políticas Para Desenvolver a Pecuária Na Amazônia Sem Desmatamento," Imazon, September 4, 2021, https://imazon.org.br/publicacoes/politicas-para-desenvolver-a-pecuaria-na-amazonia-sem-desmatamento/.
[30] "Fighting Illegal Deforestation and its Drivers in Brazil", Center for Climate Crime Analysis, 2023, https://climatecrimeanalysis.org/project/fighting-illegal-deforestation-and-its-drivers-in-brazil/.
[31] Pulice and Spring, "Deforestation in Brazil's Amazon drops 34 percent in first half 2023", Reuters, July 7, 2023, https://www.reuters.com/business/environment/deforestation-brazils-amazon-drops-34-first-half-2023-2023-07-06/.
[32] R. Shiffman, "As Climate Changes, Colombia's Small Coffee Farmers Pay the Price", Yale Environment 360, July 11, 2019, https://e360.yale.edu/features/as-climate-changes-colombias-small-coffee-farmers-pay-the-price
[33] "Ending Deforestation", Starbucks, https://content-prod-live.cert.starbucks.com/binary/v2/asset/137-71876.pdf

Rubber

1. Across our three carbon price scenarios, climate costs of deforestation emissions in the value chain of imported rubber range from **USD 63 million to USD 1.92 billion.**
2. The value of the rubber supply chain involving imported FRCs is roughly **USD 3.48 billion. representing 26% of the total value** of all imported FRCs, the highest of all analyzed commodities.
3. The U.S. imports around **1.84 $mtCO_2$** of emissions due to deforestation from 1.07 billion kg of annual natural rubber imports.
4. **The vast majority (93%)** of U.S. natural rubber imports originate from deforestation-risk countries, with **49% from Indonesia** and 25% from Thailand.
5. **Indonesia accounts for 66%** of imported emissions due to deforestation in the rubber industry, with Liberia contributing 20%.
6. Indonesia has seen rubber plantations convert to more profitable palm oil plantations at around 2% annually.[34]
7. Across Indonesia and Thailand, **over 4 million hectares of forest have been cleared** for rubber plantations over the past 30 years, and **only 7% of related companies disclose information** on how they monitor deforestation in their supply chains.[35]
8. Traceability is trending up, as the Global Platform for Sustainable Natural Rubber has increased membership to 50% of the natural rubber market and is working to verify that rubber is compliant with sustainability standards.[36]
9. Tree cover loss in Indonesia and Malaysia for rubber cultivation has **significantly decreased from 2017 to 2021**, with most major importers such as Goodyear (33% of imports) maintaining a large-scale commitment to sustainability.



Palm Oil

1. Across our three carbon price scenarios, climate costs of deforestation emissions in the value chain of imported palm oil ranges from **USD 53 million to USD 153.7 billion.**
2. The value of the palm oil supply chain that involves imported FRCs is **USD 3.08 billion, which is the second highest** of all imported FRCs analyzed, at **23% of the total.**
3. Between 2018 and 2023, U.S. financial institutions financed **USD 7.21 billion related to palm oil imports with deforestation risks.**
4. The United States imports around **1.55 $mtCO_2$** in emissions due to deforestation within the palm oil industry, based on 5.34 billion kg in palm oil imports.

[34] H. Jayathilake, et al. "The Conversion of rubber to oil palm and other landcover types in Southeast Asia", January, 2023, https://www.sciencedirect.com/science/article/abs/pii/S0143622822002090
[35] S. Ginger, "Comment: Why are rubber companies keeping investors in the dark over deforestation risk?", Reuters, May 25, 2023, https://www.reuters.com/sustainability/sustainable-finance-reporting/comment-why-are-rubber-companies-keeping-investors-dark-over-deforestation-risk-2023-05-25/
[36] "GPSNR Policy Framework", The Global Platform for Sustainable Natural Rubber, March 30, 2023, https://sustainablenaturalrubber.org/policy-framework/

5. **Nearly all (99%)** palm oil (HS 1511) imports come from deforestation-risk countries, with **55% originating from Indonesia.**
6. Indonesia, the world's largest palm oil supplier, represents **95% of U.S. imported deforestation emissions** linked to the palm oil sector.
7. Between 2001 and 2019, **32% of the 9.8 million hectares of forest cover loss in Indonesia** was caused by deforestation related to palm oil.
8. Deforestation in the palm oil industry has **fallen by 82%** in the last decade, and the Indonesian government has extended moratoriums and other protections to prevent forest destruction.
9. There has been an industry-wide shift towards preventing deforestation, as many major companies and U.S. importers of palm oil from Indonesia have committed to prevention policies, with mainly positive results.
10. The U.S. carries relatively low deforestation risk from raw palm oil materials because these represent a small share of all Indonesian exports. In addition, 99% of these imports come from companies with zero-deforestation commitments. However, revenue risk is still significant due to the widespread use of palm oil across many categories of high margin products. This study does not include imports of finished goods with deforestation in their supply chains.

Cocoa

1. Across our three carbon price scenarios, climate costs of deforestation emissions in the value chain of imported cocoa range from **USD 29 million to USD 62.35 billion.**
2. The value of the cocoa supply chain involving imported FRCs is **USD 2.24 billion, 17% of the total value** of all imported FRCs in this study.
3. The U. S. imports over 1.5 billion kg of cocoa products, along with **0.84 $mtCO_2$** of emissions due to deforestation in the cocoa sector, particularly from cocoa beans. Most cocoa imported into the U.S. comes as an ingredient within products manufactured outside the country. While these products, which contain embedded deforestation risk, are not analyzed in this report because it focuses on raw bean imports.
4. **The vast majority (93%)** of the 344 million kg of U.S. cocoa bean imports come from deforestation-risk countries, including **50% from Côte d'Ivoire**, the world's largest cocoa producer.
5. Côte d'Ivoire faces major challenges in combating illegal deforestation in the cocoa sector due to governance issues, lack of law enforcement, and widespread expansion driven by poverty. It has lost **80% of its forests since 1960**, with 37% of forest loss occurring in protected areas.[37]
6. Despite numerous signed agreements between governments and large cocoa and chocolate stakeholders, including the Cocoa & Forests Initiative (CFI), nearly **20,000 hectares of forest have been lost between 2019 and 2022.**[38]
7. Only one company out of the top 15 cocoa importers to the U.S. (Cargill, 16% market share) has headquarters in the country. The industry has large-

[37] F. Pearce, "The Real Price of a Chocolate Bar: West Africa's Rainforests", Yale Environment 360, February 21, 2019, https://e360.yale.edu/features/the-real-price-of-a-chocolate-bar-west-africas-rainforests
[38] T. Slavin, "After five years, recipe to end deforestation from cocoa farming remains elusive", Reuters, January 20, 2023, https://www.reuters.com/business/sustainable-business/after-five-years-recipe-end-deforestation-cocoa-farming-remains-elusive-2023-01-20/

scale traceability issues that result in hundreds of millions of kilograms of cocoa being untraceable. Some companies have set targets for traceability, with a majority set before 2025.

8. While the Cocoa & Forests Initiative is being renegotiated to be more comprehensive, collective action and buy-in from all stakeholders is critical to prevent expansion into protected lands and help the small, family-run farms that are the backbone of the industry.

Soy

1. Soy imports to the U.S. are around 1.1 billion kg, but only result in **0.157 $mtCO_2$** in emissions due to deforestation every year. This relatively low amount is due to high U.S. domestic soy production and limited trading connections with large international deforestation-risk soy suppliers in Brazil.
2. Argentina supplies the largest imported soy volume to the U.S. of any deforestation-risk country, accounting for **5% of U.S. soy oilcakes** (27.4 million kg) and **26% of soybean** (126.3 million kg) imports.
3. **The vast majority (95%)** of soy-related deforestation in Argentina between 2015 and 2019 occurred in areas that represent just 4% of soy exports and 10% of overall soy production.[39, 40]
4. Since 1996, **Argentina has cleared a quarter of its native forests**, much of it for the soy industry. This is due in large part to individual states, such as Salta, approving massive clearing projects.[41]
5. The concentration of soy-related deforestation, global shifts against deforestation-risk commodities, and country-wide efforts to improve traceability with online platforms such as ViSeC all contribute to making imported soy deforestation risk comparatively easy to mitigate in U.S. supply chains.
6. Argentina is targeting early 2025 for the first fully deforestation-free shipments of soy.

[39] T. Reis, "Opportunities for deforestation-fee sourcing in Argentina", Trase Insights, August 22, 2022, https://www.reuters.com/business/sustainable-business/after-five-years-recipe-end-deforestation-cocoa-farming-remains-elusive-2023-01-20/
[40] K. Brown, "Can the EU'S deforestation law save Argentina's Gran Chaco from soy?", Mongabay, June 6, 2023, https://news.mongabay.com/2023/06/can-the-eus-deforestation-law-save-argentinas-gran-chaco-from-soy/
[41] U. Goñi, "Soy destruction in Argentina leads straight to our dinner plates," October 26, 2018, https://www.theguardian.com/environment/2018/oct/26/soy-destruction-deforestation-in-argentina-leads-straight-to-our-dinner-plates

Appendix:

Considerations for discussing results from Forests & Finance data included in this report:

- These are only financial relationships that could be identified from public sources. This may exclude some financial flows. For example, bilateral loans are usually not identified within publicly available data.
- This data includes direct links to active forest-risk companies but lacks data for many importing companies that have an indirect relationship to deforestation on the ground.
- The top-15 lists for beef and other commodities lack downstream companies in the U.S., making downstream analysis difficult.
- Figure 16 depicts a total value-at-risk in Scenario 3 of up to USD 115 billion, which far exceeded the financing identified in Figure 17. This is due to the lack of data on downstream companies, as well as the fact that only U.S. financiers have been included in Figure 17.

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