The High Cost of Ignoring Scope 3 Deforestation Emissions

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

Executive Summary

This report by Orbitas, AidEnvironment, and Profundo shines a light on the climate-related financial risks of deforestation emissions tied to commodities imported into the United States. The findings of this analysis present 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 emissions (those emissions occurring within its supply chain or through use of a company's goods and services) for these goods specifically related 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 to potential future financial risk and their broader portfolios potentially exposed to harsher impacts from climate change.

As the U.S. Securities and Exchange Commissions (SEC) finalizes its climate emissions disclosure rule for investors, the issue of Scope 3 emissions measurement and disclosure has been a center of many debates. 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 rule from the SEC found 97 percent of investors support some form of mandatory disclosure of Scope 3 emissions.[1] While some actors contest the value of Scope 3 emission reporting, in this report we find that there are material risks from deforestation emissions to investors worth disclosure and action.

For many of the world's largest and most well-known corporations, Scope 3 emissions can be greater than 83 percent 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 percent of the company's total Scope 1, 2, and 3 emissions are generated from deforestation driven by imported FRCs.[3]

Deforestation left unchecked will put the world on a path to overshoot two degrees of global warming even if all other emissions were halted and induce trillions of dollars in damage to the global economy within this century if it continues. Agricultural expansion for imported FRCs such as beef, soy, and palm oil are the primary drivers of forest loss causing 83 percent of non-wildfire forest loss in 2021.[4] Additionally, deforestation reduces the world's carbon sinks, which

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[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.

impedes carbon capture opportunities for years to come. The climate transition risks for this sector are growing as governments, consumers, and private sector actors respond to the accelerating impacts of climate change and work to penalize further deforestation. Scope 3 disclosure mandated by the SEC would allow U.S. investors to manage these growing financial risks.

This report aims to shed light on the role U.S. importers play in driving raw imported FRC deforestation emissions and the potential material financial exposures that investors will need to navigate as a result. Disclosures would not mitigate the risks faced by investors, but they would certainly allow investors 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 substitute imported FRC for commodities from the U.S. or from countries with less deforestation-risk. Companies in these supply chains would benefit from higher revenues, higher profits, and higher value, while experiencing lower interest rates and improved brand image.
- Finally, even if carbon costs incurred by companies do not reach the levels discussed in these scenarios, the social cost of carbon would still be incurred elsewhere in the global economy by companies, governments, and civil society as climate impacts intensify. Thus, governments and regulators should still consider the cost of climate damage even if companies are not required to internalize them in the near future.

Summary of Key Findings

1. In three climate cost scenarios, our analysis finds that the total value at risk for imported FRCs' (Beef, Coffee, Rubber, Palm Oil, Cocoa and Soy) deforestation emissions ranges between USD 7.28 Billion and USD 114.98 Billion.

Total Risk Scope 3 Imported Deforestation Emissions

Total risk: operational business risks + reputation + financing risk US$ million	Scenario 1	Scenario 2	Scenario 3
CO2 price/ton (US$)	34.1	96.3	1160
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. Scenario analysis in this report finds that gross profits for the commodities assessed could decline by USD 366 Million to USD 6.9 Billion. The costs to the value chain for these commodities is significant, for example if climate costs of emissions from deforestation were incorporated into pricing, retail prices of imported beef would increase 700 percent.

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

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

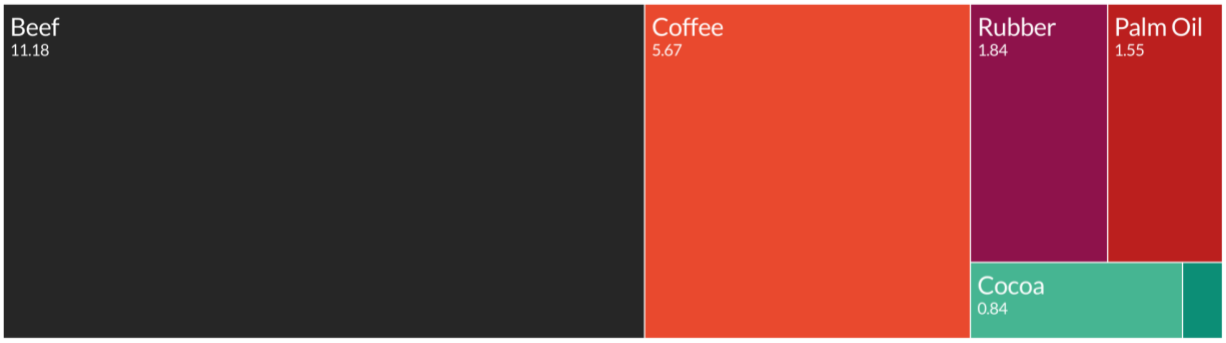
5. The reputational risk of deforestation compounds the civil society climate transition risk with reputation value-at-risk ranging between USD 2.4 Billion and USD 24.81 Billion across our three scenarios. Considering the dependence of certain industries on imported FRCs, some downstream segments could face a relatively high reputation value-at-risk. Particularly fast-moving consumer goods brands with established climate goals.

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 exhibits the share of these emissions by commodity with imported beef

[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.

accounting for 53 percent of the total, followed by coffee (27 percent) and rubber (9 percent).

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 within a few companies in most commodities. This environment means potential climate transitions, such as policies banning commodity imports tied to illegal deforestation, will have significant financial impact for producers, importers and their investors as these sectors rely on a few actors exposed to significant risk to maintain the flow of supply.

8. According to Forests & Finance (F&F), from 2018-2023, U.S. financial institutions (FIs) have financed USD 23.72 Billion to imported FRCs, excluding financing to downstream companies dependent on imported FRCs. F&F identified USD 4.94 Billion in adjusted financial flows to some of the top importers of imported 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 and many are locations known for their high-deforestation risk. Indonesia, for example, was the source of nearly half of natural rubber imports and 55 percent of the deforestation-risk 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.

Introduction

Scope 3 emissions account for 75 percent 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 will almost always be excluded without Scope 3 disclosures. However, deforestation is only one component of a company's overall Scope 3

[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.

[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.

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. Furthermore, embedded deforestation emissions from finished goods are not included due to the lack of traceability in many of these value chains.

This report analyzes six different 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 of these sectors, including a case study of the highest-risk country of origin for each of these commodities. We've combined these case studies with financial analysis to quantify the risks associated with their Scope 3 deforestation emissions.[8]

The financial analysis incorporates three scenarios. 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. Scenario 2 shows the EU Emissions Trading System (ETS) price. Scenario 3 uses a societal cost of carbon dioxide price (the $SCCO_2$ concept), which includes a wider societal cost concept and partly includes economic feedback loops in the Global South and an impact until 2100. Carbon prices increase across the three scenarios, i.e., the carbon price in Scenario 3 (US$ 1160/ton) is larger than that of 2 (US$ 96.3/ton), which is larger than that of 1 (US$ 34.1/ton). 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 transitions these commodities face, a proxy price serves to simulate how other climate transitions may similarly impact the future financial outlook of imported FRCs.

The Role of Physical and Transition Risks in Deforestation Emissions

Emissions from deforestation globally make up 11 percent of annual carbon emissions, which creates 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 lead to 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, which are driven by consumer, private sector, and government responses to climate change. The following are examples of material transition risks for imported FRCs:

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.

[8] "While the case studies do not address wood due to a lack of data, the financial analysis does include the sector."

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

2. Consumer Demand Changes and Civil Society Pressure
   - Civil society 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 chain. For instance, when a brand manufacturer issues a zero-deforestation policy, this could affect the sales of a trader in palm oil 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 make lending conditional on adhering to zero-deforestation policies or reduce lending.
     - Lower profit could lead to lower dividends.
     - Valuation risk due to lower profits and lower 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 private markets.
     - Banks might not be able to recover their outstanding loans to forest-risk clients.
     - Reputation risk as links to deforestation can result in a lower reputation value for a company, reducing the value further through intangible brand assets.

3. Policy Risks Driven by Regulatory Changes
   - Regulation on Scope 3 emissions from imported FRCs can intensify consumer demand changes with the same effects as described above. However, they are often more intense, abrupt, and wide-spread in their impact upon implementation.
   - Regulation can siphon off demand from entire segments of importers, traders, and downstream companies leading to stranded assets and even bankruptcy.
   - If the true financial risk from Scope 3 emissions from imported FRCs were priced in through regulation, margins and volumes could be affected.
   - Regulation could require higher policy execution, monitoring, and verification costs. Similarly, it could lead to fines if companies break the law.

Regulations In the Real World

The European Union Deforestation Regulation (EUDR) applies to imports of six commodities: cattle (beef and leather), cocoa, coffee, oil palm, rubber, soy and wood. This means that finished goods produced in the US, which contain imported FRCs, have a high-risk of not being imported into the EU.

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, drawing away future investment.

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

The accumulation of the impacts discussed in this section 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, negatively impacting the economy and increasing the need for unemployment benefits.
2. The financial risks at companies, sectors, and financial institutions can affect the tax proceeds of the various local and federal government entities.
3. The Scope 3 emissions of the imported FRCs could increase the investment needed to achieve the carbon reduction targets linked to 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.

Quantitative Results: Imported Deforestation Emissions and Associated Financial Risks

Imported Scope 3 Emissions from Deforestation

According to the data available, U.S. Scope 3 deforestation emissions from imported FRCs totaled 21.24 $mtCO_2$ in 2019 or 0.35 percent 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. Beef was the largest contributor to imported Scope 3 deforestation emissions at 53 percent, followed by coffee at 27

percent, and rubber at 9 percent. Palm oil, cocoa, and soy made up the remaining 11 percent of total Scope 3 emissions from imported FRCs.

Relative Size of Imported Scope 3 Emissions Agricultural Commodities US

Relative Importance Imported Scope 3 Emissions US			
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	.35%	100%
USA Total 2019	6,040.00	100%	--

Source: AidEnvironment & World Bank

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.

Quantifying the Climate Costs of 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 imported FRCs. The International Monetary Fund (IMF) uses the approach of carbon dioxide pricing per ton, also known as the Social Costs of Carbon (SCC). The SCC is a measure that is conditional on the level of CO_2 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 SCC (or carbon price) per ton was held constant over time in this analysis. The idea of using CO_2 costs to measure climate damage has been verified and widely used by other studies.[10, 11] In order to approximate the SCC, we applied three scenarios with different underlying assumptions about the price.

[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.

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 (the $SCCO_2$ concept), 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 carbon pricing models.[13] The average of these carbon prices, according to the World Bank Carbon Pricing Dashboard, is USD 34.05 per ton of CO_2, which will be used as the basis for Scenario 1.[14]

North American Carbon Pricing Initiatives

North America Carbon Pricing Initiatives 7/8/23	USD/ton CO2e
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

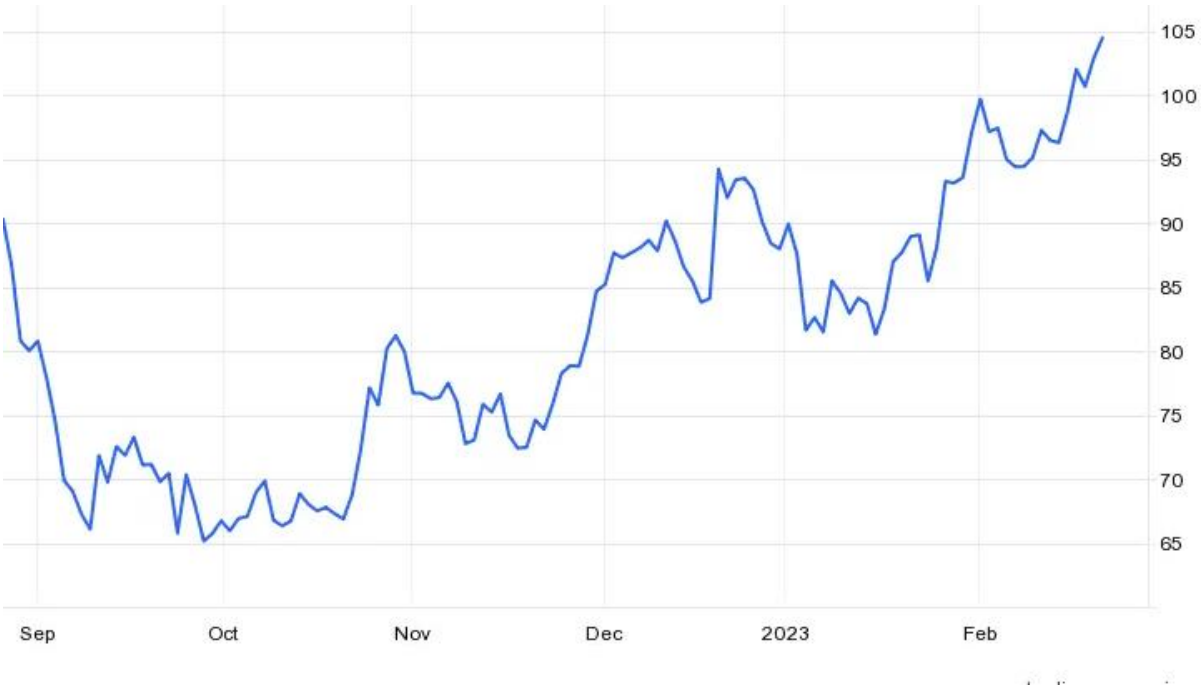
Scenario 2: The European Union Emission Trading System (ETS) is the world's first and largest carbon market. The system, also sometimes known as "cap-and-trade", was established for specific high-emission industries. While it excludes Scope 3, it is a useful point of reference for carbon pricing models.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

EU ETS End of Year Prices (Euro/€)

[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] https://carbonpricingdashboard.worldbank.org/



Source: Carbon Herald[15]

While it can be argued that the CO_2 price per ton in the EU 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 highly 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.

Scenario 3: More recent calculations of the societal costs of climate change have ranged widely from USD 171 to USD 3,000.

Expert groups of economists and climate scientists calculated values of USD 171 and USD 310 per ton respectively. Recent calculations for economic damage have increased further due to

[15] https://carbonherald.com/eu-carbon-price-at-all-time-high-trading-over-100-euros-tonne/

the inclusion of higher damages in the Global South.[16] These latest societal costs of carbon dioxide ($SCCO_2$) 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 (economic feedback).

One study shows that by 2100, global GDP could be 37 percent 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 - excluded from most estimates - GDP would be around 6% lower).[17] This means that in a wider 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]

By averaging the USD 171, USD 310 and USD 3,000 calculated above, we find a $SCCO_2$ of USD 1,160, which will be used in this report as Scenario 3.

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 around 0.35 percent of U.S. annual emissions, the economic value of these emissions is between 0.003 percent to 0.097 percent of the GDP depending on which scenario is used.

CO2 costs Imported FRCs	Scenario 1	Scenario 2	Scenario 3
Scope 3 emissions (MtCO2-eq)	21.2	21.2	21.2
CO2 price/ton (USD)	34.1	96.3	1,160.0
Total CO2 costs (USD million)	723.2	2,045.2	24,636.1
Total CO2 costs (USD billion)	0.72	2.05	24.64
U.S. GDP (2022, USD billion)	25,463	25,463	25,463
Scope 3 Imported FRCs 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

Figure 21 shows the financial risks that each sector's key importers could face based on their exposure to deforestation-risk countries and sectors. Notably, over 90 percent of rubber, palm

[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.

oil, and cocoa imports originate from forest-risk countries, while paper/pulp carries the least amount of deforestation-risk country exposure at 9 percent.

Analysis of the top 15 importers within each commodity sector studied reveals that deforestation risk is concentrated within a select few countries with high-deforestation risk, with between 22 percent and 100 percent and sourcing coming from a single country (e.g., most beef comes from Brazil, while palm oil comes from Indonesia). This environment means potential future bans on importation of commodities tied to illegal deforestation into the U.S. could significantly impact the financial outlook of major stakeholders across the value chain.

Imports Forest-Risk Commodities in the U.S. and Top 15 Importers (2022)

Total imports and top-15 importers 2022						
Metric tons	Global	From forest-risk countries	%	Top-15	Main sourcing country	% of forest-risk
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%	Na	Na	Na

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

Value of Imports 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 number does not take into account the value chain revenue at risk from pricing up. This occurs when importing companies sell their products to other, often larger, companies, who then sell the processed and branded products on to consumers. It is particularly important when a commodity represents a relatively small input in a high-margin finished good because risk to that input can jeopardize the entire value of that product. As a consequence, the value of imported FRCs is multiplied by the price mark up, for the explicit value of the raw material of the commodities assessed and not for other factors like profits, in the value chain to understand the total revenue at risk. Value-adding processes, such as processing, labor, marketing, and financing, add margins to the cost of goods sold.

Big call out box:
Pricing up 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 mark up and profit distribution models explain how the value of an embedded commodity increases in every step of the downstream segments in various commodity chains, including beef, palm oil[21],soy[22], and sugarcane.[23] Each step in the supply chain earns a gross profit and an operating profit. For this analysis, the price mark up factor is crucial to explaining the total impact that emissions from deforestation have on U.S. supply chains in the commodity sectors studied.
The following table shows how embedded commodity prices are priced up by over 100 percent over the entire supply chain.

Price Mark Up in Various 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

[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.
[21] Rijk, G., Wiggs, C. and M. Piotrowski (2021, June), FMCGs, Retail Earn 66 percent of Gross Profits in Palm Oil Value Chain, Washington DC, United States: Chain Reaction Research.
[22] Kuepper, B. and G. Rijk (2020, October), Who's Profiting from Brazilian soy? An Analysis of the Dutch Soy Supply Chain, Amsterdam, the Netherlands: Profundo for Greenpeace Netherlands.
[23] Quiroz, D., Kuepper, B., Rijk, G. and E. Achterberg (2021, May), The Sugarcane Value Chain in Latin America and Asia - Main Actors, Market Mechanisms, Labour Issues and Opportunities, Amsterdam, the Netherlands, CNV International and Profundo.

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 pricing up ratios from import to retail are applied to the import values of the various commodities. Figure 24 shows this value enhancement. Various degrees of pricing up affect each individual value chain. As a result, the total value of the aforementioned imported FRCs skyrockets to USD 13,254 million.

Value Enhancement in Each Value Chain (Imports, U.S.)

Value enhancement in chain	Total forest-risk (USD Million)	Price mark up 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 is the pricing up from midstream to retailers; for coffee, cocoa and rubber the escalation from 130 (trader) to 350 (or 2.69x) of sugarcane is used as brand marketers are very strong in this chain and generate high gross margins.

Risks to Financial Stability

With 40 percent of U.S. GDP generated in sectors with exposures to commodity driven deforestation, deforestation emissions risks can have large implications on the U.S. financial system.[24] In addition to the wide variety of risks driven by the physical risks of deforestation outlined in Figure X, we can analyze each imported FRC value chain to understand the risks that deforestation emissions imported to the U.S. can have on financial stability.

[24] https://www.climateadvisers.org/insightsfeed/climate-related-forest-food-and-land-risks-threaten-us-financial-stability/

Financial stability impact categories: Climate-related forest, food, and land risk

Source: Climate Advisers

To do this, we can calculate the monetary value of deforestation emissions in imported FRC supply chains as a reference to understand the climate damage that has been done by imported FRCs.

In scenario 1 (using the climate costs of North American jurisdictions), the total climate costs amount to USD 718 Million from imported FRCs. This is 5 percent of the total value chain. Beef is the segment with the highest relative climate damage costs, at 21 percent. 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 percent palm oil products, climate damage costs would be 10 percent of the final price, as the full price of a shampoo bottle contains more ingredients outside of the palm oil content. However, keep in mind that the total value of the finished product may also be at risk if there is a lack of easily substitutable inputs.

U.S. Climate Damage Costs as a Percentage of the Total Revenue at Risk: Scenario 1

Value Chain & Emission Damage (Scenario 1)					
US$ million	***Chain value***	***Scope 3 emissions (MtCO2-eq)***	***Pricing CO2/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, incorporating 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 percent of the value of all chains in scenario 1 to 184 percent in scenario 3.

U.S. Climate Damage Costs as a Percentage of the Total Revenue at Risk: All Scenarios

Chain value, damage, all scenarios			
	Scenario 1	Scenario 2	Scenario 3
CO2 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

Generally, operational business risks from climate transitions occur due to civil society pressure, 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 to simulate civil society risks from climate transitions. This is in keeping with projections of consumer demand shifts away from emissions intensive production as climate impacts intensify. This reaction would translate to a 5 percent decline in embedded imported FRC sales in scenario 1, a 15 percent decline in Scenario 2, and a 184 percent decline in Scenario 3.

Based on an average 56 percent gross margin[25] in the supply chain of the embedded imported FRCs, gross profits would decline by between USD 404 Million to USD 7,452 Million due to civil society pressure. In a discounted cash flow (DCF) context and assuming the losses are structural, this rises to between USD 4,479 Million to USD 82,713 Million.[26]

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

Impact on financial system			
USD million	Scenario 1	Scenario 2	Scenario 3
CO2 price/ton (US$)	34.1	96.3	1160
Total impact	-718	-2,027	-13,254
Gross margin in chain/added value	56%	56%	56%

[25] Based on Table 8 by dividing the value enhancement in the chain by the total chain value, or USD 13,254 Million minus USD 5,803 million, divided by USD 13,254 million.

[26] 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 percent discount rate and no growth, a gross profit or cash flow of 1 Euro, with a 25 percent tax rate deduction, would lead to a value of 11.1 Euro.

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

4.5 Reputation Value Risk

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

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 percent.[27] Social media has exponentially increased the extent of this impact through greater transparency and faster information dissemination. Negative events reputation can have a material negative impact on the value of a company through intangible assets in the form of brand value. Companies can work to mitigate reputational impacts, however, through transparency and 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 see lower costs of capital.

As societal awareness of deforestation's climate impact rises, fast-moving consumer goods companies (FMCGs) could see impacts of up to 70 percent of total value based on reputation.[28] Companies are, thus, increasingly adopting commitments related to deforestation-linked industries, such as palm, soy, and cattle. With increased transparency, differences in climate and deforestation policies and governance amongst FMCGs become more obvious. The leaders in these industries could outperform laggards substantially as transparency increases further, highlighting the investment hazard related to reputation risk from links to deforestation.

Chain Reaction Research reports also noted that lagging efforts of FMCGs in NDPE execution led to deforestation and reputation risks ranging between USD 16 Billion and USD 82 Billion.[29] This methodology is best suited for a one-product company (like oil & gas majors) and yields a reputation risk between 0.1 and 30 percent of market cap. A second Chain Reaction Research methodology is more relevant for diversified companies and provides a range of 2.9 to 14.7 percent of market cap.[30]

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[27] 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

[28] 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

[29] 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

[30] Gerard Rijk, Christopher Wiggs, Matt Piotrowski (2020, 2 July), "FMCGs' Lagging Efforts in NDPE Execution Led 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 of certain industries on imported FRCs, in particular coffee, palm oil and rubber, some downstream segments of these industries could face a relatively high reputational risk: For example, coffee brands and coffee retail/foodservice for coffee. Further research on this stream is needed to quantify the extent of this risk.
This study applies 2.9 percent, 14.7 percent, and 30.0 percent of reputation risk to scenarios 1, 2, and 3, respectively. Using these inputs, total reputation value at risk ranges between USD 2,399 Million and USD 24,814 Million as seen in the figure below.

Reputation Risks (All Scenarios)

Reputation value-at-risk at 30% value destruction scenario			
US$ million	**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 FRCs supply chain actors	2,399	12,159	24,814

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. Representing between 0.01 percent to 0.14 percent of all bank assets and assets under management in the US.

Total risk: operational business risks + reputation + financing risk			
US$ million	Scenario 1	Scenario 2	Scenario 3
CO2 price/ton (US$)	34.1	96.3	1160
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%
Total value-at-risk, annualized	(655.99)	(2,337.67)	(10,358.44)
USA GDP 2022	25,463,000	25,463,000	25,463,000
As % of the USA GDP 2022	0.003%	0.009%	0.041%

Risk for Financial Institutions Directly Invested in Imported FRCs

Between 2018 and 2023, U.S. financial institutions (FIs) financed USD 23,727 Million to deforestation-risk sectors in palm, beef, soy, and pulp/paper, alone. 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.

The numbers do not contain financial flows to downstream industries, which means that these flows may be a vast underestimation of the financial risks faced by FIs. U.S. FIs typically have limited loans and investments in the upstream supply chain, but 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.[31]

U.S. Financial Institutions' Financing to Forest-Risk Sectors

USA financial institution financing to forest-risk commodities							
US$ 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. FIs 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.

[31] 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.

U.S. Financial Institutions' Financing to Forest-Risk Sectors by Financial Vehicle and Region

US FIs financial flows					
US$ million	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 considerations on Forests & Finance data in Appendix

Specifically, Forests & Finance identified USD 4,935 Million in adjusted financial flows of several companies named in the top-15 importers of forest-risk commodities into the United States. More than half of these financing flows were directed to the companies' activities in Southeast Asia.

U.S. Financial Institutions' Financing to Forest-Risk Sectors - Deep Dive into Top15 U.S. Importers by Financial Vehicle and Region

Top 15 companies					
US$ million	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 our carbon price scenarios, climate costs of deforestation emissions in the value chain of imported beef ranges from USD **381 Million to USD 2.24 Billion.** If the climate costs of emissions from deforestation were incorporated into pricing, **retail prices of imported beef would increase by 7 times**.
2. Between 2018 and 2023, U.S. financial institutions (FIs) have financed USD **$1.9 Billion** to deforestation-risk sectors and in deforestation-risk countries in beef value chains.
3. The value of the beef imported FRC chain, considering price mark up, is nearly USD **1.82 billion**,**14 percent 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 percent**) of these imported emissions originating from Brazil's bovine sector.
5. The U.S. imported **1,256,451,212** kg (1.25 billion kg) of beef and leather products in 2022.
6. **49.81 percent** of imports from the top three imported groups (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. **90 percent of deforested area in the Amazon is occupied by pasture** and major meatpackers have seen thousands of indirect suppliers clear **over 50,000 hectares between 2008 and 2019**.[32, 33]
8. 10 out of the top 15 importers, accounting for 61 percent of United States imports, have headquarters in the United States.
9. Chinese multinational firms make up a large portion of the United States 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 up until 2020. In the first half of 2023 **deforestation has fallen by 34 percent**.[34]

Coffee

1. Across our 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 imported FRC chain is nearly USD **$2.64 billion, around 20 percent of the value** of all imported FRC chains analyzed. The price mark up in coffee is much higher than sectors like beef due to higher finished good differentiation.
3. Coffee imports to the United States total 1.63 billion kg and result in **5.67 $mtCO_2$** of emissions due to deforestation every year.
4. **Brazil (29 percent) and Colombia (19 percent)** contribute to nearly half of coffee imports, but account for **80.3 percent** of imported emissions due to deforestation.

[32] 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/.
[33] https://climatecrimeanalysis.org/project/fighting-illegal-deforestation-and-its-drivers-in-brazil/
[34] https://www.reuters.com/business/environment/deforestation-brazils-amazon-drops-34-first-half-2023-2023-07-06/

5. **Brazil's Atlantic Forest has been reduced to 12.4 percent** of what it once was due to coffee-driven deforestation, and Colombia's smallholder-driven coffee market has seen its coffee growing region lose 20 percent of its sunlight due to increasing cloud cover.[35]
6. 4 out of the top 15 importers, accounting for 34 percent of United States imports, have headquarters in the United States.
7. Major importers, such as Folgers (15 percent of imports) and Starbucks (10 percent of imports) have partnered with third-parties and committed to pledges of transparency and traceability. 98 percent of Starbucks coffee farms have not converted forest into agricultural land since 2004.[36]
8. Major initiatives in reforestation and lawmaking processes are ongoing in Brazil and Colombia, reducing deforestation in both countries and advancing zero-deforestation commitments.

Rubber

1. Across our 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 imported FRC chain is roughly USD **$3.48 billion, 26 percent of the total value of all imported FRCs**, the highest of all analyzed commodities.
3. The United States imports around **1.84 mtCO_2** of emissions due to deforestation from 1.07 billion kg of annual natural rubber imports.
1. **93 percent** of natural rubber imports to the United States originate from deforestation-risk countries, with **49 percent coming from Indonesia** and 25 percent coming from Thailand.
2. Indonesia accounts for **66 percent** of imported emissions due to deforestation in the rubber industry, with Liberia contributing a further 20 percent.
3. Indonesia has seen rubber plantations convert to more profitable oil palm plantations at around 2 percent annually.[37]
4. Across Indonesia and Thailand, over **4 million hectares of forest** have been cleared for rubber plantations over the past 30 years, and **only 7 percent of companies disclose information** on how they monitor deforestation in their supply chains.[38]
5. Traceability is trending upwards, as the Global Platform for Sustainable Natural Rubber (GPSNR) has garnered 50 percent of the natural rubber market in membership and is working to verify that rubber is compliant with sustainability standards.[39]
6. 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 percent of imports) maintaining a large-scale commitment to sustainability.

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[35] https://e360.yale.edu/features/as-climate-changes-colombias-small-coffee-farmers-pay-the-price

[36] https://content-prod-live.cert.starbucks.com/binary/v2/asset/137-71876.pdf

[37] https://www.sciencedirect.com/science/article/abs/pii/S0143622822002090

[38] https://www.reuters.com/sustainability/sustainable-finance-reporting/comment-why-are-rubber-companies-keeping-investors-dark-over-deforestation-risk-2023-05-25/

[39] https://sustainablenaturalrubber.org/policy-framework/

Palm Oil

1. Across our 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.**
1. The value of the palm oil imported FRC chain is USD **3.08 billion**, **23 percent of the total value**, the second-highest of all analyzed imported FRCs.
2. Between 2018 and 2023, U.S. financial institutions (FIs) financed USD **7.21 Billion to forest-risk sectors in palm oil**.
3. 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.
4. **99 percent** of palm oil (HS 1511) imports come from deforestation-risk countries, and **55 percent** of those deforestation-risk imports originate from Indonesia.
5. Indonesia, the world's largest palm oil sector, represents **95 percent of imported emissions due to deforestation**.
6. Between 2001 and 2019, **32 percent of the 9.8 million hectares of forest cover loss in Indonesia** was due to palm oil-related deforestation.
7. Deforestation in the palm oil industry has **fallen by 82 percent in the last decade**, and the Indonesian government has extended moratoriums and other protections to prevent deforestation.
8. There has been an industry-wide shift towards preventing deforestation as well, as many major companies and U.S. importers of palm oil from Indonesia have committed to policies to prevent it with largely positive results.
9. The United States carries relatively little deforestation risk from raw materials because of its relatively low share of all Indonesian exports, as well as the fact that 99 percent of these imports come from companies with zero-deforestation commitments. However, revenue risk is still significant due to the widespread usage of palm oil across a wide variety of high margin products. This study does not include imports of finished goods with deforestation in their supply chains.

Cocoa

2. Across our carbon price scenarios, climate costs of deforestation emissions in the value chain of imported cocoa ranges from USD **29 Million to USD 62.35 Billion.**
3. The value of the cocoa imported FRC chain is USD **2.24 billion, 17 percent of the total value** of all imported FRCs.
4. The United States 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 U.S. imports involving cocoa are already-manufactured cocoa products, which contain embedded deforestation risk, but are not analyzed in this report as our focus includes just raw bean imports.
5. **93 percent** of the 344 million kg of cocoa bean imports come from deforestation-risk countries, including **50 percent from Côte d'Ivoire**, the world's largest cocoa producer.

6. 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 percent of its forests since 1960**, with 37 percent of forest loss happening in protected areas.[40]
7. Despite numerous agreements between governments and large cocoa and chocolate stakeholders being signed, including the Cocoa & Forests Initiative (CFI), nearly **20,000 hectares of forest have been lost between 2019 and 2022**.[41]
8. Only one company out of the top 15 importers to the United States (Cargill, 16 percent market share) has headquarters in the United States. The industry has large-scale traceability issues that result in hundreds of millions of kilograms of cocoa being untraceable. Some companies have set targets for traceability, most of which are before 2025.
9. While the CFI 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 farmers that are the backbone of the industry.

Soy

1. Financial institutions have directed over USD **$3 Billion** into the soy sector.
2. Soy imports to the United States are around 1.1 billion kg, but only result in **0.157 mtCO_2** in emissions due to deforestation every year. This relatively low number is due to limited trading connections with large international deforestation-risk soy supplier Brazil and high domestic production of soy.
3. Argentina supplies the largest import volumes to the United States of any deforestation-risk country, accounting for 5 percent of soy oilcakes (27,448,100 kg) and 26 percent of soybeans (126,387,010 kg).
4. **95 percent of soy deforestation in Argentina between 2015 and 2019** happened in areas that represent just 4 percent of exports and 10 percent of overall production.[42, 43]
5. Since 1996, Argentina has cleared a quarter of 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.[44]
6. 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 soy deforestation risk comparatively easy to mitigate in U.S. supply chains.
7. Argentina is targeting early 2025 for the first fully deforestation-free shipments of soy.

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[40] https://e360.yale.edu/features/the-real-price-of-a-chocolate-bar-west-africas-rainforests

[41] https://www.reuters.com/business/sustainable-business/after-five-years-recipe-end-deforestation-cocoa-farming-remains-elusive-2023-01-20/

[42] https://insights.trase.earth/insights/opportunities-for-deforestation-free-sourcing-in-argentina/

[43] https://news.mongabay.com/2023/06/can-the-eus-deforestation-law-save-argentinas-gran-chaco-from-soy/

[44] https://www.theguardian.com/environment/2018/oct/26/soy-destruction-deforestation-in-argentina-leads-straight-to-our-dinner-plates

Appendix:

Considerations for Forests & Finance data included:

There are a few considerations when discussing results from Forests & Finance:

- These are only financial relations that could be identified from public sources. This may exclude some financial flows; for example, bilateral loans can often not be identified using publicly available data.
- This data includes direct links to active forest-risk companies and lacks data for many importing companies that have an indirect relation to deforestation on the ground.
- The top-15 lists for beef and the other commodities lack downstream companies in the US, making downstream analysis difficult.
- Table 18 depicts a total value-at-risk in scenario 3 of up to USD 115 billion, which far exceeded the financing identified in Table 15. This is due to the lack of data on downstream companies, as well as the fact that only US financiers have been included in Table 15.