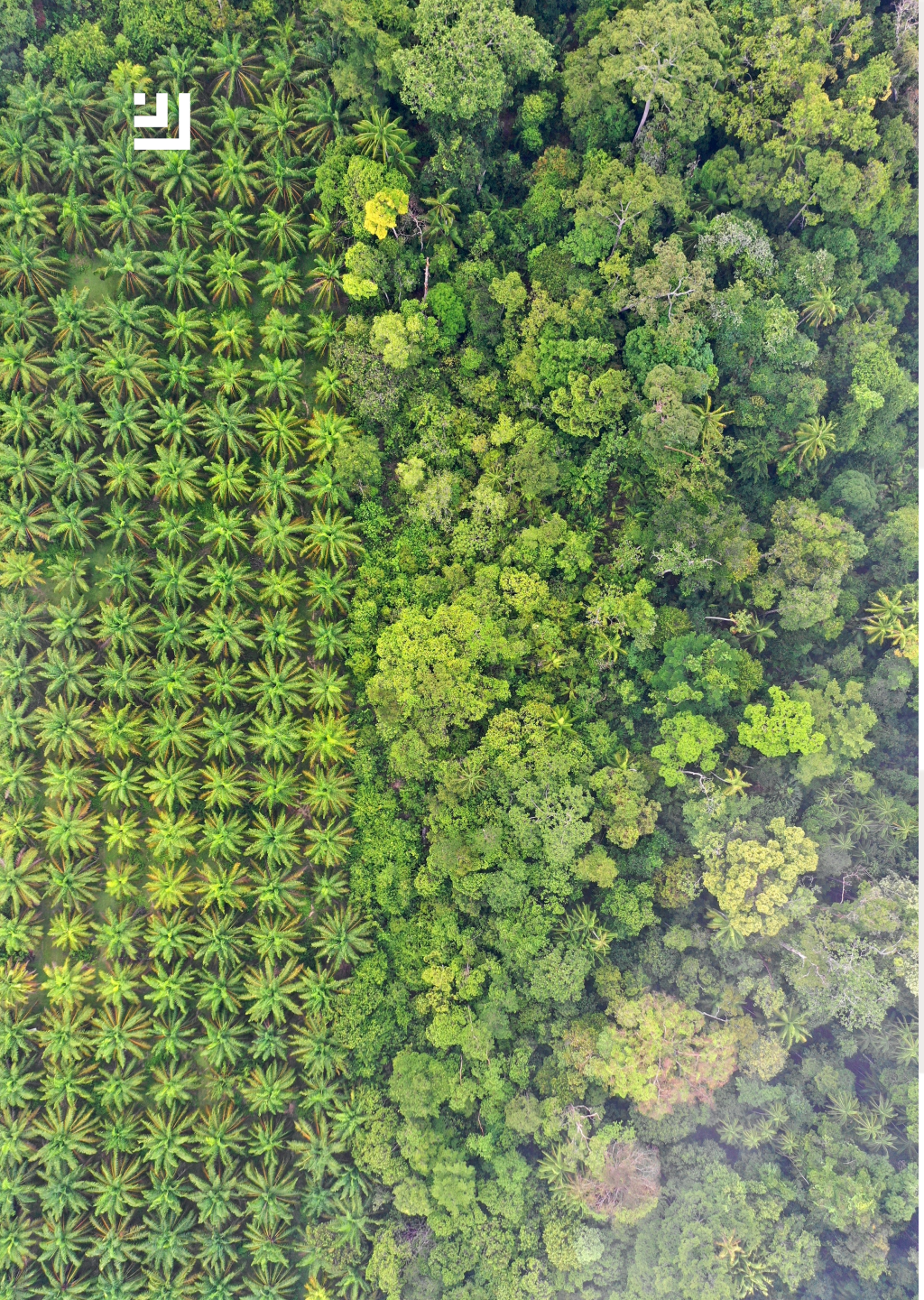
ORBITAS
A Climate Advisers Initiative

Profundo
Research & advice

aid environment

The High Cost of Ignoring Scope 3 Deforestation Emissions

October 17, 2023



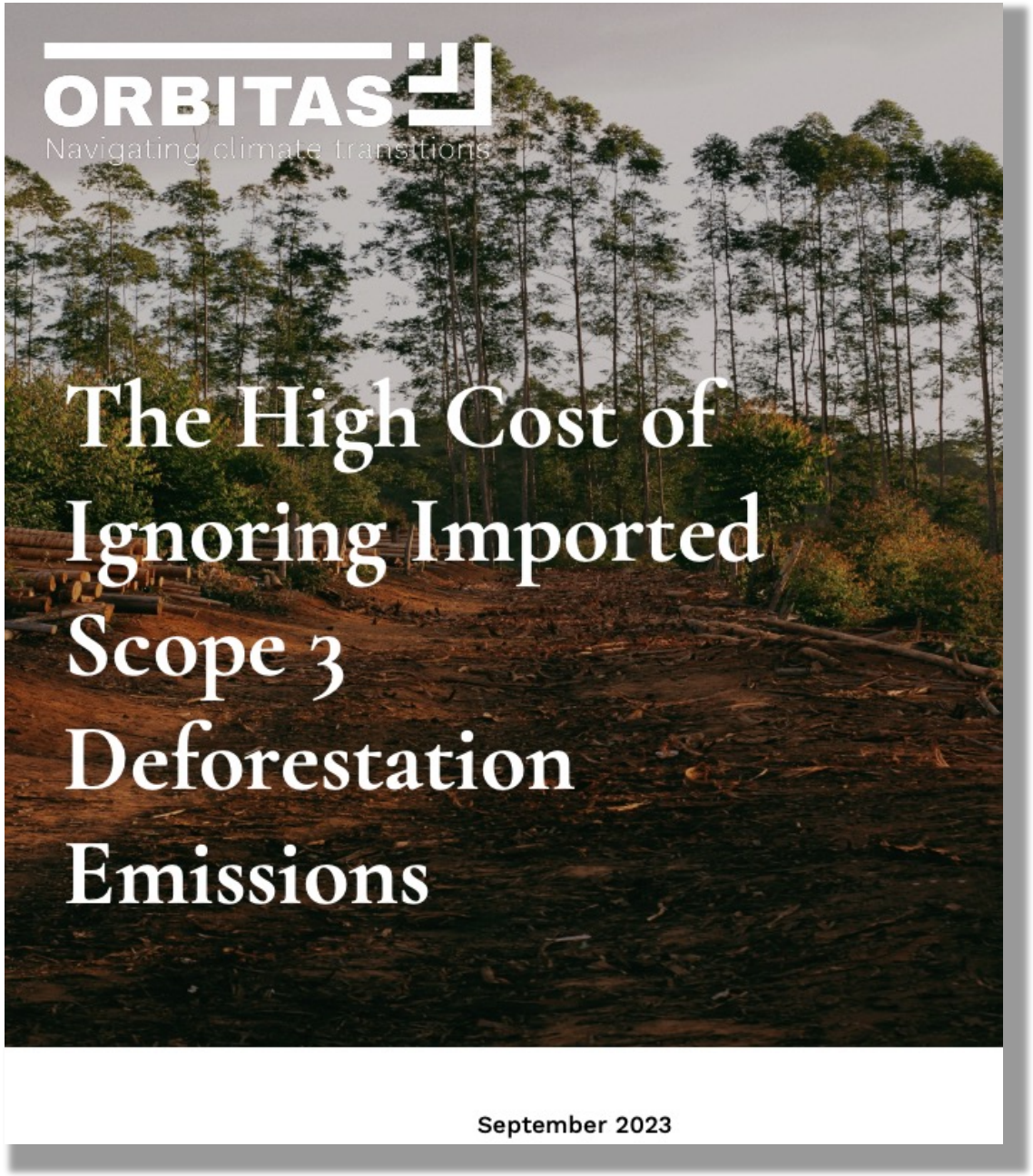
About Orbitas

Orbitas is an initiative to assess and communicate the risks to capital providers from climate transitions in the global land economy. These risks are currently not factored into financing and investment decisions, which leads to suboptimal outcomes for capital providers themselves, the companies and sectors they finance, and for forests and the climate. By combining cutting edge economic modeling with traditional financial analysis, Orbitas sheds light on emerging climate transition risks and highlights opportunities for smarter financing.

The Report

This Orbitas report 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 proactively manage Scope 3 supply chain deforestation emissions risks associated with commodities like palm oil, rubber and beef goods within their portfolios.



Why Deforestation Matters

Forests are essential for maintaining biodiversity, regulating the climate, and providing vital ecosystem services, such as clean air and water, making them crucial for the well-being of both the planet and its inhabitants.

7.6B

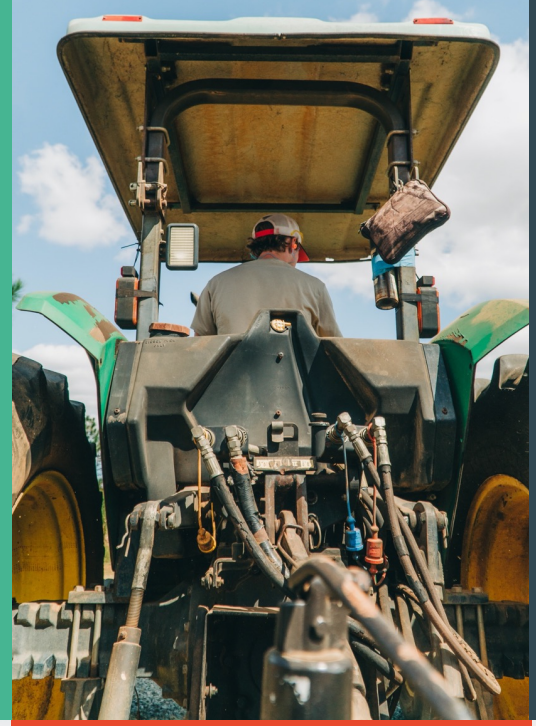
Forests absorb 7.6 billion metric tons of CO_2 per year, 1.5X more carbon than the United States emits annually.

2ºC

Even if all other emissions were halted, deforestation puts the world on a path to >2ºC of warming by 2100.

23%

of GHG emissions come from the forest, food and land sector



11%

of global GHG emissions come from deforestation

39%

of deforestation is predicted to result from international trade

30%

of mitigation needed to keep warming <2°C is based on ending deforestation by 2030

Forest Risk Commodities

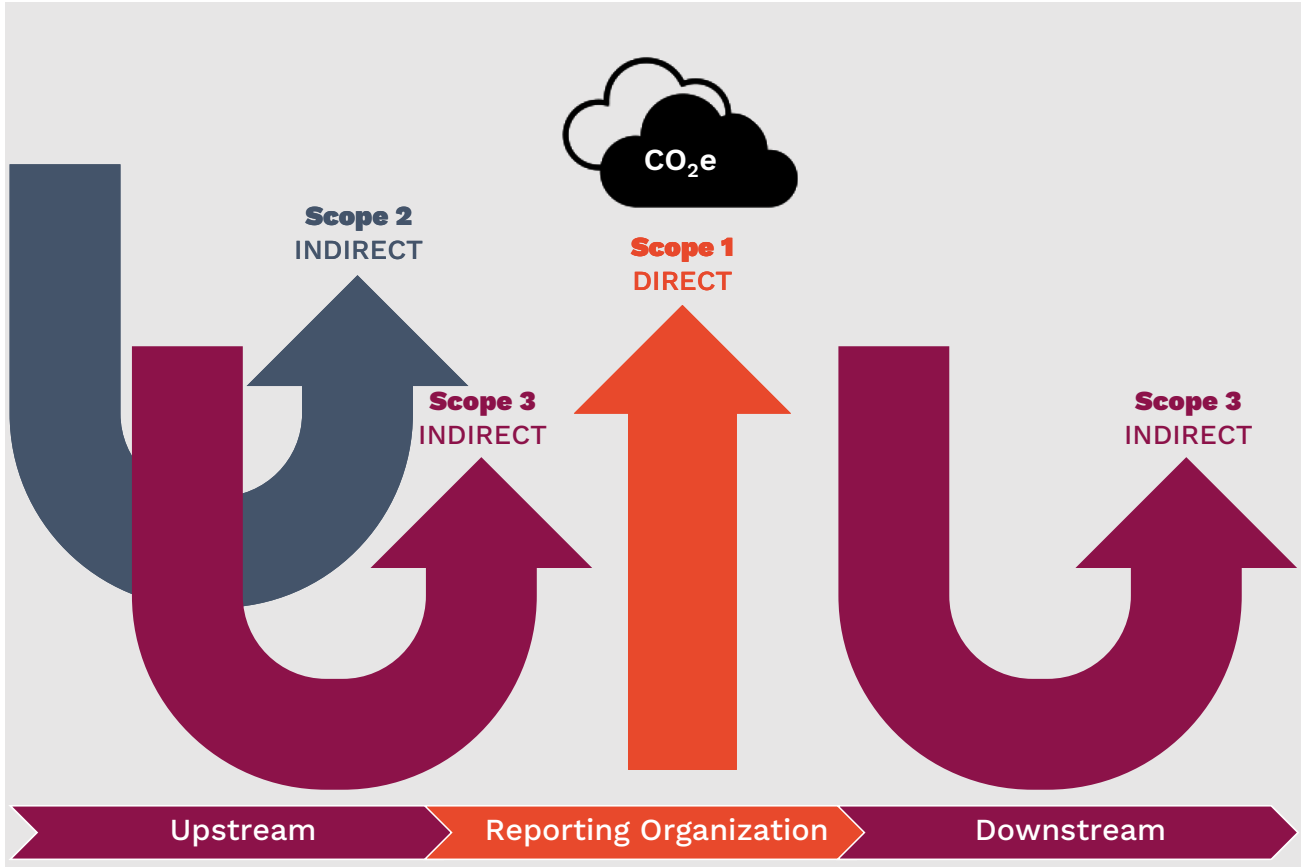
+

Forest risk commodities are agricultural products, which rely deforestation for production. This results in biodiversity loss, and environmental degradation, posing significant sustainability challenges.

Scope 1, 2 and 3 Emissions

- Scope 1 emissions are direct emissions from an organization's activities
- Scope 2 includes indirect emissions from purchased energy
- Scope 3 includes all other indirect emissions along the value chain.

For many companies, scope 3 could be **>80% of estimated total emissions**



Source: Environmental Protection Agency

Changing Regulatory Environment

SEC Proposed Climate Risk Disclosure Rule

The SEC is considering a rule requiring disclosure on climate risk and a decision is expected later this year. A Scope 3 emissions disclosure rule from the SEC would enhance transparency, help investors make informed decisions, enable companies to assess and manage risks, support global climate and sustainability goals.

California SB 253

The Climate Corporate Data Accountability Act was signed into law earlier this year. It will require that all companies that operate in California with revenues of $1 billion or more to report their Scope 1 and 2 emissions, starting in 2026 and Scope 3 emissions in 2027.

International Rules

A global consensus is emerging around Scope 3 emissions disclosure. The EU, UK, and ISSB have all taken steps to require it and understanding of importance of these disclosures, and greater sophistication is emerging as the data is being collected and analyzed.

Forest, Food, and Land Emissions ARE Scope 3 Emissions

Real world examples:

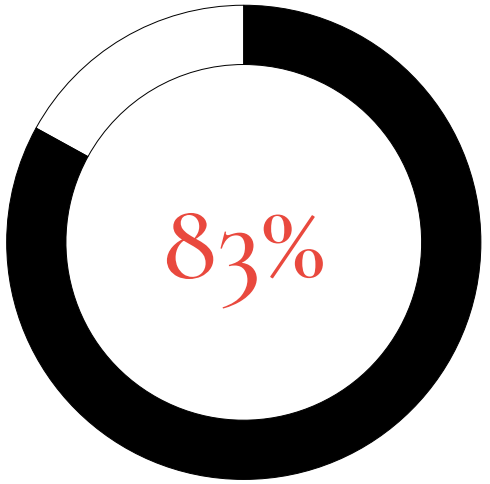
95%

of Nestle's emissions are Scope 3

29%

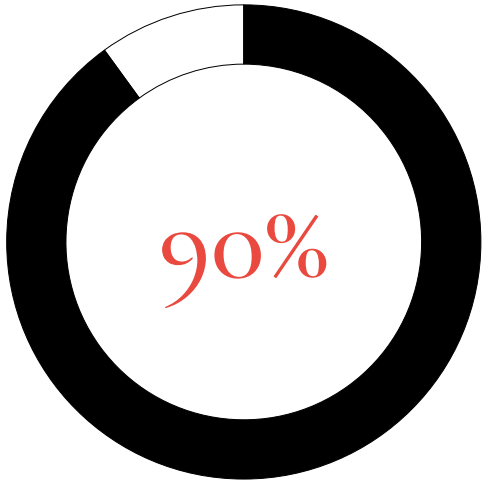
of Mars' value chain emissions are generated from tropical commodity-driven deforestation

Scope 3 Deforestation Emissions



of food sector emissions are Scope 3

Source: UN Comtrade Database

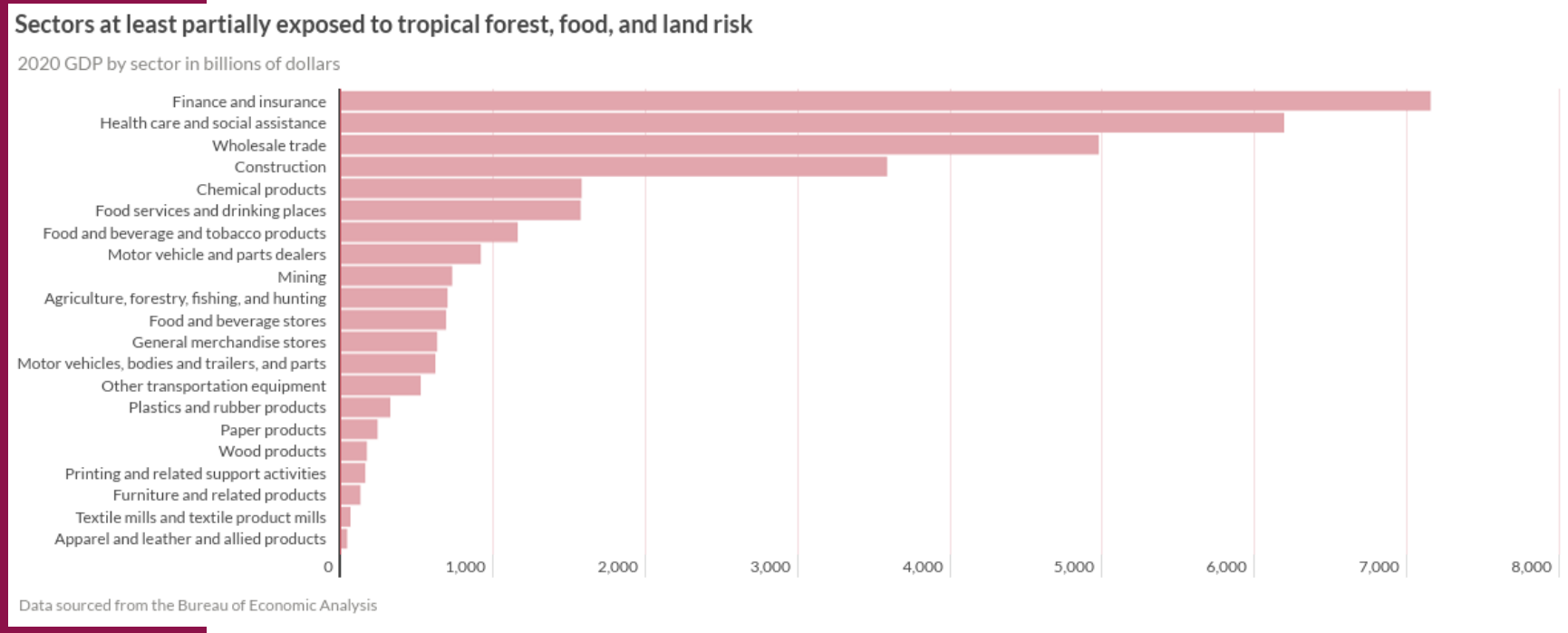


of fast-moving consumer goods sector emissions are Scope 3

Source: UN Comtrade Database

Economy-wide Reach

Many sectors are directly exposed to tropical commodity supply chain risk include food and beverage processing and production, automobile manufacturing, textiles, chemicals, pharmaceuticals, retail, food service, personal care products, print publishing, forestry, construction, energy and biofuels, and finance.



40% of US GDP comes from sectors sourcing tropical commodities

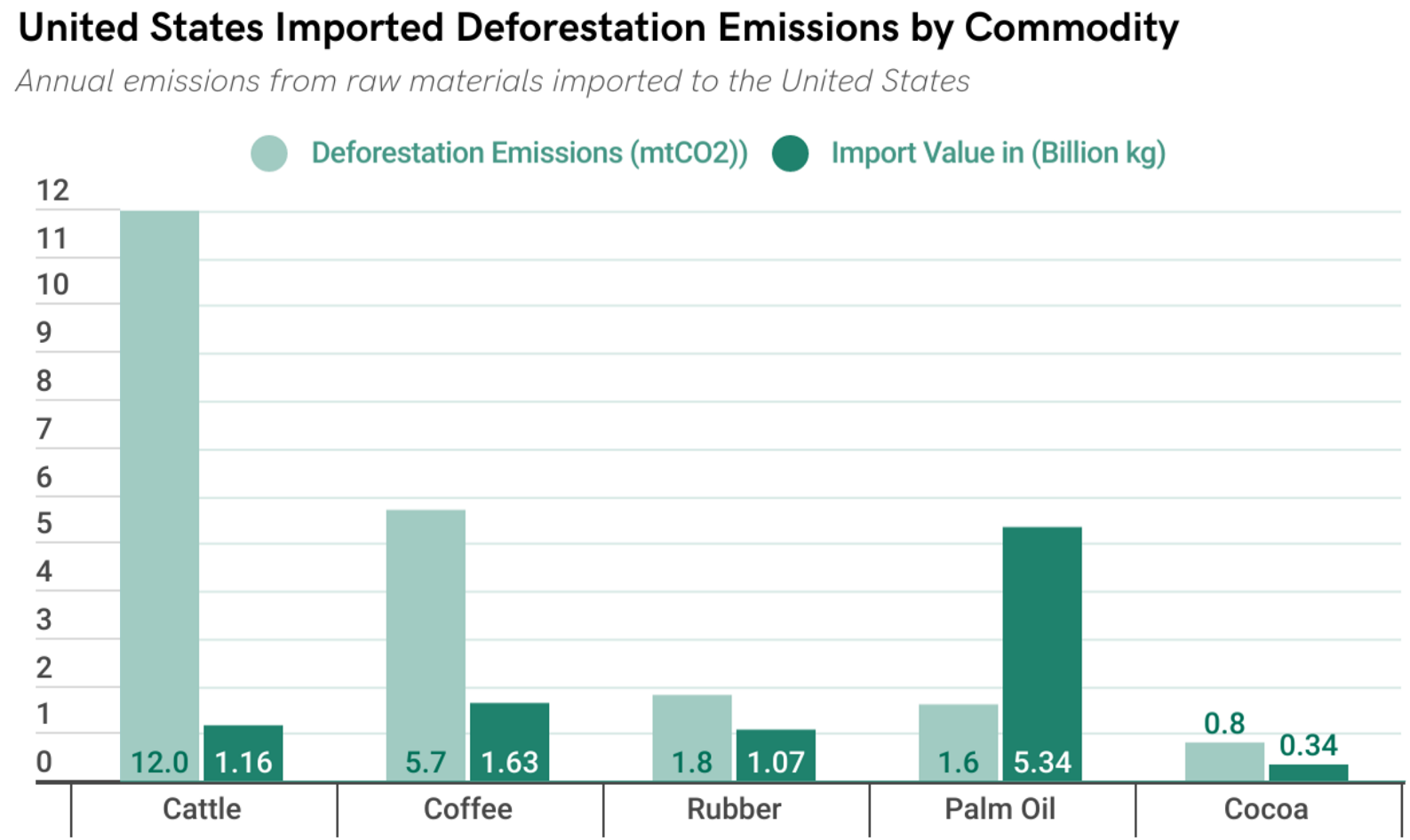
Report Overview

- Six commodities (beef, coffee, soy, rubber, palm oil, and cocoa)
- Financial analysis based on three carbon pricing scenarios
- Quantifies the imported emissions from deforestation to the U.S.

Scope 3 Deforestation Emissions Imported into the United States

Emission intensity of deforestation varies by imported raw material

Cattle and coffee have the highest emission intensity from deforestation of U.S. raw material imports studied



Data source: Climate Advisers analysis using Kasten et. al. data

Imported Scope 3 Emissions are Significant

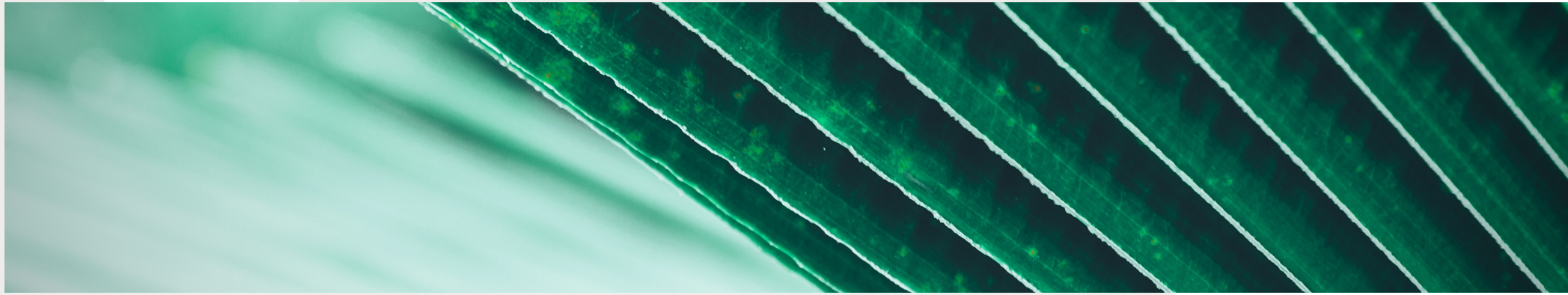
In 2019, Scope 3 emissions from deforestation to produce commodities imported to the U.S. totalled **21.24 mtCO2** in 2019.

Total Value at Risk is High

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**.

Gross Profits Could Decline

Gross profits for the commodities assessed could **decline by USD 366 million to USD 6.9 billion**, according to our scenario analysis.



Key Findings

Reputational Risks are Material

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.**

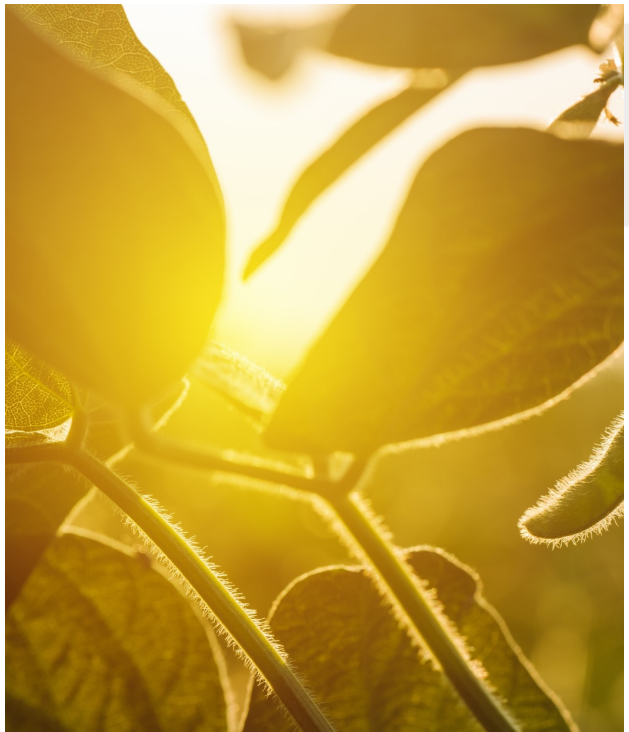
Risk is Concentrated

Deforestation risk is concentrated among just a few companies and countries for most commodities. So, even concentrated climate transitions could have value chain-wide effects.

U.S. Financial Institutions Involved

From 2018-2023, U.S. financial institutions have provided **USD 23.72 billion** in financing to imported forest risk commodities

Key Findings



Recommendations

Source from lower deforestation-risk countries

Companies with flexibility should consider sourcing commodities from countries with lower overall deforestation risk or substituting inputs with lower risk alternatives

Increase supply chain monitoring

All companies should consider enacting measures to more closely monitor their supply chains to avoid links to deforestation. This could result in higher revenues, bigger profits, lower interest rates and improved brand image.

Scope-3 Deforestation Emissions

An analysis of deforestation and carbon emissions per commodity sector linked to US consumption

Sarah Drost, AidEnvironment (17 October 2023)

aid environment

AidEnvironment works in four thematic areas

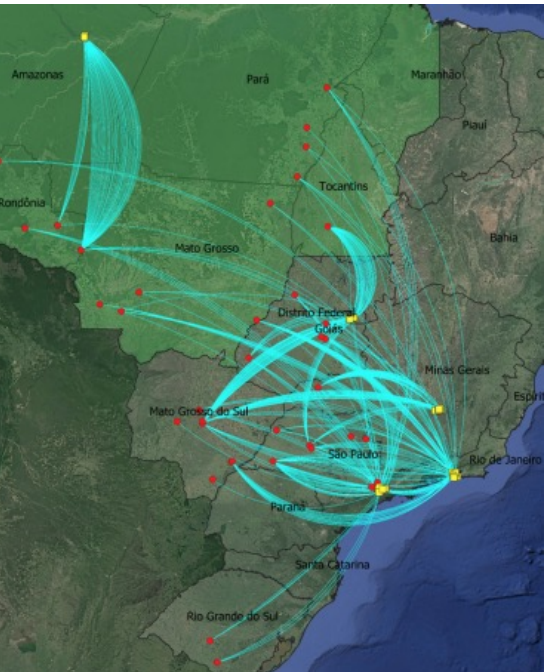
Landscape Management

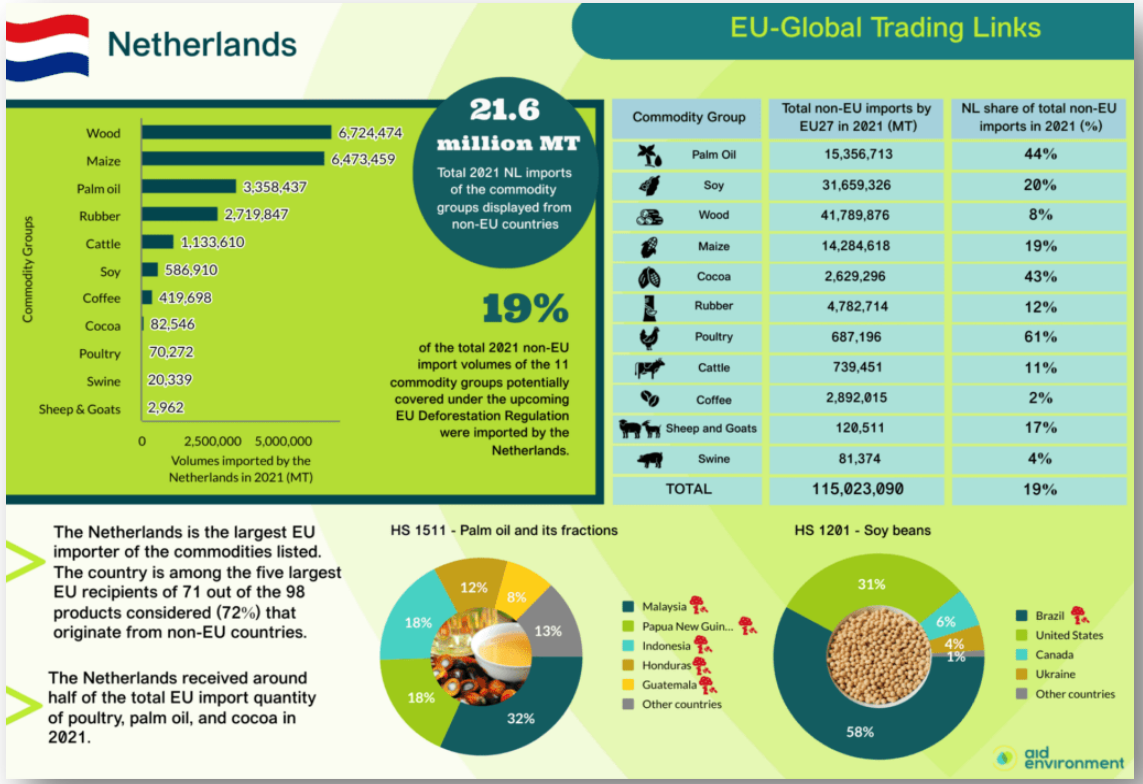
Deforestation-free Supply Chains

Water Management

Sustainable Sector Transformation

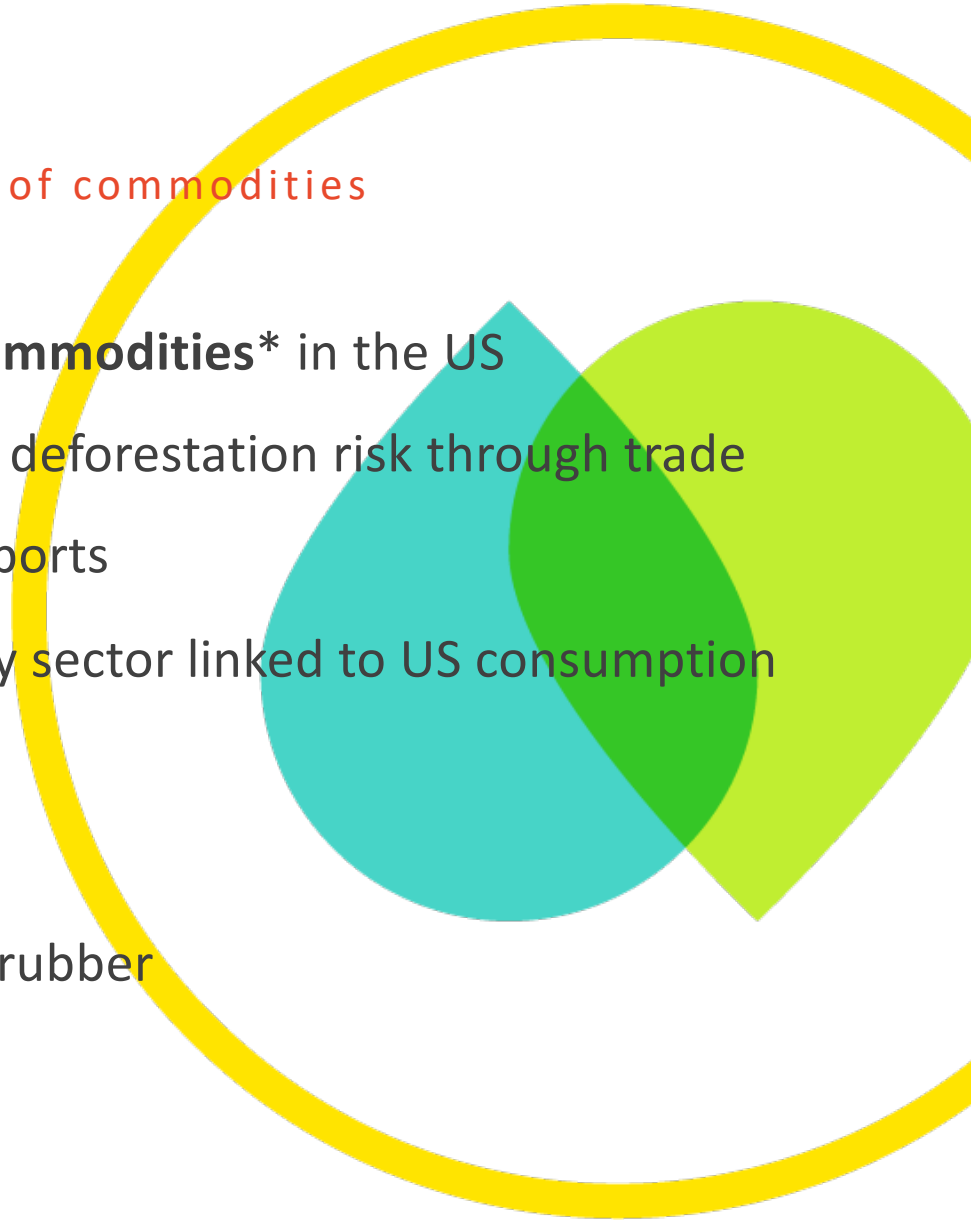
- Supply Chain Mapping
- Global trade data analysis
- Realtime deforestation Monitoring
- Zero-deforestation Benchmarking





Four research questions

Linking deforestation and carbon emissions to US consumption of commodities



- Ranking and volumes of **most imported deforestation-risk commodities*** in the US
- **Origin of commodities**; geographies where US is most tied to deforestation risk through trade
- **Key US importers** per commodity group and scale of their imports
- **Deforestation and carbon emission estimates** per commodity sector linked to US consumption

* Included are soy, beef, leather, palm oil, wood, cocoa, coffee, rubber

Ranking and volumes of most imported deforestation-risk commodities in US

Commodity group	Imports USA 2022 (KG)	Imports EU27 2022 (KG)
Wood	21,445,201,420	52,271,195,108
Rubber	7,072,327,573	4,991,269,746
Palm oil	5,340,487,561	Not comparable
Coffee	1,625,153,664	3,049,644,776
Cocoa	1,517,498,788	2,576,277,697
Beef & Leather	1,256,451,212	770,457,890
Soy	1,142,292,452	31,562,920,489

Wood and **rubber** most imported products

Compared to EU, **beef** imports high, but **soy** imports low

Source: US and EU27 trade statistics 2022 **(Census, Access2Markets)**

Total cocoa products imports in the USA (2022)			
Commodity	HS Codes	Total import quantity from non-USA countries (KG) (assessed April '23)	Proportional (%) imports based on total imported cocoa products in the USA in 2022
Chocolate & Other Food Products Containing Cocoa	1806	779,898,048	51%
Cocoa beans	1801	343,801,519	23%
Cocoa paste	1803	155,490,893	10%
Cocoa butter	1804	126,845,840	8%
Cocoa powder	1805	111,403,119	7%
Cocoa Shells, Husks, Skins And Other Cocoa Waste	1802	59,369	0%
TOTAL cocoa products imported by USA in 2022		1,517,498,788	100%
Compared to total EU27 imports in 2022		2,576,277,697	

Origin of imported forest-risk commodities

Top 10 supplying countries of cocoa beans (HS 1801) to the USA in 2022

Country	Volume (KG)	% of total imports in USA
Cote d'Ivoire	171,097,658	50%
Ecuador	70,364,394	20%
Ghana	52,250,443	15%
Dominican Republic	19,368,995	6%
Congo (Kinshasa)	8,363,467	2%
Nigeria	6,523,664	2%
Papua New Guinea	5,930,000	2%
Peru	3,556,616	1%
Venezuela	2,238,180	1%
Tanzania	674,326	0%
Top-10 total	**340,367,743**	99%
World Total	**343,801,519**	100%

For top-3 most imported products, we listed top-10 supplier countries

Only direct deforestation-linked carbon emissions, no embedded risk

In orange countries with commodity-linked deforestation risk.

Based on presence of intact forests, net forest loss, and on relevant commodity production

Sources: US trade statistics 2022 **(Census), FAO State of Forests, Faostat**

Key US importers per commodity group and scale of their imports

Assessment of origin of US imports lead to high risk countries-commodities combinations:

Brazil,
Australia,
Mexico,
Nicaragua

Colombia
Brazil
Vietnam
Guatemala

Indonesia
Liberia
Thailand
Cote d'Ivoire

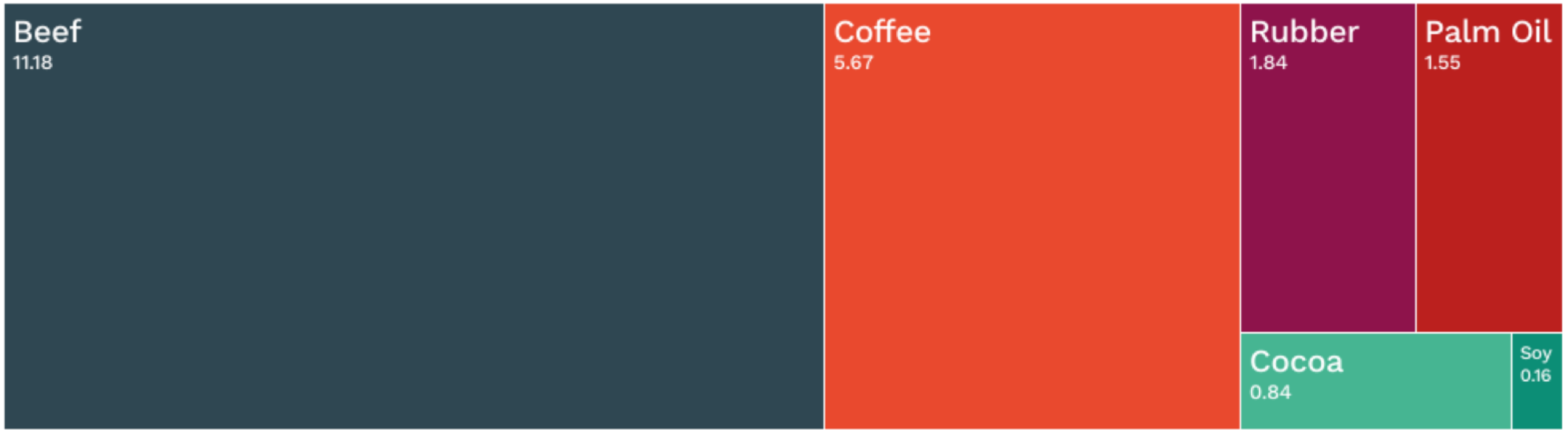
Top-15 largest USA importers of frozen, prepared, and preserved beef from Brazil in 2022

Top-15 importers	Country of headquarter	Weight (MT)	%
JBS	USA	44,664	37%
Foshan Suneatlink Trading	China	12,414	10%
Mobius Holdings	UK	12,153	10%
Link Snacks	USA	9,023	8%
Cofco	China	7,292	6%
Jiangsu Guotai	China	4,600	4%
Parker Migliorini International	USA	3,809	3%
Marfrig Foods	USA	4,194	4%
Orleans International	USA	3,388	3%
Lawrence Wholesale	USA	2,603	2%
Thomas Foods International	USA	2,441	2%
Gurrentz International Corp	USA	1,035	1%
Purcell	USA	979	1%
Awano Food Group	Singapore	779	1%
Alle Processing	USA	579	0%
Other / Unknown	-	9,297	8%
Total	**-**	**119,250**	**100%**

Source: Shipping data, based on Brazilian export data of HS codes 0202 and 160250 to the USA in 2022. JBS volumes include Sampco and Weddel. Marfrig volume includes National Beef.

Source: Shipping data (Seair)

Deforestation and carbon emission estimates per commodity sector linked to US consumption



Source: AidEnvironment, based on US 2022 import data (Census); Pendrill *et al*., 2022 (emissions); FAOSTAT (production)

Example calculation deforestation emissions coffee beans

Countries with deforestation risk	Emissions 2018 (MtCO2) Pendrill	Total coffee beans production 2018 (t) FAOSTAT	USA 2022 imports of coffee beans (t) CENSUS	Deforestation emissions (MtCO2) linked to US imports 2022 AidEnvironment
Brazil	0.28572978	3,552,729	473,599	0.038089
Colombia	12.09557742	813,420	303,752	4.516795
Vietnam	0.332789143	1,616,307	141,776	0.029191
Guatemala	0.013847399	240,400	88,394	0.005092
Nicaragua	0.001282056	141,931	71,320	0.000644
Honduras	1.12539321	478,831	69,745	0.163922
Indonesia	1.107493928	756,051	67,495	0.098869
Peru	4.550336421	369,622	62,718	0.772108
Costa Rica	0.100408242	66,929	30,360	0.045547
TOTAL	**19.6128576**	**8,036,220**	**1,309,159**	**5.670256**

$$x = \left(\frac{Deforestation\ emissions\ Pendrill\ (MtCO2)}{Production\ quantities\ FAOStat\ (t)}\right)_{year\ 2018} * \quad USA\ import\ quantities\ Census\ (t)_{year\ 2022}$$

Wherein $\chi = Deforestation\ emissions\ of\ commodity\ production\ linked\ to\ US\ consumption\ in\ 2022.$

Financial risks of Scope 3 emissions from imported FRCs

Profundo

Gerard Rijk | September 2023

Main questions…

…Scope 3 emissions and financial risks

- Regulation or civil society pressure can trigger transition effects and lead to:
  - stranded assets
  - revenue risk
  - earnings risk
  - financing risk
  - reputation risk for companies and whole sectors
- How crucial are imported FRCs for specific processing industries?
  - Certain part of financing industry might have strong links
- Value and valuation risk
  - US financial institutions are financers and might lose value

Relative size in US context

- Scope 3 emissions of imported FRCs **= 0.35% of US total**
- Imported beef from forest-risk areas is largest contributor with **53%**

Relative size of imported Scope 3 emissions agricultural commodities US

$MtCO_2$-eq*	2019	As % of US emissions	As % of IFRCs emissions
Beef	11.18	0.19%	**53%**
Leather***)	0.00	0.00%	**0%**
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%**
Wood****	No data	n/a	n/a
Group total	21.24	**0.35%**	100%
US total 2019**	6,040	100.00%	

Source: AidEnvironment, World Bank; *) Million tons carbon dioxide equivalent; **) pre-COVID-19; ***) Leather emissions are covered under beef.
****) Paper/pulp/wood are not covered in most tables, due to lack of data from AE.

Carbon dioxide costs of imported FRCs

- Carbon pricing methodology = a proxy for climate damage. However, still in development
- Three scenarios in pricing: 1- US jurisdictions; 2- EU ETS; 3- Societal cost of carbon dioxide
- The value of Scope 3 emissions is **0.003% to 0.097% versus US GDP**

Carbon dioxide costs of IFRCs and US GDP

	Scenario 1	Scenario 2	Scenario 3
Scope 3 emissions ($MtCO_2$-eq)	21.2	21.2	21.2
CO_2 price/ton (US$)	**34.1**	**96.3**	**1,160.0**
Total CO_2 costs (US$ million)	723.2	2,045.2	24,636.1
Total CO_2 costs (US$ billion)	0.72	2.05	24.64
US GDP (2022, US$ billion)	25,463	25,463	25,463
Scope 3 IFRCs costs as % of GDP	**0.003%**	**0.008%**	**0.097%**

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

The value chain of imported FRCs

- **Q1: which companies/sectors benefit from imported FRCs?**
- The top-15 importers for each commodity handle 22% to 87% of total imports from the specific country with the highest forest-risk
- This indicates the relevance of the top-15 companies in the import of each forest-risk commodity

Imports forest-risk commodities in US and Top15 importers (2022)

Metric tons	All imports US (A)	From forest-risk countries (B)	% forest-risk (B/A)	Top-15 importers (C)	Main sourcing country	% of forest-risk (C/B)
Beef	551,089	298,862	54%	109,953	Brazil	37%
Coffee	1,625,154	1,291,166	79%	282,969	Brazil	22%
Rubber, natural	1,073,450	993,433	93%	340,536	Indonesia	34%
Palm oil	1,692,001	1,673,181	99%	913,174	Indonesia	55%
Cocoa	343,802	320,324	93%	277,552	Côte d'Ivoire	87%**
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.

The value chain of imported FRCs (2)

- The total value of imported FRCs is **US$ 5,803 million and for the various top-15s US$ 2,654 million**
- All five imported FRCs contribute between 14% and 27% of the total imported value of FRCs
- The value of US$ is crucial to start the calculation of the total value in the whole chain – see next slides

Value of imports forest-risk commodities in US (2022)

	Per unit (end 2022)	Per ton (US$) (A)	From forest-risk countries (ton) (B)	Total forest-risk (US$ mln) (AxB)	As % of total
Beef	BRL 19.62/kg	3,709	298,862	1,108	19%
Coffee	US$ 1.673/lbs	759	1,291,166	980	17%
Rubber, natural	US$D 130.2 c/kg	1,302	993,433	1,293	22%
Palm oil (HS 1511)	MYR 4,174/ton	949	1,673,181	1,588	27%
Cocoa (HS 1801)	US$ 2,600/ton	2,600	320,324	833	14%
Total				5,803	100%

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

Pricing-up + profit distribution models

- The pricing-up and profit distribution models developed by CRR and Profundo
- **The models explain how the value of an embedded commodity increases in every step of the downstream segments** and how every step in the chain is earning a profit

Pricing-up in various value chains

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			
Down-stream dairy		198			
Egg packer		162			
Average downstream, or brand company		181	280	160	207
Retailer/food service	202	302	350	194	262

Source: Chain Reaction Research, Profundo. Leather and paper/pulp/wood are not considered due to lack of data from AE.

Value enhancement in each value chain

- The pricing-up ratios from import to retail are applied to the import values of the various commodities
- As a result, the total value of the IFRCs (excluding wood) escalates to **US$ 13,254 million**

Value enhancement in each value chain (imports, US)

	Total forest-risk (US$ mln)	Pricing-up factor (x)	Chain value (US$ mln)	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	1,588	1.94	**3,080**	23%
Cocoa	833	2.69**	**2,440**	17%
Total	**5,803**		**13,254**	**100%**

Are the imported FRCs essential?...

…a crucial step to conclude on the US's financial stability related to the volumes and the Scope 3 emissions

- **Brazilian beef:** a ban would not have a major impact on the US market: imports from Brazil are **less than 2%** of the consumed beef volume (2022).
- **Soy:** the large domestic production means that imports of soy are minor at **less than 2%** of consumption.
- **Rubber:** USA dependent on imports + half of the imported volume from Indonesia (2022). Loosing these supplies could impact the automotive and apparel industries.
- **Palm:** Indonesia as the largest producer globally is also supplying the vast majority of imports to the US.
- **For coffee,** the US relied on Brazil for around one quarter of its green coffee imports, followed by Colombia with a share of 19%.

Relative size of climate damage costs

- In scenario 1 (carbon costs US jurisdictions = US$ 34.05/ton), climate damage costs would be **US$ 718 million = 5% of the total value chain**
- Beef is the segment with the highest relative climate damage costs **(21%)**
- Note that these costs are versus the embedded tons, not to the product where these tons are part of (e.g. palm oil = small part of shampoo)

US Chain values and climate damage costs (scenario 1)

US$ million	Chain value	Scope 3 emissions (MtCO2-eq)	Pricing CO2/ton (US$)	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	3,080	1.55	34.05	53	2%
Cocoa	2,240	0.84	34.05	29	5%
Total	13,254	21.08	34.05	718	5%

Operational business risk

- Revenue and therefore gross profits might get a material hit in case of regulation/CSO pressure
- Based on a Discounted Cash Flow valuation, this leads to potential US$ 4.5 billion to US$ 83 billion value losses in the whole chain, including downstream

Operational business risk from imported forest-risk commodities (all scenario)

US$ million	Scenario 1	Scenario 2	Scenario 3
CO_2 price/ton (US$)	34	96	1,160
Total impact value	-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**
Financing risk	n/a	n/a	n/a

Reputation risk

- Considering the **high dependence** of certain industries on imported FRCs, like coffee, palm oil and natural rubber, some downstream segments (coffee brands and coffee retail/foodservice, apparel, tyres, automotive) could face a relatively **high reputation value risk**
- Based on studies by Chain Reaction Research, 3%, 15%, and 30% of reputation risk are applied: **US$ 2.4 to 24.8 billion value at risk**

Reputation risk (all scenario)

US$ million	Scenario 1	Scenario 2	Scenario 3
Total forest-risk (A) See Table 8	5,803	5,803	5,803
Chain value (B) See Table 8	13,254	13,254	13,254
Added value (C = B – A)	7,452	7,452	7,452
Multiply factor for DCF value (x) (D)	11.1	11.1	11.1
Market value (E = C x D)	82,713	82,713	82,713
Reputation risk percentage (F)	2.9%	14.7%	30.0%
Reputation value risk of IFRCs supply chain actors (E x F)	2,399	12,159	24,814

Summary/sum of all risks

- **Total identified financial risks are US$ 7.3 billion to US$ 115 billion**
- Equal to 0.01% to 0.15% of all bank assets and assets under management in the US

Summary of all financial impacts US imported FRCs

US$ million	Scenario 1	Scenario 2	Scenario 3
CO_2 price/ton (US$)	34.1	96.3	1,160
Operational business risk annually	-404	-1,140	-7,452
Value impact based on DCF (11.1x factor)	-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 financial assets	77,700,000	77,700,000	77,700,000
As % of US financed assets 2022/23	-0.01%	-0.03%	-0.15%

US financial institutions risk

- In 2018-2023, US financial institutions had identified financial flows of **US$ 24 billion to forest-risk activities** (excluding coffee, cocoa, as well as downstream sectors). 64% was Latin America linked
- Forests & Finance identifies **US$ 4,935 million adjusted financial flows to several companies named in the various top-15 companies** importing forest-risk commodities in the US
- These numbers DO NOT include financing of downstream sectors

US financial institutions' financing to forest-risk sectors

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, adjusted; *in forest-risk countries.

Keep In Touch:

Emma McMahon
mcmahon@climateadvisers.org

Matt Piotrowski
piotrowski@climateadvisers.org

Sarah Drost
drost@aidenvironment.org

Gerard Rijk
g.rijk@profundo.nl

Read The Report:

Find Us Online:

www.orbitas.finance | www.aidenvironment.org | www.profundo.nl