Vol. 21, No. 2, 2026

scnat
swiss academy of sciences

swiss academies
reports

swiss-academies.ch

Beyond the transaction: commodity trade and sustainable development

Interdisciplinary literature review



ABOUT THIS PUBLICATION

PUBLISHER AND CONTACT
Swiss Academy of Sciences (SCNAT)
Swiss Alliance for Global Research Partnerships (GRP-Alliance)
House of Academies • Laupenstrasse 7 • P.O. Box • 3001 Bern • Switzerland
+41 31 306 93 49 • globalresearch@scnat.ch • globalresearch.ch
GRP-Alliance

RECOMMENDED FORM OF CITATION
Brugger F, Carbonnier G, Depoorter C, Elsig M, Fischer F, Grabs J, Haller L, Kaufmann C, Kesselring R, Leins S, Luciani G, Nadakavukaren Schefer K, Nerlinger M, Pfister S, Wettstein F, Winkler MS (2026) Beyond the transaction: commodity trade and sustainable development. Swiss Academies Reports 21 (2)

DOI: doi.org/10.5281/zenodo.20050770

AUTHORS
Fritz Brugger (ETH Zurich) • Gilles Carbonnier (IHEID) · Charline Depoorter (University of Basel) • Manfred Elsig (University of Bern) • Felicitas Fischer (ETH Zurich) • Janina Grabs (University of Basel) • Lea Haller (SAGW) • Christine Kaufmann (University of Zurich) • Rita Kesselring (University of St Gallen) • Stefan Leins (University of Bern) • Giacomo Luciani (University of Geneva) • Krista Nadakavukaren Schefer (Swiss Institute of Comparative Law) • Martin Nerlinger (University of St Gallen) • Stephan Pfister (ETH Zurich) • Florian Wettstein (University of St Gallen) • Mirko S. Winkler (Swiss TPH)

PROJECT MANAGEMENT
Fritz Brugger (ETH Zurich) • Fabian Käser (SCNAT)

CONTRIBUTORS
Zeno Adams • Lance Ang Wen Pin • Felix Barbour • Elisabeth Bürgi Bonanomi • Julien Chaisse • John Curran • Yaku Fernández-Landa • Julia Gubler • Fabian Käser • Mukaka Kasonde • Wangui Kimotho • Irene Musselli • Joschka Proksik • Martin Roch • Sean Stacy • Utkarsh Uprety • Noah Wheatley • Pascaline Wibin

LAYOUT
Olivia Zwygart (SCNAT) • Monique Borer (SCNAT)

COVER PHOTO
Helder – stock.adobe.com: Soybean bulk carrier at trader-owned Itupanema port in Barcarena, Amazon, Brazil.

NOTE
This report takes stock of the current evidence on commodity trade and global sustainable development across the academic disciplines of law, economics, environmental, political and social sciences. The report also benefits from inputs from a workshop with representatives from the federal administration, international organisations and trading houses in March 2026 and comments provided by topical experts. The literature review and workshop were coordinated by ETH NADEL and the SCNAT GRP-Alliance.

1st edition, 2026

This report and the factsheet can be downloaded free of charge from globalresearch.scnat.ch/commoditytrade-report.

ISSN (print) 2297–1564
ISSN (online) 2297–1572

creativecommons.org/licenses/by/4.0
This publication is licensed under CC BY 4.0. Excluded are the following third-party materials: cover photo on the front page, and figure 5 on page 14.

Beyond the transaction: commodity trade and sustainable development

Interdisciplinary literature review

SDGs: The international UN Sustainable Development Goals

With this report, the Swiss Academy of Sciences supports informed discussion and policy-making related to the SDGs 1, 2, 3, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17.

THE SDGS ARE TO BE ACHIEVED AROUND THE WORLD, AND BY ALL UN MEMBER STATES, BY 2030. THIS MEANS THAT ALL STATES ARE CALLED UPON EQUALLY TO PLAY THEIR PART IN FINDING SHARED SOLUTIONS TO THE WORLD'S URGENT CHALLENGES. SWITZERLAND IS ALSO REQUIRED TO IMPLEMENT THE GOALS ON A NATIONAL BASIS. IN ADDITION, INCENTIVES ARE TO BE CREATED TO ENCOURAGE NON-GOVERNMENTAL ACTORS TO MAKE AN INCREASINGLY ACTIVE CONTRIBUTION TO SUSTAINABLE DEVELOPMENT.

> sdgs.un.org
> agenda-2030.eda.admin.ch/en



Content

Introduction ... 5

Part I: Commodity trade and the rise of global intermediaries ... 6

1 From commodity trading to commodity intermediation ... 6
1.1 Commodity trading ... 6
1.2 From commodity traders to financialised, integrated commodity intermediaries ... 7

2 The trading hub Switzerland ... 10

3 Transit trading in Switzerland – a mystery for over a century ... 12
3.1 Below the radar ... 12
3.2 The political economy of understanding transit trade in Switzerland ... 12
3.3 Globalisation and the post-war boom in raw materials ... 13

4 Global commodity trade and geopolitical dynamics ... 14
4.1 Commodities' storage and price behaviour ... 14
4.2 Price discovery and volatility ... 15
4.3 The economics and politics of sanctions busting ... 17
4.4 Implications for policy and research ... 17

5 Trade-relevant sustainability regulation in international law ... 19
5.1 Economic development ... 19
5.2 International financial and fiscal regulation ... 20
5.3 Environmental and social protection ... 20
5.4 Supply chain regulation ... 21
5.5 International commodity agreements ... 21
5.6 Commodity exchanges ... 21

6 Comparison of commodity trading hubs: Switzerland, the US, the UK, Hong Kong and Singapore ... 23

Part II: The sustainability effects of commodity trade ... 25

7 Financialisaton and global sustainability ... 25
7.1 Concepts, actors, and analytical framework ... 25
7.2 Transmission channels to SDG outcomes ... 26
7.3 Empirical evidence on commodity-market financialisation ... 27
7.4 Switzerland as a commodity trading hub ... 28
7.5 From commodity finance to SDG impacts ... 28
7.6 Implications for policy and research ... 29

8 Illicit financial flows ... 31
8.1 Measuring IFFs ... 31
8.2 The effectiveness of policies to curb IFFs ... 33
8.3 Implications for policy and research ... 34

→

9 Environmental effects 36
9.1 Extent of environmental effects 37
9.2 Implications for policy and research 39

10 Effects on public health 40
10.1 Occupational health impacts 40
10.2 Health impacts in affected communities 40
10.3 Implications for policy and research 41

11 Social effects 42
11.1 Inequality 42
11.2 Social conflict 42
11.3 Abstracting extraction: the moral economies of trade 43
11.4 Implications for policy and research 43

Part III: Political economy of sustainability-related trade regulation 45

12 Political economy of Swiss commodity trade regulation 45
12.1 Framework, developments, innovations 45
12.2 Participation in global sustainability initiatives 46
12.3 Integration of international regulatory developments 46
12.4 Responses to evolutions in competing jurisdictions 46
12.5 Implications for policy and research 47

13 Responsible business conduct 49
13.1 Conceptualising sustainability regimes in commodity value chains 49
13.2 The political economy and effectiveness of RBC sustainability regimes 50
13.3 Implications for policy and research 55

Conclusion 56

14 Aligning commodity trade and sustainable development 56
14.1 Key findings 56
14.2 Policy priorities 57
14.3 Research priorities 58

Abbreviations 59

Glossary 61

Bibliography 64

Introduction

Commodities represent around 33% of global trade in goods. Energy products dominate (45%), followed by agricultural exports (32%, of which 87% are food commodities), while minerals, ores, and metals account for the remaining 23% of global commodity exports in 2021–2023.[1] Commodity trade links primary extraction and production with processing, manufacturing and consumption, thereby connecting distant ecologies and social realities. Commodity trade is not merely a neutral service enabling the world economy; rather, it is an integral component that actively shapes production systems, investment patterns, and global value chains. Commodity trading delivers not just materials and goods, but also economic, environmental, and social impacts – whether intentionally or not. Moreover, commodity trade sits at the fault line where geopolitics and geoeconomics increasingly converge.

Trading hubs in Switzerland, the US, the UK, Singapore or Hong Kong, among others, play a key role in global commodity trading. They serve as nodes anchoring global networks of material, informational, and financial flows while competing for strategic and regulatory advantage. Public policy faces the challenge of balancing trade facilitation, supply chain resilience, and long-term sustainable development.

This review takes stock of the current evidence on commodity trade and global sustainable development across the academic disciplines of law, economics, environmental, political and social sciences. It considers hard and soft commodities, as well as derivatives trading. **Part I** maps the broader infrastructure of commodity trade, its interaction with geopolitical dynamics, and sustainability governance in international law. **Part II** presents current evidence on commodity trade-related sustainability outcomes from an economic, environmental, social, and health perspective. **Part III** discusses the political economy analysis of trade-related sustainability regulation in Switzerland and synthesises the aggregated evidence on the effectiveness of sustainability regimes to promote responsible business behaviour. The report concludes with priorities for policy and research.

Part I: Commodity trade and the rise of global intermediaries

Part I maps the evolution of commodity trading houses from logistics firms to financialised and integrated commodity intermediaries. It examines key elements of the trading infrastructure, such as exchanges and major trading hubs, with particular attention to Switzerland, as well as the growing entanglement of trading houses in geopolitical dynamics. It also introduces how international law addresses sustainability challenges in global commodity markets.

1 From commodity trading to commodity intermediation

The analysis begins by outlining the narrow functions of commodity trading before examining how trading firms have evolved into hybrid actors with business models that extend beyond core trading. It then explores how their operations are embedded in and interact with an increasingly sophisticated global trading infrastructure, and considers the implications of this evolution for sustainability.

1.1 Commodity trading

The narrow function of **commodity trading** includes buying, transporting, storing, and selling physical commodities, both hard (e.g., crude oil, natural gas, minerals and metals) and soft (e.g., coffee, cocoa, soybeans, palm oil, wheat, rice, sugar, cotton), with little or no transformation of the goods, aside from limited processing such as blending or refining. Trading houses also manage associated risks and may own and operate physical assets, such as warehouses, port terminals, shipping vessels, railcars, and related infrastructure.[2] Physical commodity traders coordinate material flows along supply chains, thereby reducing transaction costs across place, time, quantity, and quality.[2–5] Most commodity trade is **transit trade**, i.e., the commodities traded do not enter the jurisdiction from which the trading house operates. Trading firms derive profits primarily from controlling commodity flows and exploiting spatial, contractual, temporal, regulatory and fiscal arbitrage through their balance-sheet capacity, logistical coordination, and, above all, specialised information capabilities, relationships, and access to suppliers and buyers.[6–8]

Trading houses depend on a range of other actors, including banks, insurance companies, transport providers, and inspection and verification services. They operate within a broader trading infrastructure, with commodity exchanges at its centre. A **commodity exchange** is a regulated trading venue that facilitates the trading of standardised commodity contracts, including derivatives (futures and options) and spot contracts (physical delivery). The standardised commodity contract is backed by the physical commodity stored in a certified warehouse, with defined grades, brands, and weights, thereby turning it into a deliverable instrument (Figure 1).

The introduction of futures contracts traded on futures exchanges in the late 1980s enabled market participants to **hedge** anticipated price changes in a commodity before a specified future date. Futures markets thus allow 'hedgers' (typically commodity producers or buyers) to stabilise revenues by reducing exposure to price risk arising from physical or contractual positions. Hedging also enables physical traders to expand their activities despite a limited equity base.[9,10] It further allows smaller producers to secure financing for new capacity by stabilising future revenues, thereby supporting supply expansion and limiting scarcity rents.[11,12] Over time, derivatives markets attracted an expanding range of **financial investors**, including speculators, such as fund managers, pension funds, and hedge funds, who profit from price movements by taking positions (betting) on the direction of price changes. By providing liquidity, these actors reduce hedging costs and support the rise of independent trading houses, but they have also driven the financialisation of commodity markets, as financial actors have taken on an increasingly prominent role.

Commodity exchanges are central to **price discovery**, aggregating information on supply, demand, and risk into credible benchmark prices under conditions of liquidity and standardisation. Derivatives markets typically lead price discovery by incorporating forward-looking information. Oil has one of the most sophisticated markets in terms of depth, complexity, global integration, liquidity

and institutional maturity, but the key ingredients of trading through an exchange, the availability of **futures contracts**, **benchmark pricing**, and **financial investors**, are present in most internationally traded mineral and agricultural commodities. Among transition minerals, copper, nickel and aluminium are widely traded on futures markets, while lithium, cobalt, graphite and rare earth elements are nascent and thinly traded or not traded on futures markets.

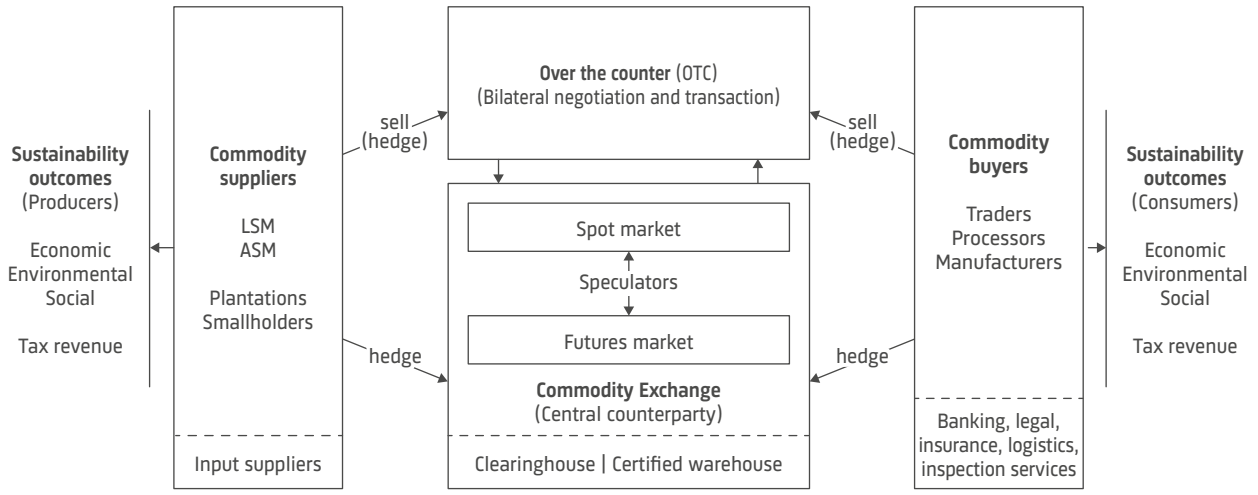
Despite the essential role of exchanges, most transactions for immediate physical delivery are concluded directly between buyers and sellers. These so-called **over-the-counter (OTC)** trades take place outside exchanges, typically using spot-market benchmark prices as a reference. While OTC markets provide contractual flexibility to negotiate differentials related to product quality, specifications, timing, logistics, and delivery terms, they also generate significant opacity. Transaction prices and contractual arrangements are not publicly disclosed, quality adjustments and premiums remain discretionary, and aggregate positions are difficult to monitor. This limits transparency in pricing, risk exposure, ownership structures (including beneficial ownership, the use of intermediaries, and regulatory arbitrage), and capital flows.

1.2 From commodity traders to financialised, integrated commodity intermediaries

Trading houses have progressively transformed their activities beyond simple brokerage. Matching supply and demand across space and time, profiting from arbitrage, logistics, and informational advantages, no longer adequately describes the scope of activities of major trading firms. Instead, trading houses have evolved into multifunctional actors that combine control over physical commodity flows with increasingly sophisticated financial operations.

This transformation can be understood along two interrelated dimensions: integration and financialisation. Integration refers to the expansion of trading firms across value chains and market segments. Financialisation captures their growing role as financial intermediaries and the integration of commodity trading into global capital markets.

Structure and key actors of physical commodity trading systems



LSM, ASM: Large-scale/small-scale mining and resource extraction

Figure 1: Stylised commodity trade architecture, actors and sustainability linkages. Source: authors, based on Soumaré, 2022[9]

1.2.1 Integration across value chains and markets

Vertical integration describes trading houses expanding their activities along commodity value chains. **Upstream**, traders invest in logistics and processing infrastructure or services to support extractive operations and the expansion of farming[20] or engage directly in primary production (e.g., plantations) and extraction (e.g., oil, gas and mining), thereby embedding trading companies more deeply into production contexts with direct exposure to sustainability risks. **Downstream**, traders invest in the production and distribution of intermediate and final consumer goods, e.g., animal feed, human nutrition, biofuels, and fuel retail.

In parallel, **commodity producers and buyers** have moved to trading through captive marketing units to manage price risks, sell their own production, and secure raw-material supply for their operations. Some extractive companies, particularly in oil and gas, have established full-fledged trading houses, that trade far more raw materials from third parties than from their own production.

Drivers of vertical integration include informational advantages from controlling a larger share of the value chain, exclusive access to resources amid fragmented, disruption-prone supply chains, and increased market power.[13] Vertical integration can be seen, in part, as a reconfiguration of earlier commodity firm structures, which were often organised under monopolistic or colonial arrangements[14, 15] before being dismantled through nationalisations in the 1970s, paving the way for trading houses.[6, 7, 16–18]

Horizontal integration has led to significant corporate concentration over the last few decades, particularly in soft-commodity value chains.[19–24] Mergers, acquisitions, and organic growth have consolidated market power among a small number of large trading houses. For example, the five largest traders account for 70–80% of global trade in essential cereals, oilseeds, and protein crops,[21] pointing to an oligopolistic market structure with potential implications for competition policy.[25–27] Market concentration is expected to grow further across commodities, particularly in LNG, natural gas, and metals and mining.[28]

Market concentration can create power asymmetries in bargaining with small-scale producers[29–31] and, in combination with trader-provided pre-harvest lending, a financial and technological 'lock-in'.[20, 32–36] Downstream, market concentration can translate into significant influence over pricing and contracting, and can constrain buyers' options when liquidity is low and opacity is high.[37] The economic weight of international trading houses can translate into political weight, including in commodity hub jurisdictions where they contribute significantly to the economy.[38, 39]

The central role of trading houses in coordinating global value chains has made them **regulatory anchors** for sustainability governance.[37, 40, 41] Regulators, development finance institutions, and civil society actors increasingly rely on trading houses as leverage points to roll out standards across dispersed and often weakly regulated production networks. Civil society has likewise targeted traders as leverage points for change,[42–44] notably in deforestation governance in Indonesia's palm oil sector[45, 46] and in the Brazilian Amazon's soy sector.[47, 48] After initial success, antitrust interventions in both countries have dismantled such trader-led collaborations with civil society.[25–27, 49–51]

More recently, trading houses have expanded into **emerging commodities**[28] such as carbon markets. Unlike classical commodities, CO_2 certificates are created by regulation, but they exhibit commodity-like features, including standardisation, exchange trading, and the use of derivatives for hedging and speculation. In parallel, many trading houses have entered voluntary carbon and nature-based offset markets through investments in carbon removal technologies, reforestation projects, and related activities. These assets often face integrity controversies[52–57] and are exposed to reputational and legal risks.[58, 59] The expansion of trading houses into such markets underscores their adaptive capacity to operate across increasingly diverse and hybrid asset classes.

1.2.2 Financialisation

Physical commodity traders have long engaged in **speculative activities**. Positions in futures markets that exceed underlying physical exposures[60, 61] are often financed through leverage, including borrowing against inventories and balance sheets. These activities reflect the dual role of traders as both hedgers and speculators.

Since around 2010, however, the scale and sophistication of trading houses' financial activities have expanded significantly, marking a shift towards deeper financialisation (see also chapter 7). A key driver of this shift has been the transformation of trading houses into **financial intermediaries** in trade finance. Following the 2008 financial crisis, regulatory reforms under the Basel III framework increased capital and liquidity requirements for banks, raising the cost of traditional trade finance and prompting many banks to reduce their direct involvement.[62] Particularly large commodity trading houses stepped into this gap.

Leveraging their market knowledge and global networks, they began operating as **non-bank financial institutions** (NBFIs), or shadow banks.[63, 243] Instead of relying on transaction-specific financing, in which banks fund individual trades based on documentary exchanges, large trading houses now typically access revolving credit facilities[64] to purchase physical commodities and manage financing more flexibly on their own balance sheets. In plain terms, the trader buys physical commodities with borrowed money, e.g., copper. Yet instead of simply reselling the copper to another buyer, the trader uses their market knowledge to structure a financial product linked to future prices, selling it to investors who gain exposure without handling the physical goods. The trader repays the bank loan, while the deal with the investor lasts. When the trader sells the physical commodity (copper), the derivative position remains in place, creating additional financial opportunities.

This 'synthetic banking model'[6] disintermediates banks from the underlying trade[65, 66] and positions the commodity trader as the central intermediary between producers, financiers, and investors. Trading houses now act simultaneously as industrial hedgers, financial speculators, liquidity takers, and intermediaries, which is reflected in their income structure (Figure 2). While they perform bank-like functions, including intermediation and maturity transformation, they face far less regulation than banks.[64] The growing role of major trading houses as financial intermediaries has raised concerns among regulators, including the Financial Stability Board, about their **systemic importance** and associated risks.[63]

Beyond capital market activities, trading houses play a significant role in providing credit directly to producers and governments. **Pre-financing** arrangements are widespread across agricultural and extractive sectors. Loans are secured against future deliveries of commodities, e.g., soy in Brazil,[67, 68] wheat in the US,[68] cocoa and coffee, mining,[69] or oil extraction.[70] While these instruments enable producers to access liquidity, they can also create asymmetric relationships. If supply is short (e.g., when metal concentrate markets tighten), producers can negotiate favourable terms.[71] In situations of weak bargaining power, e.g., lending to farmers or to a cash-strapped government in exchange for future production, these arrangements can strengthen the lender's position and may entail high financing costs. Such practices further reinforce the role of trading houses as key financial intermediaries embedded in commodity production systems.

Most recently, the integration of physical commodity trading and financial actors has taken another step. **Hedge funds** have acquired stakes in, or full ownership of, commodity trading firms in natural gas[72] energy,[73] and soft-commodities.[74] Controlling physical assets provides access to proprietary market information, opportunities for arbitrage between physical and financial markets, and diversification of revenue streams.[73] This trend further blurs the boundary between financial and commercial actors. The new owners may pursue different business strategies, though the long-term implications remain to be seen.[74]

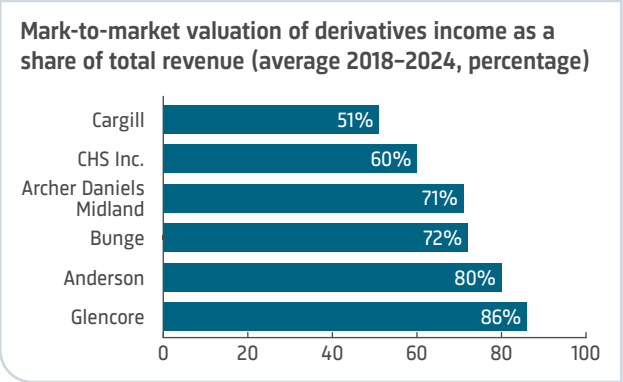


Figure 2: Commodity traders have stepped beyond simply seizing opportunities from market volatility becoming financial intermediaries.
Source: UNCTAD, 2025[64]

Taken together, integration and financialisation have fundamentally reshaped the role of commodity trading houses. They have expanded their control over physical commodity flows and value chains, becoming central intermediaries in the allocation of capital, the management of risk, and the structuring of financial exposure. The boundary between 'pure' trading houses and commodity producers, processors, banks, financial actors, and speculators is increasingly blurred, with important implications for sustainable development.[75] This dual transformation is best captured by conceptualising trading houses as financialised, integrated commodity intermediaries.

2 The trading hub Switzerland

Within the global commodity trade infrastructure, Switzerland is an important hub for transit trading (Table 1), appreciated by the industry for its ample trade finance and insurance services, the availability of verification and logistics expertise, as well as its favourable policy and tax environment.[39] Global commodity **trading hubs** are places that host a dense cluster of commodity trading firms as well as shipping, finance and services for physical merchanting, and/or globally important derivatives exchanges and clearing facilities. Long-established hubs beyond Switzerland (Geneva, Zug, Lugano) include Chicago, London, New York, Rotterdam, and Singapore. Fast-rising recent market entrants include Dubai, Shanghai and Hong Kong.

Commodity	Physical	Derivatives	Switzerland
Oil	Geneva; Singapore; Houston	New York (NYMEX); London (ICE Futures Europe); Shanghai (SHFE)	Top-tier physical
Metals	Zug; Geneva; Shanghai; Dubai; Singapore	London (LME); Shanghai (SHFE); New York (COMEX)	Top-tier physical
Agriculture	Geneva; Chicago; Singapore; Rotterdam	Chicago (CBOT); New York (ICE)	Top-tier physical
Gas, LNG	Houston; Singapore; Doha; Rotterdam	New York (NYMEX/ Henry Hub); Amsterdam (ICE Endex)	Secondary physical (LNG)
Power, Carbon	Amsterdam; Leipzig; London	Leipzig (EEX); London (ICE Futures Europe)	Minor in exchange-based carbon trading

Table 1: Major trading hubs for different commodities and Switzerland's relative position. Source: authors

about one-third of cocoa, and close to 30% of cotton are traded via Switzerland. Given shifts in competitiveness and the geopolitical environment, these figures warrant an update.

In 2023, 975 **trading firms** were operating in Switzerland (Figure 4). Of those, 27% were letterbox companies. The remaining companies employed more than 10,735 people, with an additional 1,640 people working in supporting industries, mainly in finance (950 people), followed by shipbroking, logistics, verification, and insurance.[76, 77]

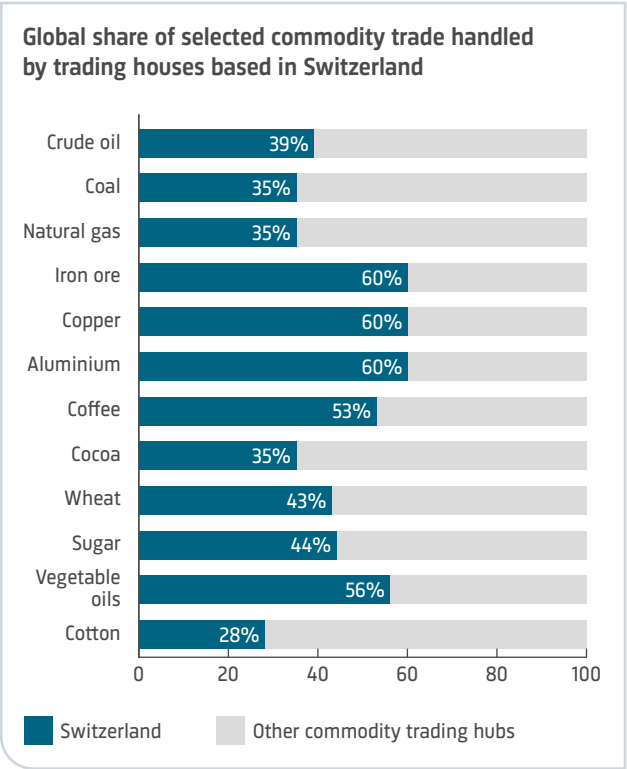


Figure 3: Estimation of share of selected hard- and soft commodities traded in Switzerland in 2017; more recent data are not available. Source: Jungbluth and Meili, 2018[78]

The most recent data available on the **share of commodities traded via Switzerland** are nearly a decade old and should be treated with caution (Figure 3). They suggest that around 60% of global trade in copper, aluminium and iron ore is conducted via Switzerland, as well as about one-third of energy commodities (crude oil, natural gas and coal). For soft commodities, the estimates indicate that roughly half of global trade in coffee and vegetable oils (including palm oil), around 40% of sugar and wheat,

Calculations of the trading sector's **contribution to Switzerland's GDP** differ. Approximating transit trade using **current account merchanting statistics** from the Swiss National Bank (SNB), including supporting industries, yields estimates of around 8% of GDP in 2021 and 7% in 2024.[79] The State Secretariat for Economic Affairs (SECO) uses **wholesale trade** (11.4% in 2023) as a point of reference, arguing that transit trade contributes a significant share.[80] Using a **survey-based** approach (no information is provided on

response rates and type of respondents[77, 81]), the Federal Office of Statistics calculates CHF 19.2 billion value added for 2025, equal to 2.3% of GDP for the 'core' industry, i.e., buying and selling products, excluding the 'cluster', i.e., companies active in associated sectors such as transport, financing or specialised services.[81] One third came from metals and minerals, while fossil fuels accounted for 41% of the total. Value added is highly concentrated in Geneva (58.4%) and Zug (27%).[81] These most recent calculations are challenged by both the industry association Suissenégoce and civil society for underestimating the sector.[82]

Irrespective of the exact size of the sector, proximity and networks are key to the trading hub.[6] As traders explain, 'everybody knows everybody in Geneva'.[44] This facilitates cooperation and informal problem-solving.[44]

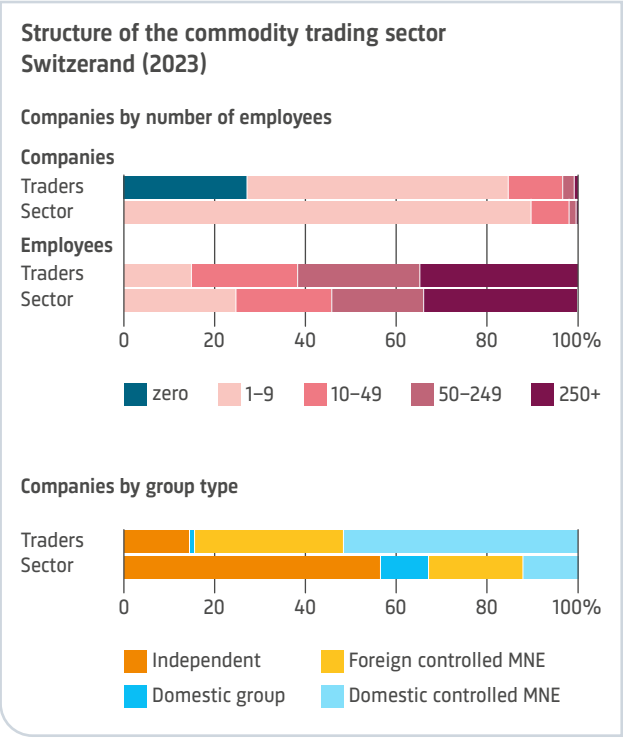


Figure 4: Structure of the commodity trading sector in Switzerland.
Source: BfS[76]

3 Transit trading in Switzerland – a mystery for over a century

Since the early 20th century, the scale and importance of transit trade in Switzerland were initially overlooked, and later contested, even though Swiss trading companies had already been deeply involved in raw materials trade during 19th-century industrialisation. Rising demand for cotton, wool, grain, sugar, and palm oil created lucrative opportunities for traders able to organise and pre-finance supplies. Among the major Swiss global trading companies at that time were, e.g., the wool trading house Simonius, Vischer & Co., the Missions-Handlungsgesellschaft Basel (after 1928: Union Trading Company International), the grain trading company André & Cie., Gebrüder Volkart, Paul Reinhart & Cie., Diethelm & Co., Ed. A. Keller & Co., Siber Hegner, and the silk trading company Desco von Schulthess.[83–89]

3.1 Below the radar

First estimates of Switzerland's balance of payments at the beginning of the 20th century[90, 91] relied on the balance between imports and exports of goods. Transit trade transactions were recorded only in the form of physical transit, i.e., when they involved re-exports.[92] For this reason, a mystery remained: Switzerland had a significant trade deficit – i.e., an import surplus of CHF 300 to 500 million over exports – while at the same time maintaining a balanced balance of payments.[93]

From today's perspective, it seems reasonable to assume that the difference between imports and exports was not only covered by 'income from tourism', 'interest income from foreign assets', 'profits from Swiss companies abroad' and 'countless smaller, more or less hidden assets of the Swiss economy', as Traugott Geering argued in 1902,[92] but that transit trade made a significant contribution to the balance of payments. Technically, transit trade was classified by the International Monetary Fund (IMF) as an export of services until 2014. From 2014 onwards, this practice changed, and transit trading is now recorded under trade in goods.

Still in 1925, Julius Landmann, a professor of economics at the University of Basel, did not consider transit trade.[94] Noting the high foreign trade figures of the Netherlands and Belgium due to commodity imports and re-export in Rotterdam and Antwerp, he wrote that Swiss trade statistics had 'for decades been meticulously accurate in excluding transit traffic'. From this, he drew a conclusion that would shape Switzerland's self-image throughout the 20th century: 'Taking this fact into account, the high figures for Swiss foreign trade (…) appear not as a symptom of highly developed international and transit trade, but as a symptom of exceptionally strong industrialisation, which primarily causes exports to rise sharply, but indirectly also causes imports to rise accordingly.' In short, Switzerland considered itself a powerful industrial nation, not a trading hub.

3.2 The political economy of understanding transit trade in Switzerland

The first effort to quantify transit trade income was initiated by trading companies seeking recognition from the Swiss federal government. When Switzerland introduced bilateral clearing agreements (tied payments) with various countries in response to the massive devaluation of many foreign currencies in the early 1930s, no credit lines were reserved in the clearing system for transit trading firms. The industry commissioned Fritz Mangold, head of the Swiss Economic Archives, to conduct a systematic survey of Swiss transit trading companies in 1934 to demonstrate their economic importance.

Mangold uncovered, based on industry-provided data, a gigantic business, of which the 'gentlemen who drew up the balance of payments for Switzerland had no idea.' For 1929, the year of the stock market crash, he estimated transit trade revenues at CHF 39.7 million, matched only by the banking industry (CHF 40 million). In the same year, the 56 transit trading companies surveyed had invested a total of CHF 157 million in equity capital (compared to CHF 123 million in the silk industry and CHF 117 million in the watch industry). Gross sales prior to the stock market crash were reportedly significantly higher, at around CHF 1.3–1.4 billion per year (CHF 9 billion in inflation-adjusted terms) for 58 companies for which data were available.[95]

While the Federal Office of Statistics was aware that the Swiss National Bank (SNB) was conducting its monetary policy in the dark because 'everything that takes place outside Swiss banks – and that is a significant portion of transactions – is beyond the knowledge of the central bank',[96] traders and banks refused to provide any data. Banking secrecy was enshrined in the Banking Act in 1934, and its violation was considered a criminal offence. Family-owned trading houses, which were liable with their private assets, were extremely reluctant to share information, since exclusive knowledge and relationships were crucial to their business success.

Yet, when the SNB published its first balance of payments in 1947, transit traders did not feel adequately represented, prompting the Association of Transit and World Trade Companies to commission another 'enquiry' into the industry in 1953. However, a low response rate and a surging post-war business reduced the exercise to a brief summary, indicating that turnover for the 48 responding companies amounted to just under CHF 2 billion in 1953.[97]

Only in the 1959 publication 'The Role of Middleman Transactions in World Trade' did Robert Lichtenberg[98] demonstrate that a large proportion of intermediate trade was not physical re-export but rather transit trade. Analysing the few countries that record both the country of origin of the goods and the country where the purchasing company is based, he calculated that around 15% of trade was transit trade, led by the UK, followed by the US, France, the Netherlands, Belgium, Switzerland, Denmark, and Sweden. Per capita, Switzerland was the largest transit trading country after the UK.

3.3 Globalisation and the post-war boom in raw materials

The establishment of the United Nations (UN) after World War II and the emergence of a rules-based international legal order, within which sovereign states are expected to cooperate, facilitated the process of globalisation, understood as the expansion of cross-border economic exchange encompassing trade in goods, finance, capital flows, and, to a more limited extent, the movement of people. Global commodity markets both emerged from and helped define this order, underpinned by US hegemony and the dollar, and reinforced by the inertia of trading practices and market structures. Switzerland participated only very selectively in this emerging multilateralism and did not join the UN until 2002, largely due to concerns over neutrality. Swiss transit traders thus benefited from the stable framework conditions for global trade created by international organisations, without having to comply with the sanctions those organisations imposed, for example, against Eastern Bloc countries or apartheid South Africa.

Operating from a politically neutral country offering holding privileges, low taxes, and a favourable double taxation agreement became an important competitive advantage. When US companies expanded into Western European markets from the mid-1950s onwards in the wake of the Marshall Plan, oil and petrochemical firms primarily established themselves in the Netherlands. Industrial companies, by contrast, opened subsidiaries in Belgium and Switzerland, which proved particularly attractive locations for holding companies, especially in commodity trading. Cargill opened a subsidiary, Tradax, in Geneva in 1956, followed by Phibro (then Philip Brothers) in 1957. They laid the foundation for a broader influx of commodity trading firms.[99,100] After the turn of the millennium, the commodities sector experienced renewed growth, with traders relocating to Switzerland from London, Rotterdam, and Russia.[101] A well-established network of consultants, lawyers, financiers, tax advisors and auditing firms was already in place to support them.

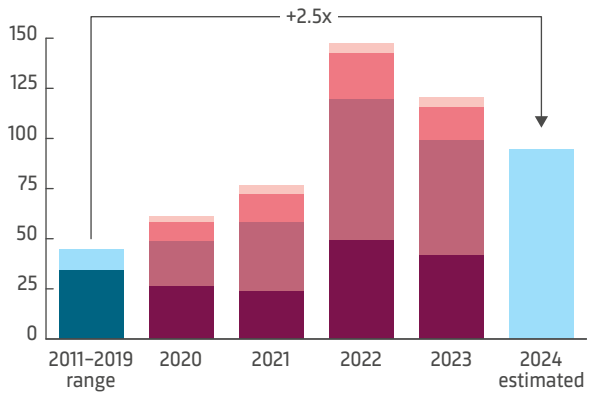
In contrast, by the turn of the 21st century, most Swiss trading companies had been converted into holding companies without direct business activities, transformed into foundations, or had gone bankrupt. Claims about the 'long tradition of this sector in this country'[102] must therefore be treated with caution. After World War II, and more intensively after the end of the Cold War, the growth of the industry was driven by foreign companies that benefited from privileges, including new holding privileges[103] and the adoption of a federal capital tax as part of Corporate Tax Reform I in 1997, which remained in place until it was abolished in 2020 under pressure from the OECD and the EU. These privileges did not disappear thereafter: many cantons lowered their profit tax rates, and some reduced capital taxes on equity attributable to shareholdings and loans ('shareholding deduction').

4 Global commodity trade and geopolitical dynamics

For much of the 20th century, globalisation rested on the assumption that trade could be insulated from politics and foster **peace through interdependence**, with geoeconomic power derived from competitiveness rather than coercion. These assumptions are now increasingly **contested**. Russia's invasion of Ukraine, a five-fold increase in trade restrictions on critical raw materials over the last decade,[104] the weaponisation of interdependence and imposition of sanctions to extract concessions,[105, 106] the growing threat and use of military force to secure economic interests, strategic decoupling,[107, 108] particularly by the US, from rivals such as China, and technological shifts that revalue critical commodities have all intensified geopolitical and geoeconomic constraints on trade and disrupted supply chains. Evidence shows that **protectionist policies** driving much of this global economic reconfiguration emerged in response to globalisation shocks, particularly after the 2008 financial crisis.[109] Long-term regional decline caused by trade competition, offshoring and automation,[110, 111] combined with eroding welfare compensation,[112] fosters economic insecurity and rising economic inequality,[113, 114] which are exploited by nationalist and anti-globalisation populism in advanced democracies.[109, 115]

Politically driven trade interference is one **shock** among many, alongside accidents, breakdowns, strikes, epidemics, and conflicts that continually affect markets. The resulting disruption, uncertainty, and volatility create arbitrage opportunities (legal or illegal, depending on jurisdiction or the specifics of each trade), which traders exploit using superior market knowledge,[117] specialised information systems,[118] and extensive networks with policymakers and market actors. While **windfall profits** earned during crises (Figure 5) are socially contested as profiteering[119] and criticised for their negative social impacts,[68, 120–124] arbitrage also reroutes commodity flows, speeding up the adjustment between supply and demand. For example, the Russia-Ukraine war disrupted wheat exports from the Black Sea region, reducing global supply and driving up prices. This shock threatened food security in several import-dependent countries in Africa and the Middle East, increasing the risk of famine.[125, 126] As prices rose and commodity traders earned significant gains, it sparked public and political backlash against traders seen as profiting from an imminent famine.[127] In response, the international community brokered the Black Sea Grain Initiative, which has helped restore flows, supplementing rather than replacing market re-routing at higher prices.[128–130]

Global commodity trading gross margin by commodity type (in USD billion)



Commodity type	Change 2019–2024	Change 2023–2024
Agricultural and food products	+60%	–10–20%
Metals and mining (including coal)	+150%	<10%
Integrated gas, power, and emissions	+170%	-10–20%
Oil	+80%	>20%

Estimations and range, no commodity breakdown

Figure 5: In 2024, gross profits for the industry were about USD 95 billion, below 2022–2023 levels, yet still 2.5 times higher than the average during 2011–2019. Source: Oliver Wyman, 2025[116]

4.1 Commodities' storage and price behaviour

The **response of prices to shocks**, whether geopolitical or otherwise, is not straightforward. Demand and supply of a commodity are not immediately connected; between them lie commodity **stocks in storage**, which play a major role in smoothing short-term imbalances. Stocks are typically classified as strategic or commercial. **Strategic stocks** are held by public entities or government-mandated private corporations.

Commercial stocks are mostly held by physical traders in private storage, with less in certified warehouses, which has implications for market transparency and predictability.[68, 131] For commercial stocks, inventory build-ups and drawdowns are driven by the futures price curve.[132]

Contango, i.e., more distant prices are above short-term maturities, rewards stock accumulation (buy spot, store, sell forward). In **backwardation**, i.e., when prices for short-term maturities are higher than for long-term maturities, holders are paid to release stocks. The prevailing shape reflects not only current supply-demand equilibrium but also expectations/sentiment about future prices; if traders anticipate higher future prices, they tend to 'go long' and buy more distant maturities, reinforcing contango.

Rising price expectations can follow from geopolitical risk, inflation outlooks, the dollar's exchange rate, anticipated supply constraints, or demand shocks. Generic geopolitical deterioration without a specific disruption tends to lift long-term prices and often short-term ones too by raising the incentive to hold inventories, including by financial investors who buy stocks via ETFs. By contrast, sudden, specific geopolitical events that threaten near-term supply typically elevate spot prices, induce backwardation, and encourage stock drawdowns. Market sentiment about inventories can outweigh current supply-demand signals. Traders often pre-price geopolitical tension; when a crisis actually breaks, expectations may flip (e.g., faith in a quick resolution), so prices fall rather than rise. Hence, geopolitics can yield muted moves if already priced in, or counterintuitive moves when expectations reverse.

Trading houses sit at the centre of this nexus because they hold a large share of the commercial stock at prevailing market prices, directly reflecting exposure (marked to market). But they are not alone: **investors, speculators, and strategic stockholders also react**, often unpredictably, sometimes irrationally, shaping outcomes. For example, after the US announced in February 2025 an investigation into economic and national security risks in copper production, traders anticipated imminent import tariffs that would raise US prices and shifted copper stocks to the US.[133] When a 50% tariff took effect in July but excluded key smelter products, prices fell by ~20%,[134, 135] yet the US premium still covered shipping costs. US exchange stocks rose 4.5-fold, reaching ~55% of global exchange inventories.[136] The volatility triggered by US tariffs created arbitrage opportunities that major trading houses monetised, an unsurprising outcome given the scale of policy-induced market dislocations.

Geopolitical risks and developments are independent of commodity prices; the latter are the dependent variable. Yet, steep commodity price movements can intensify, transmit, and sometimes escalate existing geopolitical tensions. Market reaction to shocks may be complex, depending on whether crises are anticipated (and hence already priced in) or unexpected.

4.2 Price discovery and volatility

The extent to which sudden price shifts are attributable to physical traders also depends on the size of the futures market. In the oil market, WTI and Brent futures trade approximately 20 times global oil consumption,[137] i.e., prices are determined by futures trading rather than by actual oil sales and purchases.[138]

Financial investors, the dominant players and providers of liquidity on the futures market, primarily use **momentum trading**,[138] which relies on rule-based signals that exploit price trends. In its simplest form, momentum trading compares short- and long-term price moving averages, generating buy signals when short-term trends rise above the longer-term trend and sell signals when they fall below it. Well-suited to automated execution, it is estimated to account for up to 70% of daily trading volume in oil futures markets.[137] Despite relying solely on past prices, which is at odds with rational expectations, momentum remains prevalent because it often delivers positive returns, especially in volatile markets. Momentum trading also amplifies volatility by extending trends. Since 2022, however, value/mean-reverting strategies have generally outperformed, tending to dampen volatility.[139, 140] Nevertheless, momentum trading still dominates.

In other commodity markets, the **balance between financial and physical players** is greatly variable (Figure 6).[141] On one extreme, the price of gold almost exclusively reflects financial or macroeconomic considerations, as stores held for investment (speculative) purposes far outweigh those held for industrial purposes.[141] Copper is not too dissimilar from gold, but physical considerations (variations in production in response to consistently growing industrial demand) also have a significant impact. For lithium, expectations of future demand, supported by government policies in favour of decarbonisation, are of overwhelming importance. For soft commodities, the short-term or close-future demand-supply equilibrium is the main determinant of price volatility.

Price volatility is a problem per se. It has been identified as a major cause of the resource curse[142] (the paradox that countries rich in natural resources often experience weaker economic development, poorer governance, and greater conflict than resource-poor countries) in hard commodity-producing countries, and is a problem for designing policies to support the transition from fossil to low-carbon energy sources. Volatility exposes consumers, especially low-income households, to recurrent price shocks that they are ill-equipped to absorb. Energy prices are particularly pivotal, as they cascade through the economy, raising transportation costs, increasing food prices via higher fertiliser costs, and driving up production costs more broadly.

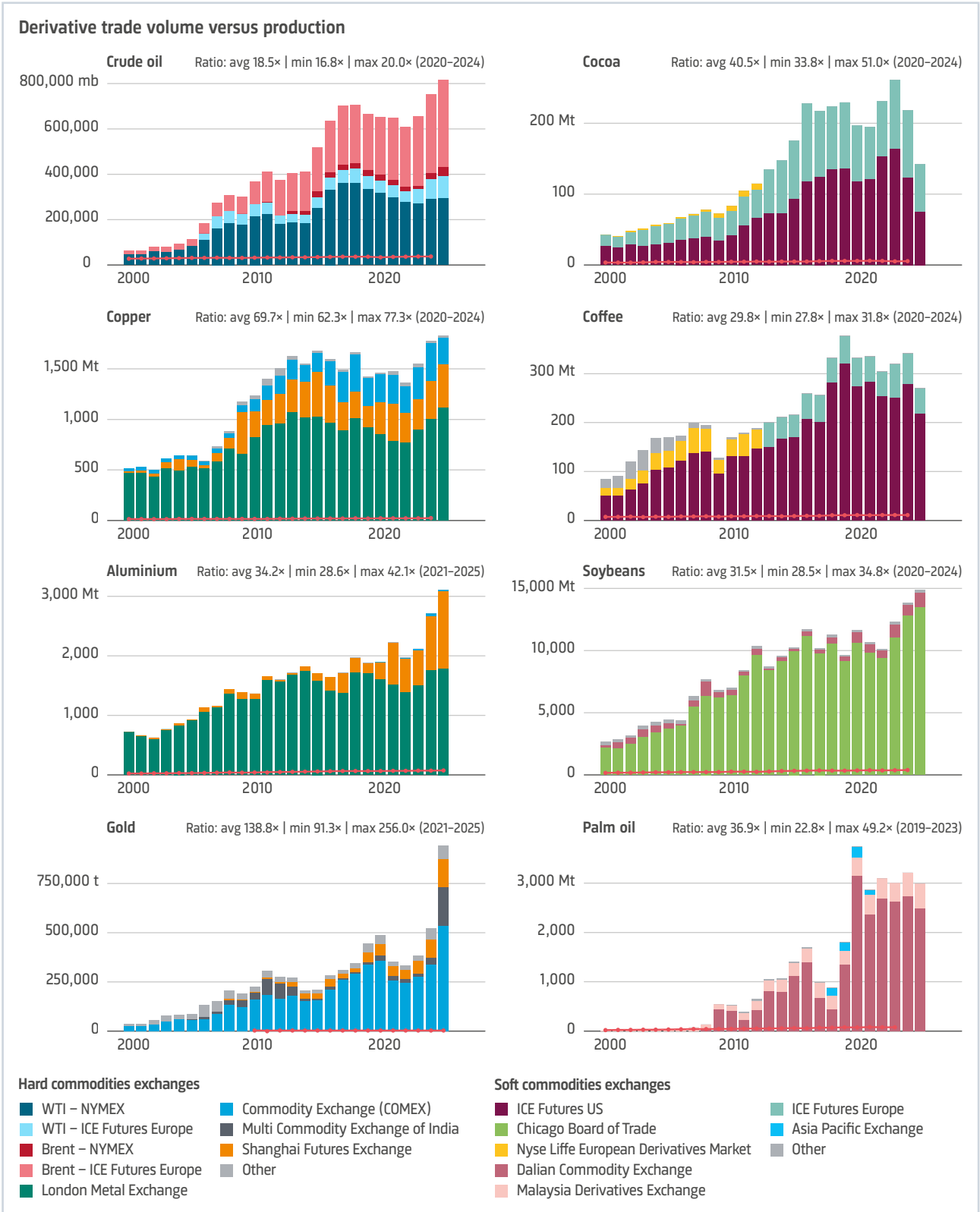


Figure 6: Ratio of derivative trade (futures and options) versus global demand (oil) and production (others) for selected hard and soft commodities over time. Gold and copper are the most financialised commodities. Source: authors

While vulnerable populations struggle to cope with these pressures, evidence shows that the gains disproportionately accrue to shareholders in the commodity sector.[119, 121]

4.3 The economics and politics of sanctions busting

Sanctions are frequently used to exert geopolitical influence via commodity trade. Sanctions can take different institutional forms, ranging from **unilateral** measures imposed by a single state to **multilateral** sanctions coordinated among a group of countries, to **UN Security Council-authorised sanctions**, which are binding under international law and carry the highest degree of formal legitimacy. Scholarship highlights a shift from comprehensive to targeted, financial and autonomous sanctions, with private actors deputised for enforcement.[143, 144] However, the effectiveness of sanctions is far from given, and they often have significant unintended economic, humanitarian, institutional and political consequences.[105, 143–148]

Sanctions may constrain legitimate traders while simultaneously creating rents for sanctions-busters. Although sanctions busting is more likely under unilateral and plurilateral measures (which are the focus of this chapter), it cannot be ruled out for UN-authorised sanctions either.[149] Evidence suggests that large, diversified traders closely integrated into global financial systems are more risk-averse and are more likely to abstain from contentious deals.[150, 151] In such dynamics, **smaller and more opaque actors** often emerge, frequently established in permissive jurisdictions with the primary goal of exploiting opportunities to circumvent sanctions.[6]

A case in point is the response to sanctions on Russian oil beginning in 2022. The imposition of sanctions led to a major dislocation of Russian crude oil away from Europe, mainly to India and China, as well as to Türkiye and Egypt. This redirection of crude flows, however, was not primarily driven by major trading houses.[151] Instead, most trade was conducted by small, opaque, and previously unknown companies outside Europe or directly between Russian producers and major refiners. In parallel, Russia established a large shadow fleet of tankers under flags of convenience or without clear registration.[152] The imposition of sanctions by multiple countries, combined with the absence of a coherent international approach, has shifted a substantial share of Russian oil trade from major trading companies to smaller actors and, in some cases, illicit actors.

While most literature explains sanctions-busting as a function of profit opportunities, it is also important to account for political interests when analysing these dynamics. Sanctions busting depends not only on the prospect of substantial profits, but also on the **willingness of importing or hub jurisdictions** to tolerate, or actively enable, such trade when their governments do not expect significant repercussions, or judge the expected gains to outweigh the associated costs.[146, 153] In the case of sanctions on Russian oil, the UAE has offered a platform for such trade, contributing to a shift in oil trading away from traditional hubs such as Geneva to Dubai.[154] This case also shows that trading companies, even smaller ones, could not operate without at least tacit political cover.

Research into the effects of sanctions shows increased trade flows between sanctioned states and their neighbours,[155] and between neighbours and former importers from the sanctioned country,[127, 130, 156, 157] suggesting that **traders reroute goods** through neighbouring countries by using intermediaries who earn a profit due to the possibility of buying commodities at lower prices from sanctioned regions and selling them at market prices, allowing traders to bypass direct trade restrictions.[158] The analysis of sanctions over the last 50 years shows that firms that bust sanctions tend to lobby their home government to sign new preferential trade agreements to secure their first-mover advantage post-sanctions.[159]

Traders both adapt their strategies to shifts in geopolitics and geoeconomics and, in turn, reconfigure commodity flows and mediate the underlying power relations among the actors on the supply and demand sides.

4.4 Implications for policy and research

4.4.1 Sanctions and geopolitical shocks

Sanctions regimes are not just neutral technical measures but are normatively and legally contested because they blend coercion, norm-enforcement and geopolitical ordering while generating often unintended economic, social, and humanitarian impacts.[143–145] Three policy-relevant considerations regarding the effectiveness of sanctions emerge from the literature.[143, 144, 160, 161]

A **coherent, unambiguous definition** and **consistent implementation** of sanctions or other geopolitical initiatives affecting the trade in commodities strengthen their effectiveness. The disruption to global wheat trade after Russia's invasion of Ukraine was severe, but coordinated international action quickly mitigated its effects. By contrast, sanctions on Russian oil sought the far more complex goal of reducing export revenues while preserving export volumes by introducing a price cap, which effectively sustained rather than discouraged trading and made secondary sanctions impracticable.[152, 162] Where sanctions targeted specific

firms such as Rosneft and Lukoil,[163] ambiguity was reduced, and impacts were immediate and visible.[164–167] Despite this evidence, the evolving sanctions regime against Russia reveals ongoing tensions among sanctioning jurisdictions over the clarity and stringency, as well as over who assumes responsibility for enforcement and bears the economic costs of sanctions.[168]

Traceability of all physical commodity transactions protects legitimate trade against illicit trade. The current lack of transparency around transactions can also harm trading houses, as Geneva-based trading houses have experienced in the wake of sanctions on Russian oil. Accusations, even if unproven, may severely impact the targeted company.[166, 167] Reputation is critical for major trading companies – once it is compromised, counterparties may refuse to engage, potentially forcing a firm to cease operations.[169] Establishing a traceability system would require substantial international cooperation, but the technology to ensure full transparency while protecting firms' commercial confidentiality already exists. Trading houses could anchor such a system, with participation as a condition for access to exchanges, clearing, and financial services. This approach may be as important as, if not more important than, ownership disclosure, since transparency alone does not prevent questionable trading practices.

Better monitoring of commodity logistics counters sanctions busting. Shadow fleets are typically established in response to policy measures such as sanctions. They enable targeted entities to continue trading commodities that sanctioning governments have deemed illegitimate. The shadow tanker fleet currently counts around 3,000 vessels.[170] While land-based smuggling is hard to stop, maritime trade can be effectively monitored with satellite technology. A more effective use of remote sensing technology combined with stricter rules on flags of convenience, practices such as transponder spoofing and ship-to-ship transfers, and restrictions on navigation rights for non-compliant vessels, would significantly curb these activities.[171–173]

4.4.2 Globalisation under strain

As retreat from globalisation towards regionalisation and the re-ordering of supply chains seems to accelerate,[174–176] governments can deploy tools to curb import-dependence risks, mitigate the effects of supply chain disruptions and introduce policies aimed at resilience and strategic autonomy; which instruments are chosen and how forcefully they are used will largely shape the structure of commodity trading and the role of trading houses.

The accumulation of **strategic stocks** has received renewed attention,[5] particularly for critical minerals[177, 178] and agricultural commodities.[179, 180] Government stock builds/draws can influence prices, especially in the short run and in thin or segmented markets, and can reduce extreme volatility.[181–183] Durable control over price levels is more difficult as programmes are constrained by finite stocks, the challenge of timing, fiscal costs, strategic private responses, and the risk of speculative attack.[183–187]

Support to domestic producers to bolster their resilience can take the form of direct subsidies or guaranteed minimum prices. Depending on design, the trade impact ranges from mild to restrictive. Importing states may also support 'national champions' to secure preferential access to overseas resources, often coupled with priority supply for domestic industry, thereby strengthening vertical integration and reducing reliance on competitive trading. China and, lately, the US, exemplify this approach. Support for Chinese miners' overseas projects has fuelled the expansion of China's refining capacity and contributes to Chinese dominance in the refined metals sector.[188–191]

Tariffs (broad or targeted) and import quotas (to enforce supplier diversification) need not diminish trading houses' roles, but they raise certification and traceability demands to deter cheating. Independent of diversification, regulators increasingly require traceability of origin, environmental impacts, labour and human rights. Major, established traders generally favour stricter traceability,[158] which can entrench their market share against opaque upstarts and bolster claims of non-involvement in sanctioned flows.

Emerging **rival blocs** could largely trade within their own blocs, transact in non-USD currencies (e.g., RMB, euro, rouble), and develop distinct systems for price discovery. Combined with support for local production, vertical integration, and inter-bloc barriers, gradual decoupling between blocs would reduce the role of trading houses. Security-driven trade policies would likely sideline environmental and human rights objectives. A continued shift towards segmented commodity markets is unlikely to be reversed through regulation alone. It would instead require bilateral, regional, and interregional pacts to guarantee minimum conditions for stable availability and prices, thereby reshaping or potentially marginalising the role of trading houses as we have known them. Further research is needed to draw on historical precedents to better understand the potential social, economic and distributional impacts.

5 Trade-relevant sustainability regulation in international law

The centrality and interdependence of sustainability and commodity trade entered the political mainstream at the **1972 UN Conference on the Human Environment**, stating that 'for the developing countries, stability of prices and adequate earnings for primary commodities and raw materials are essential to environmental management since economic factors as well as ecological processes must be taken into account'.[192]

The idea of sustainable development, defined by the Brundtland Commission Report[193] as meeting the needs of the present without compromising the ability of future generations to meet their own needs, has culminated, at least for now, in the **Agenda 2030** for Sustainable Development and its Sustainable Development Goals (SDGs). These goals are aspirational and aim to harness the sustainability efforts of states, businesses and other stakeholders around commonly agreed-upon targets.[194, 195] Evidence to date suggests impact has been mixed: while they have significantly shaped how actors frame and discuss sustainable development, they have less frequently translated into regulatory uptake, institutional change, or substantial shifts in resource allocation.[196] The rejection and denunciation of the SDGs by the US in 2025 illustrates this broader pattern.[197]

The concept of sustainable development is central to international policy debates. A range of international law instruments require States to ensure that private actors, including businesses, prevent or at least mitigate the negative impacts of their activities on human rights and the environment. However, these instruments vary considerably in scope, granularity, and enforcement mechanisms, resulting in a fragmented and often poorly implemented legal landscape for ensuring sustainable business practices.

While some **convergence in principles**, particularly regarding due diligence obligations, appears to be emerging, and important legally binding measures have been adopted at the national and regional levels, notably within the EU, it remains premature to conclude that a new customary rule of sustainability governance has been established based on the broadly accepted leading soft law frameworks – the UN Guiding Principles on Business and Human Rights, the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct, and the ILO Tripartite Declaration of Principles Concerning Multinational Enterprises and Social Policy.

5.1 Economic development

International economic law is largely based on the belief that cross-border economic relations generate mutual benefits.[115, 198–203] **International trade law** has traditionally focused on liberalising trade and ensuring non-discriminatory competition, while allowing limited exceptions for non-trade norms, such as environmental protection, human health, and employment. The exceptions are permitted under strict conditions to avoid market distortions. State-to-state dispute settlement mechanisms are contained in the WTO system and in most free trade agreement frameworks.

Environmental and labour standards are only weakly harmonised among WTO members, making it difficult to reference them in a trade context, given the potential unequal competitive conditions. Promising exceptions are the recently concluded Agreement on Fisheries Subsidies,[204] which prohibits WTO members from subsidising unsustainable fishing practices such as overfishing endangered species, and the Investment Facilitation for Development Agreement, concluded by 129 WTO members. The latter includes a specific section on sustainable investment and refers to internationally recognised standards for responsible business conduct.[205]

International investment law obliges states to protect foreign investors and their investments in order to encourage cross-border capital flows, job creation, and wealth generation. State obligations are contained in bilateral and plurilateral treaties (there is no multilateral investment treaty), which often grant investors the right to initiate arbitration against host states. Such **investor-state dispute settlement** mechanisms strengthen the investment regime but may create tensions with environmental and social sustainability objectives. In particular, the risk of compensation claims arising from regulatory measures that negatively affect investments may produce a regulatory 'chilling effect', discouraging governments from adopting laws to promote sustainability.[206–209]

Concerns about the environmental and social impacts of international economic law have driven a shift over the past two decades towards preserving governments' flexibility to regulate. Emphasising the **'right to regulate'** in the public interest may weaken investor protection obligations[210] while permitting governments to implement environmental and social safeguards without fear of liability. This argument led, for example, to the inclusion of a 'right to regulate' clause in modern Investment Treaties[211] and to

the EU withdrawing from the European Energy Charter Treaty in 2024 after attempts to reform it failed.[212, 213] Further steps are required to help lower-income countries benefit from global markets through technical support and by curbing multinational regulatory arbitrage.[209]

5.2 International financial and fiscal regulation

International financial regulations promote open financial markets and minimum supervisory standards, enhancing financial access and security in global finance.

The Financial Action Task Force (FATF) Recommendations,[214] the core international **Anti-Money Laundering** (AML) standards, require countries to assess and mitigate money-laundering risks and to ensure that financial institutions and designated non-financial businesses and professions (DNFBPs), such as notaries and lawyers, apply due diligence measures. These include enhanced checks for politically exposed persons (PEPs) to verify the legal origin of funds administered on behalf of clients. Commodity traders dealing in precious metals and precious stones are classified as DNFBPs and are required to observe enhanced due diligence and record-keeping obligations, suspicious transaction reporting requirements, and whistle-blower protection provisions. Other commodity traders, however, are not explicitly covered, although FATF has indicated that this sector may become a future focus of AML regulation. While formally non-binding, FATF standards are recognised by the World Bank and IMF, and FATF compliance assessments can place countries on 'grey' or 'black' lists, with severe consequences, as market actors avoid transactions with institutions in listed jurisdictions.

On the private regulation side, the International Chamber of Commerce (ICC), the Wolfsberg Group, and the Bankers Association for Finance and Trade (BAFT) have issued Trade Finance Principles[215] urging banks to increase scrutiny of trade finance to prevent money laundering. However, these principles also limit responsibility by emphasising that financial intermediaries deal only with documents, not with the underlying transport, delivery, goods, or services to which those documents relate.

Two principal international **anti-corruption** instruments exist. The UN Convention Against Corruption[216] obliges its 192 state parties to criminalise bribery, embezzlement, and misappropriation in the public sector and to consider extending such offences to the private sector. The OECD Bribery Convention[217] criminalises bribery of foreign public officials, including accomplice liability, and treats bribery as a predicate offence for money laundering.

Multilateral trade law has only begun to address corruption directly, while bilateral and regional trade agreements often go further by requiring criminalisation of corrupt practices, mandating financial disclosures, or incorporating trade facilitation measures to enhance transparency and reduce corruption risks. In international investment law, anti-corruption considerations are more developed. Investors increasingly face a 'corruption defence', in which host states argue that investments obtained through illegal conduct are not entitled to treaty protection.[218] This is reflected in the updated Chapter VII on Bribery and other Forms of Corruption in the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct. Because bribery of public officials is illegal in every jurisdiction, arbitral tribunals may declare contracts procured through bribery void ab initio, barring investors from recovering losses arising from subsequent state measures affecting such investment.[219]

5.3 Environmental and social protection

The international treaties protecting **environmental resources** most closely related to trade and production include the 1973 Convention on International Trade in Endangered Species (CITES), the 1992 Convention on Biodiversity, and the 1992 Framework Convention on Climate Change and subsequent instruments, including the Kyoto Protocol and the Paris Agreement.

At the request of the UN General Assembly, the International Court of Justice issued an advisory opinion in 2025 on the obligations of states in respect of climate change.[220] The opinion marks a shift from viewing **climate commitments** as aspirational to seeing them as enforceable duties that extend beyond territorial boundaries (based on due diligence). While non-binding, it reflects the authoritative interpretation of the Court on how international law applies and is to be interpreted with regard to obligations of States in relation to climate change, including climate governance, dispute settlement, and potentially future litigation.[221]

International **social protection** safeguards are found in the ILO, particularly the non-binding Tripartite Declaration of Principles concerning Multinational Enterprises and Social Policy, which aims to ensure state sovereignty and the protection of worker rights throughout the employment cycle; the Conventions (binding for state parties) on the right of workers to organise and to unionise, the prohibition of forced labour and discrimination between men and women and require equal pay, and adequate health and safety standards in the workplace.

The non-binding UN Declaration on the Rights of **Indigenous Peoples** recognises the rights of indigenous peoples to self-determination and to live as distinct communities, providing, inter alia, the right to free, prior and informed consent as well as the right to land and resources.[222]

5.4 Supply chain regulation

The expansion of global value chains complicates efforts to protect workers and the environment, with the UN, OECD, and ILO providing the main international soft-law frameworks for promoting sustainable supply chains.

The 2011 **UN Guiding Principles on Business and Human Rights** (UNGP)[223] is the most prominent soft-law framework for protecting human rights in supply chains, reaffirming that states bear primary human rights obligations while businesses must respect them. The UNGP introduced the concept of human rights due diligence, requiring companies to assess and address human rights risks across their supply chains, including those arising from legally separate but contractually linked suppliers.

The **OECD Guidelines for Multinational Enterprises**[224] and the OECD Due Diligence Guidelines for Responsible Business Conduct[225] define governments' expectations regarding responsible business conduct by requiring firms to apply due diligence across their activities and to assess their impacts on people and the planet beyond human rights. This includes the environment, labour, bribery and corruption, consumer protection, and impacts related to technological developments. General and sector-specific due diligence guidance, including for minerals from conflict-affected areas and stakeholder engagement in the extractive sector, operationalises these principles for particular commodity chains.[225]

The **Kimberley Process** (KP), while a public-private collaboration, is a prominent example of informal international lawmaking, combining public-private governance, a harder form of soft law.[227] Through its Certification Scheme (KPCS), participating states commit to trade only in certified diamonds,[228] with enforcement via peer review and the possibility of sanctions, including suspension of membership for non-compliance.

5.5 International commodity agreements

The **first generation of international instruments** to regulate commodity trade has existed since the early 20th century,[229] aiming to stabilise supply and demand through export and import quotas and price controls to promote market stability and development.[230] From the 1980s, the neoliberal turn led to state-to-state commodity agreements being replaced by arrangements under international commodity bodies, with a focus on supporting trade, quality standards, and innovation rather than quotas and price controls. Remaining agreements were terminated or transformed in the 1990s.

Many **newer international commodity agreements** include sustainability provisions, framed in soft language that does not impose binding obligations. For example, the International Cocoa (2010) and Coffee (2022) Agreements call for improving living and working conditions and pursuing sustainable sector development, while the Tropical Timber Agreement (2006) promotes trade in sustainably managed and legally harvested timber without operational obligations.

Sectoral **intergovernmental organisations**, such as the International Cocoa Organisation, the International Coffee Organisation, and the International Cotton Advisory Committee, support sustainability through discussions, projects and encouragement rather than with binding commitments to take particular actions. The **Common Fund for Commodities** (CFC) is an intergovernmental financial institution that implements international commodity agreements by funding projects to support SMEs and promote sustainable practices across its 101 member states. The Intergovernmental **Forum on Mining, Minerals, Metals and Sustainable Development** (IGF) supports member states in advancing sustainable mining policies.[231] **OPEC**'s Solemn Declarations reference development, technology transfer, environmental protection, and poverty eradication.

5.6 Commodity exchanges

Dozens of commodity exchanges operate worldwide, most regulated by their own rules. The London Bullion Market Association (LBMA) and London Metal Exchange (LME) have recently introduced limited **responsible sourcing frameworks**. The LBMA standard is considered by both the OECD[226] and the EU[232] to be only partially aligned with their respective due diligence frameworks, while no comparable assessment of the LME requirements has been conducted to date.

The **International Organisation of Securities Commissions** (IOSCO) is the main global standard-setter for commodity trading conducted through derivatives and other financial instruments. Its rules bind exchanges and, indirectly, their members. While IOSCO's Objectives and Principles of Securities Regulation do not explicitly address

sustainability, a 2023 IOSCO report on developing a global assurance framework for sustainability-related corporate reporting highlights the need for regulators to ensure strong ethical standards in climate-related assurance reporting.[233]

The US Commodity Futures Trading Commission (CFTC) and the EU's European Securities and Markets Authority (ESMA), for example, are further influential players in standard-setting, even when their jurisdiction is territorial. These organisations' prescriptions become a basis for other national- or exchange-specific regulatory frameworks.

There is no single international body overseeing or **licensing commodity trading firms**, which are regulated through national licensing regimes; however, a small number of influential organisations provide fora for multilateral discussion of trading rules and practices.

6 Comparison of commodity trading hubs: Switzerland, the US, the UK, Hong Kong and Singapore

Commodity hubs function as control nodes in global value chains. However, they are not merely marketplaces; they also operate as governance nodes where trade is coordinated, finance is structured, risk is hedged, and compliance systems are embedded.

The governance of commodity trading hubs – for physical trading and exchange-based trading – therefore has significant implications for sustainability, as regulatory leverage can extend along entire value chains. Sustainability-relevant regulation in this context includes financial integrity measures, such as transparency, AML enforcement, and sanctions screening, as well as environmental and climate-related requirements, and social and human rights safeguards.

Table 2 provides a synoptic overview of the regulatory framework that guides five key trading hubs. For each trading hub, a detailed report is available online (globalreserach.scnat.ch/commoditytrade-legal).

Switzerland	US (New York, Texas)	UK (London)	Singapore	Hong Kong
Type of trading				
Physical and derivatives; strong in transit trade; No exchanges.	Physical (TX): Energy (crude oil, natural gas), agriculture (corn, soybeans); Derivatives (NY).	Physical: Metals (LME), agriculture (GAFTA, FOSFA). OTC: Precious metals (LBMA). Derivatives. Energy futures; carbon.	Physical: Agriculture, energy, metals, minerals, carbon. Derivatives.	Physical: Precious metals (gold, silver). Derivatives. ETFs.
Physical versus derivative trading				
Physical dominates; derivatives <5% global OTC share.	Both significant.	Derivatives higher (<5% of LME in physical delivery).	Derivatives complement physical (hedging).	Physical (gold, metals). Derivatives less important.
Role of contract law				
Contracts central; often governed by UK law; ISDA for derivatives.	Goods: State contract law (UCC); Derivatives: Federal regulatory framework.	OTC: Bilateral contracts. Derivatives: standardized.	Contract law. Strong freedom of contract.	Common law. Strong freedom of contract.
Trading framework				
No overarching framework; partial regulation (FinMIA/FINMA).	Transaction-based, fragmented; different financial vs. physical.	Physical: unregulated, Derivatives: FCA (exemptions).	Legislation for physical (1992), derivatives (2001).	Transaction-based (physical vs. financial) and OTC vs. exchange.
Definition of 'commodity'				
No single definition; sector-specific definitions.	Physicals as 'goods'. Broad for derivatives.	No single definition.	Separate definitions for physical and derivatives.	No general definition.
Licensing requirements				
None for physical; licence required for derivatives issuance.	NY: None for physical. CFTC license for derivatives. TX: No 'commodity trader' license; permits for regulated activities (e.g., oil and gas production, pipeline, storage).	None for physical. FCA for derivatives. 'Ancillary activities exemption'.	For spot commodity brokers (and their representatives). Capital markets intermediaries for derivatives. Both are subject to exemptions.	None for physical, SFO for derivatives, Customs for precious metals/stones.

Switzerland	US (New York, Texas)	UK (London)	Singapore	Hong Kong
Supervisory authority				
No dedicated authority; partial FINMA supervision.	CFTC for derivatives and sector regulators (environment etc).	Derivatives: FCA Exchanges (e.g., LME) act as front-line regulators.	Physical: Enterprise Singapore Board Derivatives: Monetary Authority of Singapore.	Different regulators for derivatives and for physical trade.
Economic sanctions regime				
Embargo Act for implementation of UN and selectively EU sanctions.	Extensive extraterritorial sanctions regime.	Sanctions and AML Act and UN sanctions.	UN sanctions.	UN sanctions, indirect exposure (USD clearing).
Sustainability framework				
Fragmented; reporting and limited due diligence.	Fragmented, issue-specific.	Light regime; self- regulation; some reporting.	Singapore Green Plan 2030.	Disclosure-led approach.
Supply chain regulation				
Selective (conflict minerals, child labour); no comprehensive law.	Illegal harvesting, forced labour, conflict minerals. No federal due-diligence statute.	Modern Slavery Act; Forest Risk Commodities Scheme (soy, palm oil) proposed for 2027.	Hazardous substances; trade in endangered species; climate disclosures.	Corporate reporting and listing rule disclosures.
Energy regulation				
ETS linked to EU; no CBAM; electricity derivatives rules.	Only state ETS.	ETS and CBAM (2027).	Carbon tax, ≤5% offset.	Voluntary carbon market.
Reducing poverty and inequality				
OECD global minimum tax (15%) implemented.	Only domestic min-tax (GILTI). TX: no CIT.	OECD 15% min CIT.	OECD 15% min CIT.	OECD 15% min CIT.
Good governance				
AML framework; upcoming beneficial ownership register.	AML; traders often covered via banks. FCPA.	AML under FCA; Bribery Act (2010).	AML; Corrupt Practices Investigation under PM.	AML and Prevention of Bribery Ordinance.
Sustainable development framework				
No specific law; voluntary initiatives (e.g., Swiss Better Gold).	Via import rules (Lacey Act, UFLPA, Dodd-Frank).	Forest Risk Commodities Act. LME and LBMA: resp. sourcing standards.	E-waste, producer obligations.	ESG disclosure rules.
'Know Your Customer' (KYC) requirements				
Apply for financial intermediaries; strict beneficial owner rules.	Indirect via banks, futures brokers; Bank Secrecy Act.	General obligations apply. No obligations unique to commodities traders.	Precious metals dealers, financial intermediaries.	Duties for licensed companies and DPMS.
Anti-money laundering (AML) requirements				
General AML applies; no commodity-specific regime.	If regulated (precious metals), or categorised as a 'financial institution'. Indirect via bank.	No AML regulation unique to commodities traders; AML duties if FCA- regulated and depending on transaction type.	Activity based. Individuals to report suspicious transactions.	Financial institutions (can include traders) Individuals to report.
Lending of money to governments and state-owned enterprises				
Permitted; may trigger banking licence requirements.	Permitted. Boundaries: Sanctions, FCPA, law.	Permitted. may be regulated. AML rules.	Moneylender license, unless exempted or excluded.	Permitted. AML rules.

Table 2: Sustainability-relevant commodity trade regulation framework elements across major trading hub jurisdictions. Source: authors

Part II: The sustainability effects of commodity trade

Sustainability effects from commodity trade arise across the entire value chain and unfold through both operational and financial channels. These effects are most explicit upstream, in producing regions and countries where natural resources are extracted, and primary commodities are cultivated.

As trading houses have evolved from mere brokers matching supply and demand into financialised, vertically integrated intermediaries, the sustainability risks, impacts and responsibilities have expanded accordingly. They reflect the scale, integration, and operational and financial reach through which commodity intermediaries shape commodity flows and the conditions under which they are produced.

The following chapters examine these sustainability effects in relation to financialisation, illicit financial flows, environmental, public health, and social effects.

7 Financialisaton and global sustainability

Over the last two decades, the volume and composition of commodity derivatives positions have changed markedly. Institutional investors gained exposure to commodities as an asset class through index products and related strategies.[234, 235] In parallel, dealer intermediation expanded through commodity-linked notes and OTC risk warehousing, generating correlated 'risk flows' across contracts.[236, 237] The term financialisation is used to describe these shifts, often with the implicit concern that 'financial' demand may distort prices away from fundamentals. The empirical literature, however, points to a more nuanced picture in which effects are commodity-specific and state-dependent.[238, 239]

7.1 Concepts, actors, and analytical framework

7.1.1 Physical vs. derivatives markets and the meaning of 'financialisaton'

As introduced in Chapter 1, commodity prices are jointly determined in physical spot markets, forward contracting, storage decisions, and derivatives markets. Physical supply chains include producers, processors, traders, and end-users. Derivatives markets include exchange-traded futures and options, as well as OTC swaps, often intermediated by dealers and clearing members. In many commodities, physical pricing conventions reference futures benchmarks plus location- and quality-specific differentials; hence, derivatives markets can influence physical transactions even when underlying supply and demand are the primary drivers.

We use financialisation to denote three related developments:

- **Asset-class demand:** growth of index investment and other large, largely non-commercial exposures in futures and swaps.[234, 235]
- **Financial intermediation:** expansion of dealer balance sheets, commodity-linked notes and OTC positions.[236, 237]
- **Cross-asset integration:** tighter co-movement of commodity returns with equities, credit, and macro risk factors.[240]

Several key **drivers** underpin the growing importance of futures markets along these dimensions. These include a) rising demand for price discovery and risk transfer in increasingly globalised and volatile supply chains; b) the use of standardized, centrally cleared futures contracts as cost-efficient hedging instruments under tighter funding and regulatory constraints; c) the expansion of institutional portfolio management strategies that treat commodities as a distinct asset class; and d) the increasing role of large trading firms and dealers that combine physical logistics with derivatives-based risk management.

A crucial mediator is **storability**. When inventories are ample, arbitrage and storage can dampen shocks. When inventories are tight, small shocks can produce large price movements; identifying speculative components becomes difficult because precautionary demand and expectations are endogenously linked to inventories.[241, 242] This is one reason empirical findings differ across energy, metals, and agricultural markets and over time.

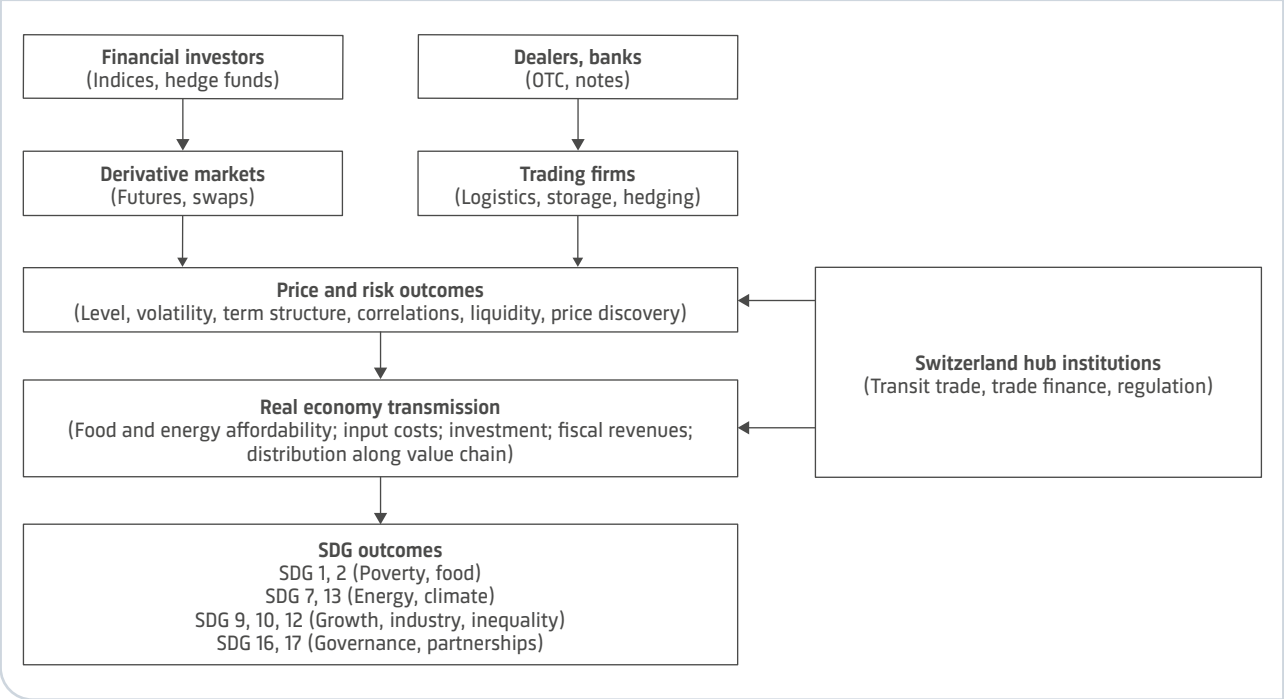


Figure 7: Analytical framework: from financialisation and hub institutions to SDG outcomes. Source: author

7.1.2 A taxonomy of actors

For SDG mapping, it is helpful to separate participants by function:

- **Commercial hedgers** (producers, processors, end-users) use derivatives to transfer price risk and smooth cash flows.
- **Commodity trading firms** combine logistics, storage and information with derivatives hedging; many rely on trade finance and operate with high leverage.[238, 243]
- **Dealers and market makers** warehouse risk, supply liquidity, and distribute commodity-linked structured products.[236]
- **Institutional and alternative investors** (index funds, hedge funds, commodity trading advisors (CTAs)) take exposures for diversification, carry, momentum or macro hedging.[234, 237]

The empirical difficulty is that observed positions are endogenous and categories are imperfect. For sustainability, this matters because welfare impacts are nonlinear: short-lived spikes in volatility or correlation can be disproportionately harmful in economies with limited safety nets, weak foreign reserves, or constrained fiscal capacity.

7.2 Transmission channels to SDG outcomes

We organise the SDG-relevant transmission mechanisms into six channels:

1. **Price levels** and pass-through into retail food and energy prices (SDG 1, SDG 2, SDG 7).
2. **Volatility** and hedging costs affect investment, production, and fiscal buffers (SDG 2, SDG 8, SDG 9).
3. **Co-movement** and spillovers transmit financial stress into commodity prices and importing economies (SDG 1, SDG 2, SDG 8).
4. **Distribution along value chains** and potential rent capture by intermediaries (SDG 10, SDG 12).
5. Governance and **illicit financial flows** through opacity, trade mispricing, and tax base erosion (SDG 16, SDG 17).
6. **Systemic risk** through leverage, margining, and trade-finance networks (SDG 16, SDG 17).

7.3 Empirical evidence on commodity-market financialisation

We synthesise evidence on five outcomes: price levels, volatility, co-movement, market quality, and systemic risk. A consistent theme is heterogeneity: effects vary across commodities and across regimes (normal times vs. crises), and identification is difficult because fundamentals and financial flows co-move. Evidence on the outcomes of illicit financial flows will be presented in more detail in Chapter 8.

7.3.1 Price levels: persistent distortions vs. state-dependent effects

The narrow 'bubble' hypothesis is that long-only demand mechanically pushes futures prices above fundamentals, thereby raising spot prices through benchmarking. Empirical work using trader positions and event-style identification often finds limited support for significant, persistent spot-price distortions after controlling for fundamentals and simultaneity.[235, 244] However, studies consistently find that financialisation can alter the joint dynamics of prices and risk premia and can strengthen cross-commodity linkages.[234, 245] A conservative interpretation is therefore that sustainability concerns are more likely to arise through spillovers and crisis amplification than permanent spot-price inflation.

7.3.2 Volatility, inventories, and hedging costs

Volatility affects SDG outcomes through hedging costs, investment timing, working-capital needs, and fiscal buffers. Evidence does not support a universal claim that financialisation increases volatility across all commodities. Instead, volatility effects are often state-dependent and mediated by inventories and funding conditions. The oil literature is instructive: inventories and precautionary demand are central for identifying the role of expectations and for separating demand-driven from supply-driven price dynamics.[241, 242] When inventories are tight, the same flow shock can translate into larger price and volatility responses, which are directly relevant for food and energy affordability.

7.3.3 Co-movement, contagion, and cross-asset integration

A robust empirical pattern is that commodity returns became more integrated with financial markets during the post-2000 era, especially during crises. This challenges early diversification arguments for commodity futures.[246, 247] Empirical work documents rising commodity-equity correlations and stronger cross-commodity co-movement and links part of these shifts to financial trading.[240, 248] For SDGs, the implication is that global financial stress can propagate into food and energy prices, potentially amplifying macro and welfare impacts in importing economies.

7.3.4 Market quality: liquidity, price discovery and information

For regulators, market quality is as important as levels. Broader participation can improve liquidity, but correlated flows can also reduce the informational content of prices. Evidence on whether speculation harms market quality is mixed and contract-specific. Importantly, trader categories do not map cleanly onto economic motives, and 'speculative' positions often serve to provide liquidity and transfer risk.[249, 250] From a policy perspective, the literature supports targeted monitoring of concentration, leverage and large positions rather than broad generalisations about 'speculators.'

7.3.5 Trading firms, leverage and systemic risk

A separate, increasingly policy-relevant literature views large commodity traders as leveraged intermediaries that connect physical flows, derivatives margining, and trade finance. Liquidity shocks can arise from margin calls, credit line withdrawals, and counterparty failures and can disrupt physical trade. Recent work begins to quantify the systemic risk of commodity traders in a Switzerland-relevant context,[243] and political-economy accounts emphasise how market power and opacity can interact with governance risks.[75] This strand is particularly important for regulators because many large trading firms are privately held and fall outside traditional reporting regimes.

7.4 Switzerland as a commodity trading hub

Switzerland's hub role spans energy, metals, and agricultural commodities, and is associated with a concentration of major, privately held trading firms.

Policy objective	Illustrative monitoring variables	Swiss hub relevance
Market integrity	Position concentration; large trader reporting; OTC exposures.	Hub concentration and private firms make traditional, decentralized datasets incomplete.
Financial stability	Trader leverage/ liquidity; bank counterparty exposures; margin dynamics.	Trade finance and margining can transmit shocks to banks and disrupt physical flows.
Tax integrity	Benchmark-price gaps; mirrortrade discrepancies; re-export markups.	Transit trade and complex structures raise incentives for mispricing.
Responsible conduct	Due diligence and traceability in high-risk supply chains; sanctions compliance.	Hub jurisdiction is a focal point for enforcing and coordinating standards.

Table 4: A regulator-oriented lens on Switzerland as a commodity hub.
Source: authors

7.4.1 Why hubs matter for sustainability

Hub economies can amplify SDG-relevant channels for three reasons. First, traders centralise information and storage decisions, thereby influencing benchmarks and rent distribution along value chains. Second, hubs concentrate financial links through trade finance and derivatives intermediation, creating a channel for stress to propagate from finance to physical trade and vice versa. Third, hubs face particular accountability demands regarding sanctions compliance, supply chain due diligence and tax integrity (Table 4).

7.4.2 Transparency, trade mispricing and illicit flows

Trade mispricing (under- or over-invoicing, misclassification, transfer pricing) can erode tax bases and accountability in producing countries (SDG 16). Detection requires granular customs data and benchmark prices. Swiss-focused policy research highlights these challenges and discusses governance options.[251] The broader public finance literature provides identification tools, such as 'missing trade' methods.[158] For regulators, the key implication is that hub jurisdictions need analytic capacity and disclosure regimes commensurate with the scale of transit trade.

7.4.3 Financial stability and trade finance

Commodity traders often rely on revolving credit facilities, inventory-backed lending and derivatives margining. These features create liquidity risk distinct from typical corporate exposures. Quantifying systemic importance is an active frontier. Recent modelling and measurement efforts for commodity-trader networks support treating large traders as part of the non-bank financial intermediation perimeter.[243] Network approaches in adjacent domains further motivate the focus on interconnectedness and liquidity spirals.[252]

7.5 From commodity finance to SDG impacts

This section connects the mechanisms in Sections 2–4 to SDG outcomes. The purpose is not to claim a single causal chain, but to clarify how evidence on commodity prices and intermediaries can translate into SDG-relevant impacts (Figure 7).

7.5.1 SDG 1 and 2: poverty and food security

Food security is sensitive to both price levels and volatility, but impacts depend on whether households are net consumers or producers, the degree of pass-through, and the availability of social protection. High and volatile food prices are linked to social unrest and instability.[253] Even if financialisation does not permanently raise food prices, the evidence on spillovers and crisis correlations implies a sustainability concern: global funding shocks and energy crises can propagate into food prices, raising volatility precisely when importing countries are least able to absorb it.[240, 248]

An additional finance channel is capital allocation. If markets price exposure to food-security risks, then commodity dynamics can feed back into firms' cost of capital and investment incentives along the agri-food value chain.[254, 255] This provides a bridge between derivatives-market dynamics and real-economy sustainability behaviour, directly relevant to both regulators and investors.

7.5.2 SDG 7 and 13: energy affordability and climate transition

Energy prices are central to inflation, competitiveness and household welfare. The oil literature emphasises the need to disentangle demand and supply shocks and the role of inventories in identifying expectation-driven components.[241, 242, 256] Investor flows can interact with information frictions, contributing to boom-bust patterns.[257] For SDG 13, the relevance is twofold: first, volatile energy prices can affect the political feasibility of carbon policies; second, risk-sharing in energy derivatives can support investment and hedging in low-carbon transition projects.

Environmental commodities create an additional link. Carbon allowance markets and related derivatives increasingly interact with corporate risk management and investor portfolios. Recent evidence highlights that allowance prices can embed regulatory credibility and abatement expectations, but can also exhibit heightened volatility and cross-market spillovers.[258, 259] For regulators, this strengthens the case for viewing environmental markets as part of the broader commodity-finance system rather than as isolated compliance instruments.

7.5.3 SDG 8, 9, 10 and 12: growth, industrialisation, inequality and responsible value chains

Commodity price volatility affects growth through uncertainty and financing constraints, and it can redistribute rents across countries and along supply chains. Financialisation can influence these outcomes primarily through spillovers and the behaviour of intermediaries. Work on commodity hubs emphasises that intermediaries can capture markups through re-exports, storage and information advantages, with potential implications for inequality between producing regions and trading hubs.[260]

For SDG 12 (responsible consumption and production), commodity finance interacts with sustainability through value-chain governance and capital allocation. For example, studies link commodity price dynamics and corporate behaviour in resource-related sectors, including agriculture, to environmental outcomes, disclosures and trading-firm strategies.[75] Work on ocean sustainability highlights how commodity demand, supply chain structures and governance can create sustainability externalities.[261] Corporate finance evidence further suggests that commodity price shocks can influence firm risk-taking and investment, including in environmental dimensions.[262]

7.5.4 SDG 16 and 17: governance, peace and partnerships

Commodity dependence interacts with political stability and conflict. Evidence indicates that world commodity price shocks can influence civil conflict risks.[263–265] While these studies do not focus on financialisation, they underscore why volatility and spillovers are SDG 16-relevant: when shocks are amplified or transmitted across markets, governance risks can rise.

Hub-related opacity and trade mispricing can further weaken accountability through tax-base erosion and illicit flows.[158, 251] For Switzerland, this implies that SDG-aligned governance requires not only market conduct supervision but also effective coordination across financial regulation, trade policy, anti-money laundering and international cooperation (SDG 17).

7.6 Implications for policy and research

7.6.1 Implications for monitoring and policy

Commodity financialisation is best understood as a set of mechanisms – asset-class demand, financial intermediation and cross-asset integration – rather than as a single hypothesis about speculative bubbles. The evidence on persistent spot-price distortions from index investment is mixed and commodity-specific. More robust findings concern crisis-state dependence: correlations and spillovers rose in the post-2000 era, implying that global financial stress can propagate into food and energy prices. A separate, increasingly policy-relevant strand suggests that large commodity trading firms can be systemically important through leverage, margining, and concentrated trade-finance networks.

Three policy implications follow from the evidence.

1. Monitoring **spillovers** and crisis-state dependence can detect stress propagation, the most robust concern regarding financialisation. To be effective, monitoring frameworks should track correlation spikes, funding conditions and co-movement among benchmark contracts.[240, 248]
2. Expanding the **perimeter** of systemically relevant entities to include large trading intermediaries allows for the early detection of material risks to domestic banks in hub economies and the continuity of physical flows. The systemic-risk literature suggests collecting data on leverage, liquidity buffers, margining exposures and counterparty networks for major commodity traders.[243]
3. Strengthening **transparency** and tax integrity increases the revenues of host governments to advance the SDGs.

Effective measures include improved reporting of transit trade, enhanced analytic capacity for benchmark-price methods, and coordination to detect trade mispricing and illicit flows.[158]

7.6.2 Research and data agenda

The literature leaves gaps that are particularly salient for Switzerland and for SDG-focused assessments.

1. **Firm-level trader behaviour.** Most empirical work uses exchange-level prices and positions. Linking trader balance sheets, storage decisions and procurement patterns to physical flows would allow clearer attribution of value capture and SDG externalities.
2. **Trade finance and liquidity spirals.** A priority is measuring margin and credit line dynamics and their interaction with bank balance sheets. Network methods are promising.[243, 252]
3. **Transparency metrics for hub economies.** Peer-reviewed work quantifying trade mispricing and evaluating the effectiveness of governance reforms in hub jurisdictions remains limited. This is a natural agenda given Switzerland's role in transit trade.[251]
4. **Environmental and transition commodities.** The energy transition increases the importance of metals and environmental markets. Extending financialisation tests and SDG mapping to these commodities is an important next step.

8 Illicit financial flows

Commodity trade-related illicit financial flows (IFFs) deprive governments of vital tax revenues. The UN methodology to measure progress on reducing IFFs (SDG 16.4.1) defines them as 'financial flows that are illicit in origin, transfer or use, that reflect an exchange of value and that cross country borders'.[266] IFFs result from 1) illicit tax and commercial practices, 2) illegal markets, 3) corruption, and 4) exploitation-type and terrorism financing. While this is an analytical distinction, these categories can be interlinked and sometimes overlap in practice; for example, tax evasion can be enabled by corruption, or illegal markets blend into formal activities.

IFFs from commodity trade fall under the first type, as this covers illicit practices by legal entities and individuals with the objective of concealing revenues, reducing tax burden, evading controls and regulations and other purposes. Illegal commercial and tax practices include tariff and duty offences, tax evasion, corporate and market abuses, trade and investment violations, and activities in the shadow or informal economy. IFFs arising from aggressive tax avoidance stem from practices such as transfer pricing manipulation, the strategic placement of debt and intellectual property, treaty shopping, and the use of hybrid instruments. As these practices involve otherwise legal transactions, only the illicit portion of cross-border flows qualifies as IFFs.[266]

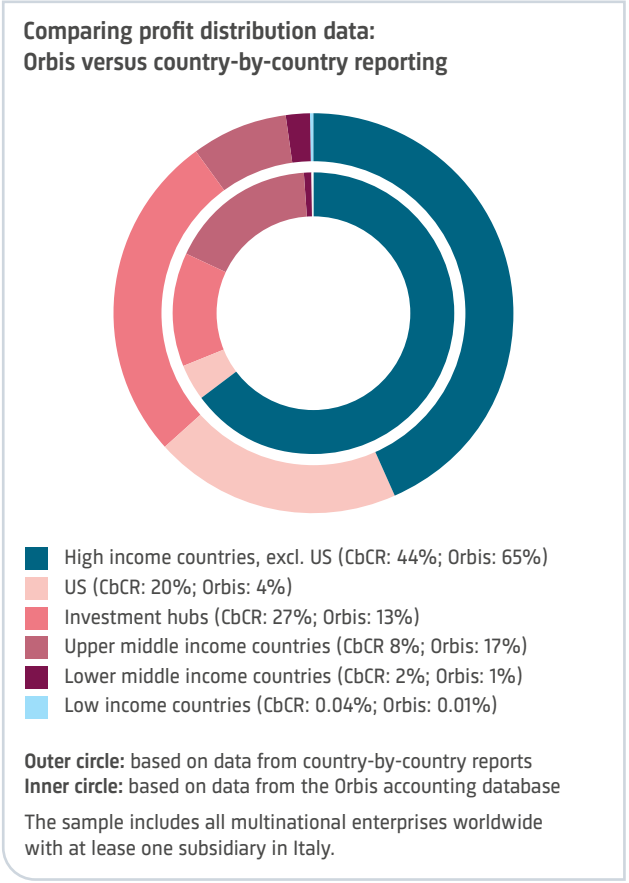


Figure 8: CbCR data provide a better coverage of activities of MNEs compared to Orbis data, which builds on published corporate financial statements. Profits reported in the US account for 20% of world profits in the CbCR dataset, whereas they account for only 4% of global profits in the Orbis dataset. Investment hubs account for 27% of total profits in the CbCR dataset, compared with 13% in the Orbis data.
Source: Bratta et al. 2024[267]

8.1 Measuring IFFs

While IFFs are inherently difficult to detect and measure, progress has been made in developing methods to identify them. The introduction of country-by-country reporting (CbCR) requirements has improved the availability and quality of tax-related data, as illustrated in Figure 8. However, persistent gaps in transaction-level data and ongoing methodological challenges continue to constrain robust IFF analysis. Further progress will be necessary to improve measurement accuracy and reliability.

8.1.1 Partner country trade analysis

The analysis of mirror trade statistics enabled the production of initial worldwide estimates of IFFs and garnered policy attention.[268] The early application of the method equated discrepancies in the **double-entry accounting in international trade** data from the World Bank's Direction of Trade Statistics (DOTS) and the UN Comtrade database with misinvoicing.[251] Recent estimates have become more precise. Analysis of the six-digit-level data from UN Comtrade finds, after removing transport and insurance costs, a marked trend towards export underinvoicing for exports from lower-income countries and the opposite trend for imports from industrial countries.[269]

Methodologies that eliminate false positives and false negatives estimate that lower-income countries lost approximately USD 1.7 trillion in gross illicit outflows between 2000 and 2018, equivalent to USD 131 billion per year as a lower bound for IFFs arising from trade misinvoicing.[270]

8.1.2 Transaction- and commodity-level estimations

An alternative approach to measuring IFFs exploits transaction-level trade data and applies a **price filter** for each transaction to estimate misinvoicing.[271] Because endogenously determined price ranges inherently assume some level of mispricing and fail to account for quality variation, these filters have been refined based on qualitative information from industry experts, traders, and regulators. In addition, moving averages are employed to control for short-term price volatility, while 365-day rolling windows smooth out seasonal fluctuations.[272–274]

Applying this refined methodology, approximately 11% of gold doré exports, 1% of cocoa bean exports, and 7.2% of cocoa paste exports from Ghana between 2011 and 2017 appear abnormally undervalued. This corresponds to an estimated corporate tax base erosion of USD 2.2 billion in constant prices (base year: 2011), equivalent to an average annual reduction of 0.3% in Ghana's tax-to-GDP ratio.[274] For Laos, close to 80% of all coffee exports appear undervalued, resulting in a tax revenue loss of USD 3.1 million, while copper cathode exports seem largely within the arm's-length price range.[273]

8.1.3 Tax rate differentials analysis

Profit shifting is heterogeneous and concentrated among larger firms, which face relatively lower fixed costs and shift a disproportionate share of profits as tax differentials widen.[267, 275–278] Recent aggregate firm-level estimates broadly converge at high levels: approximately USD 616 billion in 2015,[279] EUR 887 billion and USD 850 billion in 2017,[267, 276] and USD 969 billion in 2019.[280] These shifts correspond to roughly USD 250 billion in lost tax revenue, with lower-income countries most affected relative to their total tax revenues.[276]

Windfall profits of extractive multinational enterprises (MNEs), defined as an extraordinary surge in MNE profits accruing from commodity price upswings, accounted for two-thirds of the total profit increase between 2016 and 2023, totalling USD 102 billion annually.[281] While the elasticity of profits to commodity prices is particularly large in the mining sector (a 1% increase in prices leads to a 1.21% surge in profits) and partially reallocated to tax havens, a USD 1 increase in windfall profits yields only a USD 0.41 increase in tax revenue (Table 3). A progressive production tax that rises with the commodity's market price could reduce base erosion risks while being less distortive than a flat production tax.

Country	Windfall profit (USD bn)	Tax base loss (USD bn)	Revenue loss ($bn)	Share of loss in govt revenue (%)
UAE	16.80	3.40	2.20	1.80
Australia	39.10	7.80	2.20	0.37
Norway	19.60	3.90	1.90	0.77
Nigeria	12.10	2.40	1.50	4.57
Oman	8.80	1.80	1.40	4.70
US	176.80	35.40	1.30	0.02
Canada	53.00	10.60	1.10	0.15
Libya	7.40	1.50	1.00	3.95
Iraq	13.00	2.60	0.90	X
Angola	11.00	2.20	0.90	5.75
Indonesia	10.10	2.00	0.80	0.59
Peru	9.50	1.90	0.70	4.28
Brazil	24.30	4.90	0.60	0.41
Kazakhstan	15.10	3.00	0.60	1.90
Algeria	4.70	0.90	0.60	1.07
UK	12.90	2.60	0.60	0.05
Egypt	9.00	1.80	0.60	X
Chile	10.30	2.10	0.60	0.77
Russia	14.80	3.00	0.60	X
Colombia	7.70	1.50	0.40	X

Table 3: Distribution of windfall profit losses and the associated estimated losses in revenues. The last column is the ratio of estimated tax losses to total government revenues, excluding social security contributions, as reported in the Government Revenues Dataset (UNU Wider).
Source: Chiocchetti and Moreau-Kastler, 2025[281]

8.1.4 Phantom foreign direct investment

Foreign direct investment (FDI) is often channelled through **special-purpose entities** that have no real business but perform holding activities, such as intrafirm financing or the management of intangible assets, in order to minimise MNEs' global tax liabilities. So-called 'Phantom FDI' has grown faster than Real FDI and is estimated at around USD 15 trillion, nearly 40% of Total FDI globally, in 2017, up from 30% in 2009.[282] Jurisdictions such as the Netherlands, Luxembourg, Hong Kong, Switzerland, Singapore, Ireland, Bermuda, the British Virgin Islands and the Cayman Islands together host more than 40% of global Phantom FDI, although their combined share of global GDP is only around 3%. For Switzerland, Phantom FDI is estimated at 50% of total FDI, compared to 13% in official Swiss statistics. The Swiss National Bank uses

a narrower definition that underestimates pass-through investment, which may explain part of this discrepancy.[283] Accounting for Phantom FDI implies that Real FDI linkages are substantially larger than implied by statistics based on immediate ownership. For instance, US FDI into the original BRICS countries increases by around USD 150 billion when traced through ultimate ownership structures. While promising, Phantom FDI analysis remains an emerging approach that requires further data and methodological refinement.[284]

8.1.5 Balance of Payments

Finally, the **Net Errors and Omissions** (NEO) position in balance-of-payments statistics is used to evaluate short-term speculative capital movements.[285] A Europe-wide network analysis of NEO flows identifies trade connections, differences in institutional quality, and disparities in corporate tax rates as network drivers, suggesting that NEOs point to IFFs rather than being random. The high sensitivity of some countries, including Switzerland, to speculative capital flows may have substantial implications for their financial stability when NEO capital is prone to higher volatility and sudden stops.

8.1.6 IFFs from artisanal mining

Artisanal and small-scale mining (ASM) accounts for an increasing share of the mineral supply. Tantalum and tin from artisanal sources contribute around 25% of global supply, sapphires 80%, diamonds 20%, cobalt has risen from 5% in the late 2000s to over 12%, and gold from 4% in the 1990s to approximately 20% today. At the same time, ASM is increasingly associated with IFFs. Partner country trade data (Figure 9) suggest that between 100 and 435 tons of gold were **smuggled** annually from Africa between 2012 and 2022, of which around 80% went to the UAE.[286] Revenues from illicit gold trade play a significant role in domestic state-building dynamics and are linked to international (criminal) financial networks.[287–290] Despite three decades of efforts to formalise artisanal mining, outcomes have remained limited, with little improvement in livelihoods, environmental conditions, or tax collection.[291, 292]

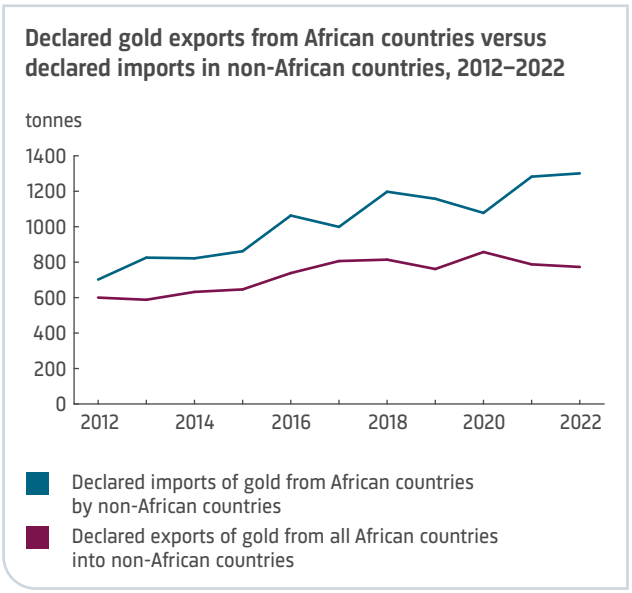


Figure 9: Gold production across Africa – declared exports versus declared imports 2012–2020, using UN Comtrade HS 7108 declarations. Source: Ummel and Schulz, 2024[286]

8.2 The effectiveness of policies to curb IFFs

8.2.1 Tax policy

The evidence on the effectiveness of tightening **transfer pricing regulations** in middle-income countries is inconclusive. While positive effects are found for South Africa[293] and Peru,[294] none are found for Chile.[295] The only study in a high-income country, Denmark, finds positive effects.[296]

A prospective analysis confirms the effectiveness of the 15% **global minimum** tax for MNEs with turnover exceeding EUR 750 million. Of the EUR 19 billion in profits shifted by German MNEs to tax havens in 2022, 95% originated from firms above the inclusion threshold. It also confirms earlier findings that both the extent and aggressiveness of profit shifting increase exponentially among the largest MNEs.[277]

In response to the weaker institutional capacity of tax and customs administrations in lower-income countries, **rule-based transfer pricing** has been identified as a stopgap measure.[297] Price benchmarks and pricing formulas are less difficult to apply than conventional transaction valuation methods, cost-effective, leave less room for MNEs to exploit information asymmetry, and create space for tax administrations to build capacity. For example, Laos, Ghana, and Nigeria prescribe quoted prices; Guinea uses the safe harbour method whereby firms need to justify transactions below the relevant reference prices; the sixth

method, adopted by 11 Latin American countries uses quoted prices to facilitate monitoring; Norway uses administered pricing for the oil sector whereby the tax authority sets the normal price range while taxpayers bear the burden of justifying deviations from it.[298] **Unitary taxation** treats the multinational group as a single entity and allocates taxable income across jurisdictions based on information about assets, payroll, and revenues, a process called formulary apportionment. The approach has been applied in the US since the early twentieth century and later in Canada, China, Germany and Japan and has been discussed in the EU as the first application in a supranational context. The method would need some adaptation in extractive settings.[299] Unitary taxation based on formulary apportionment, combined with the OECD minimum tax, could raise more than USD 30 billion in the European Union.[300]

8.2.2 Information exchange

US firms have reduced imports of tangible goods from foreign affiliates by 20% after the host country adopted a **tax information exchange** agreement (TIEA) based on the OECD Common Reporting Standard introduced in 2014.[301] Imports were rerouted via nearby countries without a TIEA agreement. Automatic bank information sharing reduced hidden offshore wealth held by Danish taxpayers by about 70%.[302] The decline results from increased wealth repatriation, a tripling of self-reported offshore income, and stronger tax enforcement through improved cross-checking of self-reported data with foreign bank records.

8.2.3 Transaction level transparency

Greater transparency in general, the central objective of the **Extractive Industries Transparency Initiative** (EITI), does not necessarily ensure transparency at the level of individual transactions. The terms of specific deals may still conceal improper behaviour, whether by the seller or the buyer, and can be extremely difficult to detect. This limitation is well recognised, and EITI efforts to address it have achieved only limited success.[303–309] For governments seeking EITI validation, the publication of payments received is mandatory. For companies purchasing commodities from governments, however, the publication of a specific 'Payments to governments' report is encouraged but not mandatory.[310] In addition, many governments oppose contract transparency or even prohibit trading houses from disclosing detailed information on payments and trades. As a result, only a small number of trading companies regularly publish payment reports.[311, 312]

In theory, the increased transparency of international commodity exchanges enables commodity producers, who can today, at a cost, access a wealth of independent information, expertise, and legal and marketing advice, to more accurately assess whether the price they receive is fair and to maximise the benefits derived from commodity production and export.

In practice, however, producers are often inclined to seek direct contact with offtakers for reasons that go beyond personal enrichment and corruption. Since Jamaica obtained a loan from a commodity trader to avoid bankruptcy in the early 1980s,[6] trading houses have provided resource-backed loans to governments of resource-rich states. Some deals have proven unfavourable, locking governments into long-term sales at below-market prices.[153] This has, in several cases, led to substantial revenue losses for resource-rich states, potentially with detrimental effects on their economic development.[6, 118, 313]

Today, trading companies still extend resource-backed credit to state-owned extractive enterprises and governments, acting as financial intermediaries, particularly since the 2008 financial crisis, when large international banks reduced their risk exposure.[314, 315] Recent publicly known cases include Chad, South Sudan, Gabon and the Republic of Congo.[70, 316]

8.3 Implications for policy and research

8.3.1 Implications for policy

While **country-by-country reporting** of tax payments to governments has improved data availability (Figure 8), significant gaps remain, particularly for lower-income countries. Addressing these gaps is essential to reducing disparities in research coverage and to limiting the information asymmetries that MNEs can exploit under the current international tax architecture to reduce tax liabilities.[317] Internationally agreed standards that harmonise data collection and improve data accuracy and consistency support host government tax authorities and facilitate international cooperation.

Mandatory **transaction-by-transaction disclosure** enables a more comprehensive understanding of trading houses' behaviour, including during geopolitical shocks or periods of economic stress. Requiring firms to report all transactions involving the physical movement of commodities to a central monitoring authority is technically feasible and can protect commercially sensitive information. While such a measure might be politically challenging, some trading houses have supported greater certification.[318] The precedent set by the Global Forum on

Transparency and Exchange of Information for Tax Purposes, established under the OECD, may be viewed as a step in this direction.

8.3.2 Implications for research

The understanding of **MNEs' adaptive behaviour** is limited, particularly when tax avoidance intersects with national security and geoeconomic priorities. The impact of such non-tax drivers on tax base erosion requires closer scrutiny, as they may yield uneven transparency gains across countries[319] and further fragment the global tax architecture along regional lines. Similarly, studies are warranted to analyse stakeholder preferences and the existing policy space for IFF policy reforms.[320]

Comparative studies on **anti-profit-shifting measures** would clarify the merits of different policies, taking into account the evolving administrative and tax capacities of resource-rich lower-income countries. Expanded data availability through CbCR can enable research and inform policy deliberation over the adequacy of the arm's-length principle versus a shift to unitary taxation with formulary apportionment.[321, 322]

Research on **IFFs from artisanal mining** is only beginning to emerge at the producer-country level. It is largely absent regarding international networks and the effectiveness of measures to curb IFFs through the international financial system. At the same time, the energy transition and prevalence of armed conflict in many producer countries are increasing the stakes. The likely impact of such non-tax considerations on tax base erosion warrants greater scrutiny, as they might lead to uneven progress in global transparency across countries.[319]

9 Environmental effects

The expansion of international trade in agricultural, mineral, and forest commodities has led to significant changes in land use, resource consumption, and emissions, with consequences for water, forest, biodiversity, and climate systems.[323–328] Environmental footprints are embedded in products and in the complex supply chains and financial flows that enable global trade.[43, 328–333]

Approximately a quarter of global gross agricultural production by value is traded internationally.[334] For commodities such as coffee, export orientation is even higher, at over 70%, while it is much lower for rice.[335] International trade has been an increasingly important driver of metal ore extraction across all continents,[328, 336] and the share of global metal extraction induced by international final demand increased from around 63% in the 1970s to 71% in 2020.[336] Overall, there is a net transfer of resources from the Global South to the Global North (Figure 10),[337, 338] and lower-income, resource-rich countries typically bear the environmental costs of producing commodities that are ultimately consumed in industrialised or urbanised regions.[338]

This chapter synthesises the evidence on environmental effects of land use and land-use change, greenhouse gas emissions, biodiversity, water, and pollution.

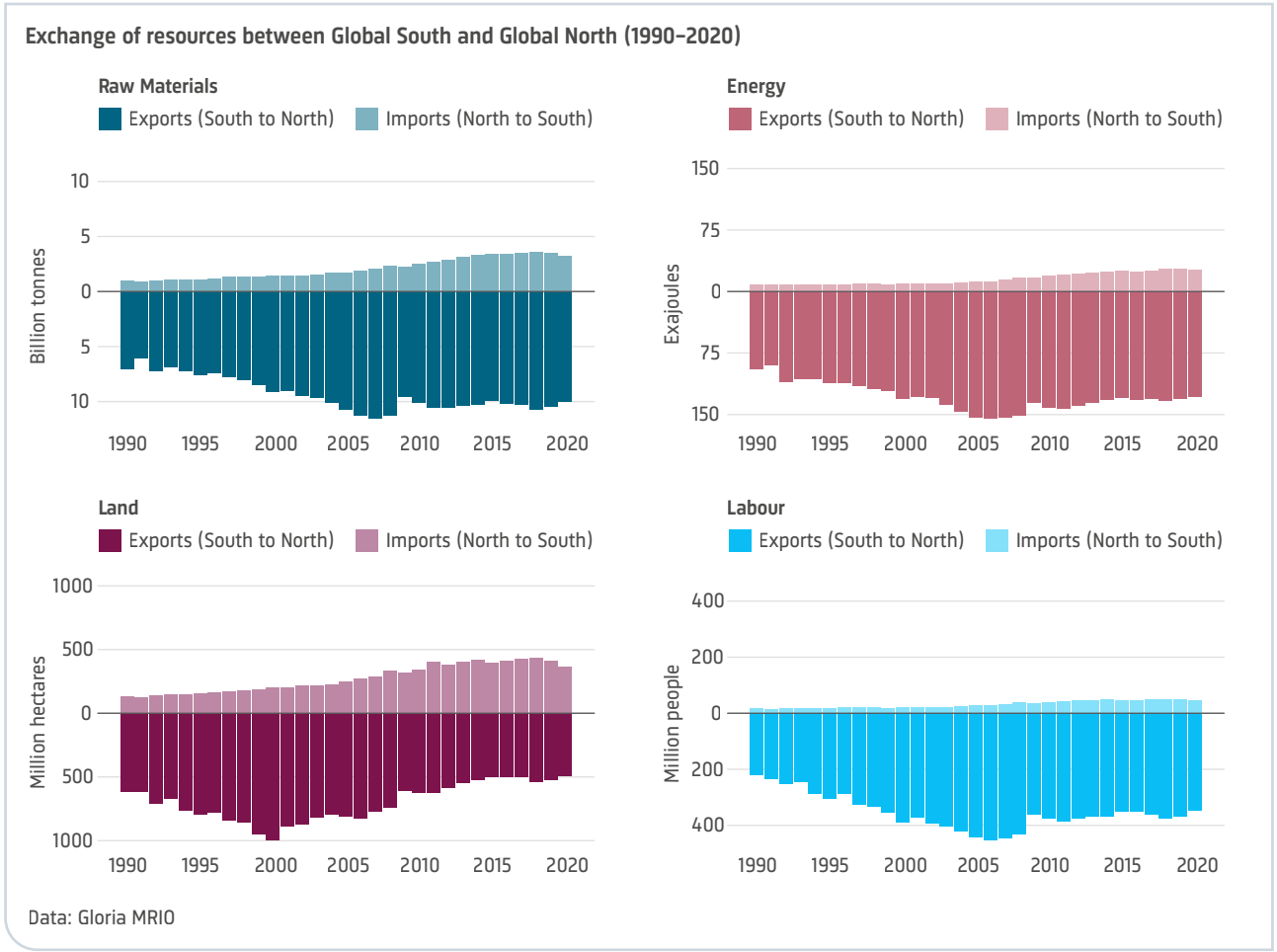


Figure 10: Net transfer of raw materials, land, energy and embodied labour from the Global South to the Global North.
Source: Hickel et al. 2022[337] updated[339]

9.1 Extent of environmental effects

9.1.1 Land use and land cover change

Crops for export are produced on around 20–26% of global agricultural land, which is virtually imported by consumer countries.[340] This often involves converting natural ecosystems, such as **tropical forests**, for beef, soybeans, palm oil, or timber. Export-driven deforestation is concentrated in Latin America, Southeast Asia, and Africa, while importers include major economies such as China, the EU, and the US.[341–343] **Grasslands and wetlands** have also been converted to grow export crops or biofuel feedstocks, but on a smaller scale than irreversible tropical deforestation. The net effect of current trade patterns has accelerated land-use and land-cover change in many exporting countries. This effect is reflected in the concept of 'telecoupling', which describes how consumption in one region drives land-cover change in another, turning land resources into a globally traded commodity.

9.1.2 Greenhouse gas emissions

A given country is a net importer of emissions if the emissions embedded in its imports exceed those in its exports, and vice versa.[344, 345] With increasing trade volumes, greenhouse gas (GHG) **emissions embedded in trade** have been rising more rapidly since the 1980s,[340, 345–347] representing 26% of the global total in 2006.[345] Although the share of emissions attributable to cross-border trade has stabilised since around 2010, it remains central to ongoing climate policy deliberations, particularly regarding responsibility-sharing among countries.[345, 348] Over the last 20 years, 70–75% of Switzerland's annual emissions have been associated with imports, without emissions from commodity trading.[349]

The rapid growth of middle-income countries is shifting the geographical centre of global trade, including embedded emissions, from Europe to Asia, replacing traditional trading hubs such as Russia and Germany.[345, 350] Rapid industrialisation made China the 'smokestack' for many consumer goods, with top emission trade flows from China to other Asian and Pacific regions, the US, and Europe.[350] In recent years, China has shifted its exports towards more low-carbon, higher-value-added goods and services, with exported emissions declining by 20% from 2008 to 2013.[45, 351] The US is the largest net importer of GHG emissions embedded in trade, followed by European nations, with over 40% of the CO_2 footprints of France, Germany, Italy, and Spain generated by imported goods and services,[345, 352] and about 33% for the whole European Union.[345, 353] Similar levels apply to other high-income economies, such as Japan, South Korea, Canada, and Australia.

From a sectoral perspective, manufactured goods and heavy industry products dominate virtual CO_2 transfers, whereas agricultural trade accounts for a large share of non-CO_2 GHG emissions, such as methane (CH_4) and nitrous oxide (N_2O). Notably, more than 75% of emissions embedded in trade come from just a few high-emitting sectors, especially energy-intensive manufacturing, transport, and mining.[354, 355]

There is growing recognition of the need to reduce the carbon intensity of traded goods or adjust for it via measures such as carbon border fees,[350] but accurately capturing all GHG flows, enacting policies to account for them, and keeping pace with evolving trade patterns remain ongoing challenges.

9.1.3 Biodiversity

About USD 44 trillion of economic activity, more than half of the global GDP, highly or moderately relies on biodiversity and ecosystem services.[356, 357] When a product is made from converted habitat or extracted from nature, the loss of **species** (Figure 11) and natural ecosystem functions is part of its hidden costs.[323, 328, 332, 358] Among 25,000 species threat records from the IUCN Red List, 30% are attributable to international trade[359] driven by habitat destruction and overexploitation in biodiversity-rich, lower-income countries to grow export commodities such as coffee, tea, sugar, palm oil, cotton, and extract minerals.[328, 336, 359] Nearly 80% of recent global land-use change impacts on biodiversity are associated with increased agri-food exports from Latin America, Africa, and Southeast Asia.[332]

When forests are cleared or wetlands drained for export production, critical **ecosystem services** are diminished, including carbon sequestration,[323, 360–362] flood control,[361–364] pollination,[365, 366] and water purification.[361, 367, 368] The degradation of ecosystem services in producer regions constitutes a subsidy to consumers that is neither compensated for nor accounted for in trade balances.

There is growing recognition of this **biodiversity inequity** in global trade and the need to shift global supply chains away from nature-negative towards nature-positive outcomes,[328, 332, 358, 359, 369] which requires transparent disclosure frameworks, zero-deforestation supply chain commitments, and restoration and compensation mechanisms in lieu of destructive production.

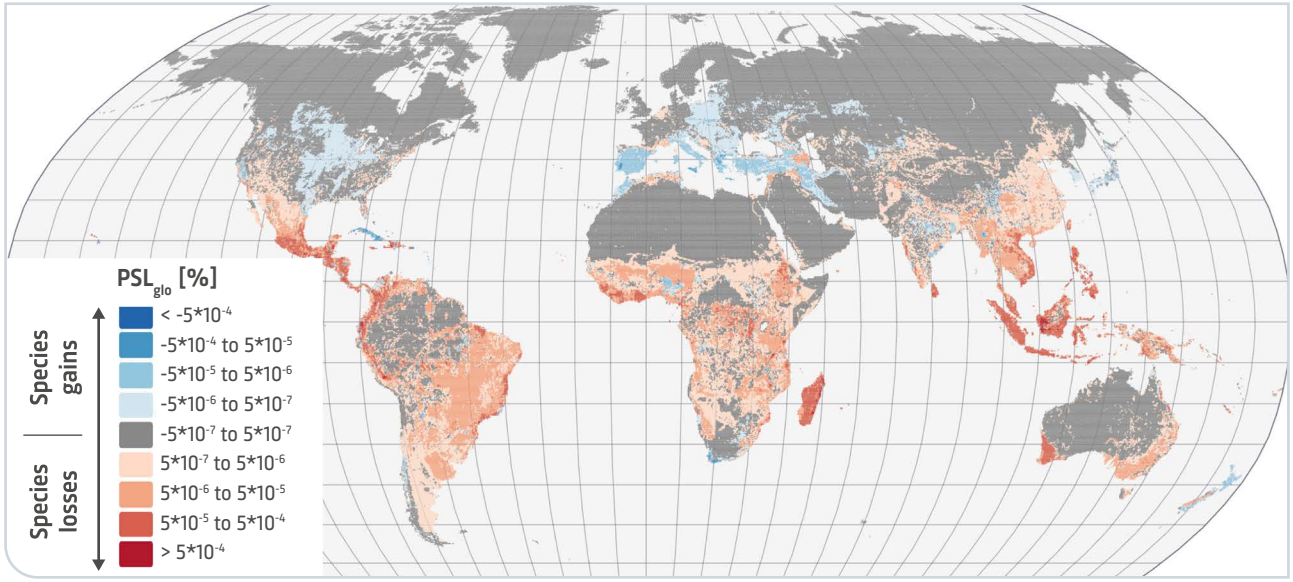


Figure 11: Global biodiversity impacts of land-use change. The unit indicates the global share of species lost or potentially regained (PSL$_{glo}$ [%]) due to land use change in on-grid cells of ~700 km^2. The blue areas indicate gains from restoration or from abandoned agricultural land.
Source: based on data from Cabernard et al. 2024[332]

9.1.4 Water consumption and scarcity

Approximately 22–26% of the global water use is embedded in international trade, labelled 'virtual water',[370–372] with water-scarce regions often exporting water-intensive commodities.[340, 341, 373, 374] Agriculture is the largest contributor to **virtual water flows**. Water-intensive crops such as cotton, rice, and sugarcane are often grown in arid or seasonally dry countries for export.[375–377] In 2016, 812 km^3 of water use was directly embodied in the international soybean trade, one-third of the water used to grow soybeans globally.[341]

While virtual water trade can help water-scarce countries save domestic water by importing water-intensive goods, countries such as India, Pakistan, Iran, and Egypt remain net exporters of virtual water despite their water scarcity, thereby exacerbating local water stress.[374–376] By contrast, the European Union imported 585 km^3 of virtual water in 2009, about 28% of global virtual water trade flows.[378] Overall, there is a strong virtual water transfer from low-income countries to high-income countries when considering water scarcity.[379]

By 2100, exports of renewable water are expected to triple, and exports of non-renewable groundwater are expected to at least double, driven by changing agricultural demand, climate change, and socioeconomic development.[380] Water-rich basins in North America, the La Plata, and the Nile will be major exporters, while Africa, India, and the Middle East will become more reliant on virtual water imports,[380] making international cooperation, renewability accounting, and sustainability-focused trade policies essential.

9.1.5 Pollution

Trade in commodities also drives **transboundary pollution**, including nutrient runoff, air contaminants, water pollutants and chemical waste.[324, 375, 381, 382] Agriculture and industry release reactive nitrogen compounds from fertiliser and manure application, fossil fuel combustion, among others, which cause eutrophication, air pollution, and further climate effects.[324, 383, 384] Approximately a quarter of the global nitrogen footprint is attributed to the production of goods for international trade.[383] A similar pattern is seen for heavy metals and toxic chemicals. For example, chemical pollutants from Bangladesh's textile and leather tannery export industry are discharged into local waterways,[385] and the production of goods generates local air pollution; both are effectively redistributed through international trade.[386–388]

Trade in goods also means trade in waste and pollutants at the **end of product life cycles**, routinely from high- to lower-income countries, including electronic equipment, effectively exporting the pollution and health risks of e-waste processing.[389–394] Up to 70% of plastic waste produced in OECD countries is exported to East Asia and the Pacific, with China importing 45% of global plastic waste since 1992[395] and now increasingly shifting to lower-income countries in the region. The environmental consequences include plastic pollution in freshwater and

marine ecosystems, unsound recycling practices, incineration, and landfilling, resulting in local pollution and health hazards.[396–400] International agreements such as the Basel Convention have been strengthened, but enforcement and global cooperation remain critical challenges and negotiations for an international plastics treaty have been unsuccessful so far.[401, 402]

9.2 Implications for policy and research

Quantifying the environmental footprints of global trade has become a foundational element supporting sustainable supply chains. Top-down environmentally extended multiregional input-output (MRIO) models reframe understandings of responsibility for environmental impacts in an interconnected world. Bottom-up and hybrid methodological innovations are adding actionable sectoral and regionalised detail, helping to identify whom and where to target for mitigation. Improving data availability and quality through collaboration among scientists, governments and industry, and through methodological integration, enhances reliability. A transparent global monitoring system makes the hidden footprints of trade visible and supports a more sustainable economy.

9.2.1 Traders and the promotion of sustainably produced commodities

Traders have increasingly invested in **traceability and monitoring** systems to verify compliance with emerging regulations and corporate no-deforestation pledges.[403, 404] Through preferential sourcing, certified supply chains, improved traceability, and producer support, traders have emerged as central actors capable of catalysing more sustainable commodity production.

However, **efforts remain selective** and insufficiently comprehensive. For instance, 20 years after the introduction of the RSPO Responsible Palm Oil standard, to which all large palm oil traders are members, only 13% of global palm oil production is currently RSPO-certified,[405] with this share plateauing since 2020. When major grain traders used their sourcing power to enforce forest conservation in the Brazilian Amazon through the Brazilian Amazon Soy Moratorium,[403] deforestation for soy shifted to regions outside the perimeter.[403] Another loophole is indirect sourcing. Many trader commitments and monitoring systems focus on direct suppliers, yet traders often source more than 40% of their commodities through local intermediaries, creating a major blind spot in sustainable sourcing efforts.[41] A more holistic picture based on top-down data helps to understand the unaddressed share of impacts and points to potential hotspots in supply chains that require detailed assessment.

9.2.2 Accounting framework for financial environmental footprints

While financial institutions are usually not directly responsible for cutting down forests or burning coal, they can enable such activities. A common method for attributing environmental footprints to investors or insurers is to assign impacts in proportion to their equity share or financing share.

Data availability remains a major challenge, as financial actors generally do not disclose lending or investment information at the company or project level, especially in environmental terms. The Task Force on Climate-Related Financial Disclosures (TCFD) and the Task Force on Nature-Related Financial Disclosures (TNFD) encourage banks and investors to report how their portfolios contribute to climate and nature loss. Methodologies are still emerging, and disclosure, while increasing, remains uneven.[406] **Conceptual reservations** persist due to the unproven assumption that voluntary biodiversity-risk disclosure redirects finance away from environmental degradation.[407] The 2026 IPBES report on Business and Biodiversity provides evidence to support reforms that move from voluntary to mandatory nature-risk disclosure, strengthen safeguards, remove harmful subsidies, and update financial regulation that no longer incentivise biodiversity loss.[408]

Accounting for **avoided impacts**, 'scope 4' in climate accounting,[409] is, unlike scope 1–3 emissions, not part of the Greenhouse Gas Protocol and is fraught with counterfactual uncertainty, the risk of double-counting and greenwashing. Avoided-impact accounting in biodiversity is even more complex, and positive contributions cannot offset ongoing biodiversity harm elsewhere. Consequently, priority is given to avoiding and minimising impacts, and restoring ecosystems.[408] Investing in restoration projects can still contribute to mitigating negative environmental effects, provided that leakage is accounted for and minimised, and that such investments are not used for compensation or net-zero claims.

10 Effects on public health

Despite a growing body of scholarly literature, the evidence base documenting the human health effects related to commodity extraction and production remains fragmented across commodity types, value chain stages, geographic settings, and health outcome domains. Regionally, West and Southern Africa form the most prominent cluster of high study density, particularly in mining contexts. Latin America is represented primarily by Brazil and Colombia, with few studies across the rest of the region. South Asia is present but less dominant, and Southeast Asia and other regions appear sporadically. The recent peer-reviewed literature is overwhelmingly dominated by minerals and metals (88%), followed by soft commodities (8%) and oil and gas (4%). Within the minerals and metals category, artisanal gold mining dominates (50%), followed by coal (20%). While occupational health and safety (OHS) falls under a country's labour law framework, community health typically falls under a combination of public health law, environmental law, and sector-specific extractive legislation, often supported by impact assessment requirements.

10.1 Occupational health impacts

Respiratory diseases represent the most documented occupational health effects. Documented conditions include silicosis,[410, 411] coal workers' pneumoconiosis ('black lung disease'),[412, 413] impaired lung function,[414, 415] and emphysema.[416, 417] These outcomes are most frequently attributed to prolonged exposure to airborne particulates and hazardous materials, particularly silica and (coal) dust.[418, 419] Accidents and injuries represent the second most consistently reported occupational outcome and are particularly prominent in small-scale mining contexts. Studies in artisanal and small-scale gold mining repeatedly document elevated injury rates and unsafe working conditions.[420, 421] Industrial-scale mining studies similarly report substantial injury burdens, often linked to mechanised extraction and underground operations.[422, 423] Musculoskeletal disorders are documented in both industrial- and small-scale mining and, to a lesser extent, in plantation settings, reflecting physically demanding labour and ergonomic strain.[424, 425] Hearing loss has been reported in association with chronic exposure to high levels of noise in mining environments.[426, 427] Neurological, hepatic, and renal outcomes are described mainly in the context of long-term exposure to metals and industrial chemicals in mining operations.[428, 429] Communicable diseases directly attributable to occupational exposure are comparatively rare. Tuberculosis is reported in mining settings, particularly in environments characterised by overcrowding and poor ventilation.[410, 430]

Across occupational outcome domains, the majority of comparative studies report adverse associations between commodity-related work and health outcomes. Neutral findings are less frequent, and no studies documented statistically significant protective effects.

10.2 Health impacts in affected communities

Across community health domains, non-communicable diseases constitute the most frequently studied category in mining contexts. Respiratory diseases are the most reported outcome. Comparative analyses predominantly indicate increased respiratory disease among populations living near extractive sites, with four studies documenting adverse associations[431, 432] and one reporting no statistically significant difference compared with non-exposed populations.[433] Reported conditions include acute respiratory infections,[434, 435] asthma[436, 437] and shortness of breath,[438, 439] most often linked to exposure to airborne pollutants and hazardous materials such as coal dust[436, 437] and grain dust.[439] Other non-communicable conditions documented include cases of poisoning,[440, 441] orthopaedic disorders,[442] diabetes,[442, 443] and oral health outcomes.[444] Cancer and genotoxic outcomes are also reported in mining-affected communities, with two studies indicating increased risk.[445, 446] Vector-related diseases, particularly malaria, are documented in both industrial-scale and small-scale mining contexts, with three studies reporting increased transmission or prevalence associated with mining activities.[447, 448] One study, however, reports a reduction in malaria associated with industrial presence, suggesting a positive association in that specific context.[449] Maternal and child health outcomes are also reported in mining regions. This category includes studies reporting positive associations, specifically reductions in stunting[450, 451] and underweight[450] among children living in communities near industrial extractive projects.

Overall, the distribution of community health outcomes mirrors the broader commodity imbalance in the literature, with a dominant focus on mining-related contexts and comparatively limited attention to soft commodity systems.

10.3 Implications for policy and research

Although the volume of research is substantial, the evidence base is structurally imbalanced. The geographic and sectoral skew constrains the generalisability of findings and limits comparative insights across commodity systems and production models. An important limitation of the current evidence base is the relative underrepresentation of health impacts associated with soft commodity production. The narrow focus limits the ability to draw balanced cross-sector comparisons and may underestimate the cumulative health burdens associated with soft commodity production.

For example, major **crops**, such as cocoa, are underrepresented in the reviewed literature, despite potential occupational and community health risks associated with child labour, ergonomic strain, and land-use change.[452, 453] Equally underrepresented are also studies into the risk of adverse health effects arising from **pesticide** application in export-oriented large-scale and smallholder agriculture. Targeted studies are warranted because the literature on agrochemical exposure and chronic low-dose toxicological pathways has established associations between pesticide exposure and acute poisoning, neurotoxicity, endocrine disruption, reproductive harm, and certain cancers in agricultural populations;[454, 455] research documents that smallholder farmers typically lack training in safe pesticide use and demonstrate limited knowledge, weak safety practices, and poor attitudes towards proper handling;[452, 456, 457] finally, indicative evidence from civil society and the grey literature consistently highlights harmful impacts of pesticide use in export-oriented agriculture, underscoring the need for more rigorous and independent scientific investigation.

Another gap in the literature concerns the outcomes of commodity-specific **health regulation** and the political economy shaping their design and implementation. In lower-income countries, such regulation is largely absent from public frameworks except for environmental impact assessments that address environmental determinants of health. Existing studies document political economy dynamics that constrain implementation.[458–461] By contrast, health impact assessments are required by multilateral[462] and many private financial institutions,[463] and feature in industry commitments.[464, 465] The limited evidence base highlights restricted data access and partial implementation,[466, 467] though exceptions exist.[449] More systematic research on the effectiveness of health policies in the commodity sector is needed and the conditions under which they improve health outcomes.

11 Social effects

Commodity production and trade shape social outcomes far beyond economic growth. They influence how people work, live, and interact within communities, creating both opportunities and risks. These social effects are not uniform. While commodity sectors can generate employment, infrastructure, and income, they are also frequently associated with precarious working conditions and labour exploitation, rising inequality and social disruption, for example, through resettlement, in-migration or land conflicts, especially in lower-income countries.

11.1 Inequality

At the local level around mine sites, quantitative research finds modest average welfare gains alongside rising within-area inequality. Qualitative and ethnographic studies further show that these aggregate patterns mask highly uneven and differentiated social outcomes within communities.[468–472]

The effect of resource extraction on inequality is epitomised in the **stratified mining town**,[468, 473–476] a space where extractive operations co-shape distinct spatialities and lived realities. These dynamics unfold through processes such as in-migration, pressure on public services, corporate hiring practices and working conditions, infrastructure expansion, resettlement, environmental burden, and rising living costs, with local authorities often caught between corporate, local and national interests. With the advent of mining, the town becomes increasingly stratified, with some groups benefiting while others experience dispossession and displacement. This reality contrasts with what Kesselring calls the 'Golf Estate': purpose-built residential and recreational enclaves for mine managers, expatriate employees and their families, offering comprehensive amenities and services.[468] The corporate enclaves of the 'Golf Estate' shield their inhabitants from the lived realities of the surrounding population, which are often framed by mine managers as a 'dysfunctional town',[468] in disregard of how extractive operations themselves contribute to these conditions.

The contrast between the stratified city and the Golf Estate has led Kesselring to refer to Switzerland as a commodity hub with its outsized role as the 'Golf Estate of the World',[468] challenging the appearance of separateness between regions of production in the Global South and service provision in the Global North, arguing that these relations are asymmetrically interdependent.

Driving this 'Golf Estate' dynamic is, among other factors, the **enclave character** of extractive industries.[477] These operations are only weakly embedded in local economies, relying primarily on low-cost labour, a need that declines after the construction phase and further diminishes as automation increases. Instead, companies depend on specialised global suppliers and service providers, while extracted raw materials are predominantly destined for international buyers and processors.

Yet, the biggest share of local benefits results from strong backward, forward and horizontal **linkages**.[478, 479] Realising these gains through local procurement, domestic processing, or transport infrastructure (rail, road, ports) designed to also serve the wider economy requires deliberate policy choices and sustained investment.[478, 480–483] Companies, however, often negotiate from a position of strength to minimise obligations and benefit from favourable investment treaties (cf. Chapter 5.1), further reinforcing their leverage over host countries.

11.2 Social conflict

Research has also analysed the links between resource abundance, political violence and civil war[484–487] as well as conflicts between local communities and companies over extractive projects from Latin America[488–491] to Africa,[492–497] Asia,[498, 499] and Europe and North America.[500, 501]

The aggregated evidence documents that company-community **conflicts in mining are not an exception but systemic**, and are not contingent on the company's home country, the host country, geographic region, or the raw material extracted.[265, 472] Mining-related conflicts increase in lockstep with investment in exploration.[502] Of 16 topics identified to drive conflict,[502] 14 are found in Africa and Latin America, 10 in Asia, and 3–8 in Europe, the Pacific, and North America. Environmental issues are the most prevalent drivers, except in Europe and North America, followed by contestation over the asymmetry of costs and benefits, resettlement and health, employment opportunities, safety, and lack of meaningful consultation.

Relating conflict propensity to **social spending** by 292 mining operations across 17 African countries between 2011 and 2018 suggests that such spending primarily serves as a risk-management tool. Mining companies are more likely to engage in social spending when they are exposed to conflict in their areas of operation in prior years. While social spending can attenuate tensions, the effects

are moderate and tend to dissipate after a few years.[503] A similar relationship is evident in **sustainability reporting**, where community engagement is closely associated with risk categorisation.[504] Notably, sustainability reporting is conducted at the corporate level, targeted at international stakeholders, and rarely disaggregated by individual mining sites, where it would be most relevant to local stakeholders.[505] Limited site-level disclosure appears to be driven, at least in part, by liability concerns.[506, 507]

Evidence on conflict in soft commodity production is less rich but shows similar patterns and mainly occurs in **export-oriented plantation systems** (e.g., oil palm, soy, sugarcane, tea, forest plantations). Drivers include land and natural resources dispossession,[508–513] labour exploitation and precarious work,[510, 511, 514, 515] unequal legal regimes for foreign direct investment and indigenous land rights,[516, 517] environmental degradation,[508, 510, 511, 514] lack of benefits,[225, 518, 519] dependence and lock-in.[36, 520, 521] Emerging research links commodity price shocks, climate change, and conflict with export agriculture.[514–519]

The analysis of conflicts in **downstream operations** (e.g., transport, export, refining) is often neglected in the analysis of commodity-related conflicts. While resistance against mining often involves communities (less often workers) interrupting mine operations, gaining similar leverage and visibility downstream is more difficult, and effectiveness depends on the organisation of workers. Protests typically exploit 'choke points' such as borders or ports to demand higher salaries, risk allowance or better working conditions.[522, 523]

11.3 Abstracting extraction: the moral economies of trade

The question then arises: how do trading companies navigate and reconcile the frictions and contradictions between profit-oriented trading practices[7, 75, 524, 525] and the social realities in which extraction is embedded, and how is this linked to global inequalities?[526]

Emerging ethnographic accounts examine those strategies by following the asymmetrically interdependent realities along value chains and by linking research in the trading room in Switzerland with commodity traders' and extractive firms' everyday practices in sourcing areas.[44, 527] In essence, different moral narratives are deployed at each stage of operations that allow for varied positions on social and ecological concerns, masking the power to shape and entrench unequal and asymmetrical relations between the Global North and the Global South,[468] including through upstream integration and 'servicification' as strategies to capture a larger share of the value chain.[528]

On one hand, commodity traders develop multifaceted, yet largely abstract, relationships **(coupling)** with the goods they trade. As Leins[44] documents, after purchase, they remain in constant contact with subcontractors, certification firms, and ship captains to track quality, quantity, and logistics, yet rarely see the commodities themselves. Instead, they cultivate connections through tokens, site visits, and relationships with local brokers, balancing their base in trading hubs with the need to demonstrate ties to production sites.

The abstract nature of these relationships enables traders to morally **decouple** from the broader consequences of their activities, primarily through distinct narratives, a mechanism that is well established in the literature.[529–532] Traders frame themselves as amoral intermediaries between production and consumption. Discursively separating trading from the production and consumption of commodities transfers responsibility for issues such as environmental or social damage to producers and consumers, deflecting ethical criticism while expanding influence and profitability.[44]

Another decoupling mechanism is observed in **ESG**-based financial transactions, including trading. Conceptually, ESG frames topics that affect communities or the environment as risks that reflect in the company's valuation. ESG-related financial performance is understood as a market signal that can harm (or benefit) a company's reputation and, in turn, its cost of doing business.[533] ESG translates normative issues into financial tools by reframing the impacts of their activities, making narratives acceptable in market settings and legitimising business-as-usual.[534, 535] Primary research into ESG practices at Swiss banks[536] and empirical analysis of ESG ratings[537–540] question the depth and effectiveness of ESG criteria.The core function of an ESG assessment is to evaluate a company's capacity to manage the ESG risks it faces, rather than to assess the company's net impact on society and the environment across supply chains.[539, 541–544]

11.4 Implications for policy and research

Policy innovation can tackle community conflicts that remain insufficiently addressed by current approaches. For example, moving from captive data collection led by companies to **independent monitoring** of development effects in mining areas can inform negotiations between communities and companies, national policy processes, and global governance regimes. Monitoring **over time** serves as an important feedback loop over the life cycle of a mining operation and increases comparability between operations. New approaches, such as the Resource Impact Dashboard,[545] can serve as a starting point.

In light of the systemic nature of company-community conflict, research into the effective internal workings of company-administered **grievance procedures** and their outcomes is warranted. Previous efforts have largely failed since related information is treated as private knowledge.[546–548]

Technical and negotiation support to host countries to establish and implement sector-wide **local content policies** helps to realise critical local benefits from commodity operations.

Clear **definitions of ESG** topics, aligned with reporting standards, can improve the reliability, comparability, and effectiveness of ESG reporting.[540, 541, 549]

Part III: Political economy of sustainability-related trade regulation

Part III discusses the scientific evidence on the political economy of trade-related sustainability regulation in Switzerland, as well as aggregated evidence on the effectiveness of sustainability regimes in promoting responsible business behaviour.

12 Political economy of Swiss commodity trade regulation

Research on Switzerland's regulatory regime regulating commodity trade is limited. The most comprehensive mapping of Switzerland's commodity trading sector and sustainable development was provided by Bürgi Bonanomi et al.[38] in 2015. Many of the knowledge and research gaps identified, including the lack of data on taxation, financial flows, and the evolution of trade and tariffs, still persist. The 2013 stocktaking report by the Interdepartmental Commodities Platform on the state of Switzerland's commodity trade sector,[102] together with the follow-up reports by the Federal Council, the most recent of which was published in 2023,[550] map regulatory developments. We synthesise research analysing these developments.

12.1 Framework, developments, innovations

Recent regulatory reforms affecting commodity trade concerned transparency in the financial market, including the commodity-derivatives market (Financial Market Infrastructure Act (FMIA), 2015), asset freezing and restitution of assets (Foreign Illicit Assets Act (FIAA), 2016), commercial purchase of recycled gold (Anti-Money Laundering Act (AMLA), 2021),[551] non-financial reporting and due diligence regime (Code of Obligations, 2022) and extended supervision of and due diligence obligations for gold refineries (Customs Act, 2025).

Research on the Swiss regulatory regime governing commodity trade is scarce, particularly in recent years. Tagmann[552] presents a comprehensive overview of the legal governance of corporate responsibility with respect to human rights, noting the absence of a comprehensive regime. The legal study by Carnot[553] examines whether the Swiss AML Act adequately covers the Swiss commodity sector and concludes that additional measures aligned with evolving international norms would mitigate reputational risks without adversely affecting economic activity.

The regulatory innovation in the **Comprehensive Economic Partnership Agreement** (CEPA) between the EFTA States and Indonesia (2018), which links reduced tariffs on palm oil to compliance with recognised environmental and social sustainability labels, has attracted substantial scholarly attention. Bürgi-Bonanomi[554] argues that such market-based sustainability incentives could serve as a model for future trade negotiations, while noting their asymmetric and non-reciprocal design. Sieber-Gasser[555] notes that although only a limited share of Indonesian palm oil currently qualifies for CEPA preferences, the arrangement enhances legal certainty for Indonesian exports overall and incentivises producers to adopt sustainable practices. Similar conditional preferences could be extended to other commodities where established standards exist.

The **Responsible Business Initiative I** (Konzernverantwortungsinitiative, RBI I), which sought to convert voluntary standards into binding law by holding Swiss companies liable for human rights and environmental harms in their global value chains,[556, 557] has attracted significant scholarly attention. Martinelli[558] frames the NGO-, trade union-, and left-led campaign as part of a broader 'resurgence of social contestation in a conservative country.' While Schneider[557] argues that national initiatives remain necessary in the absence of coordinated international regulation, Kaufmann[559] highlights unresolved questions regarding extraterritoriality and the scope of liability. Werro[560, 561] finds that both the rejected initiative and the narrower indirect counterproposal, which was finally approved in the referendum, reflect Switzerland's traditionally conservative, business-friendly liability regime, placing it in the lower tier in an international comparison of regulatory stringency. Drawing on interviews with trading firms, industry associations, and NGOs, Niederberger et al.[562] show that despite the legal framework's limited specificity, firms have strengthened internal data collection, supply chain traceability, and risk management. Globally active companies also monitor foreign regulatory

developments to anticipate stricter requirements or align voluntarily with international standards.

Many voters felt that the successful counterproposal to BRI I did not go far enough. A second initiative, **Responsible Business Initiative II**, was submitted in May 2025.[563] The Federal Council proposed the Federal Act on Sustainable Corporate Governance (NUFG) as an indirect counterproposal in April 2026.[564] The NUFG moves towards more comprehensive obligations regarding sustainable corporate governance in line with the EU Omnibus Initiative, while simultaneously narrowing the scope of application compared with the existing regulation. At the time of writing, RBI II is in the early stages of the federal consultation process. Given the expected duration of parliamentary deliberations and the presence of a counterproposal, a popular vote is unlikely to take place before 2027 at the earliest. The scientific debate on RBI II remains at an early stage.

12.2 Participation in global sustainability initiatives

The Swiss government has long supported internationally coordinated approaches to strengthen **extractive sector governance** (e.g., EITI since 2009; EGPS since 2015) and improve business regulation. The **OECD BEPS** (Base Erosion and Profit Shifting) project is the most significant global initiative to enhance coherence and transparency in the international tax regime and to curb profit shifting by MNEs. Switzerland is implementing both minimum standards and extended measures.[565] Savignac[566] shows that Switzerland has adopted BEPS instruments selectively, pursuing a cautious reform strategy to balance international compliance with economic competitiveness. In response to the adoption of the **UN Guiding Principles on Business and Human Rights** (UNGPs) in 2011, a soft-law that does not include legal responsibility for process or for reporting,[567] Switzerland has introduced a National Action Plan to promote the UNGPs, and published a Commodity Trading Sector Guidance on Implementing the UNGPs.[568] In addition, Switzerland adopted a CSR Position Paper to promote the implementation of responsible business conduct beyond human rights, based on the OECD Guidelines.[569]

While competitiveness remains an ongoing concern in Swiss regulatory policy,[102, 570] regulation has increasingly incorporated sustainability requirements, placing greater emphasis on human rights, environmental protection, and financial transparency. These changes reflect both civil society pressure and shifts in international regulatory regimes, particularly within the EU, OECD and international institutions.

12.3 Integration of international regulatory developments

As regulator of one of the world's largest consumer markets, and given its relatively stringent regulatory framework and firms' tendency to standardise practices, the **EU functions as a global norm-setter**.[571] Owing to the extraterritorial reach of the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD), and Switzerland's close economic ties to the EU, Swiss companies that access the EU single market are strongly affected by these regulations.[572]

A comparative analysis by Neri-Castracane et al.[572] shows that, while Swiss legislation includes provisions on non-financial transparency, raw material companies, and due diligence for conflict minerals and child labour, the EU's CSRD and CSDDD impose far more stringent reporting and due diligence obligations and contain more stringent procedural requirements. For example, whereas the CSRD mandates extensive ESG disclosures with specific reporting requirements, the Swiss Code of Obligations provides comparatively general guidance, with specific requirements largely limited to climate-related information. The authors propose reforms to align Swiss law more closely with EU standards.

Reviewing recent developments in due diligence and supply chain regulation for gold trading in Switzerland and the EU, including expanded anti-money laundering measures and due diligence requirements, Schäli et al.[551] caution that refiners, purchasers, and assayers will increasingly forgo ASGM gold from non-formalised sources and cease purchasing from high-risk suppliers or regions altogether, rendering artisanal and small-scale gold mining particularly vulnerable.

12.4 Responses to evolutions in competing jurisdictions

How does Switzerland's regulatory regime respond to evolutions in jurisdictions hosting competing commodity trade hubs? OECD regulations targeting **illicit financial flows**, including the Exchange of Information on Request (EOIR), the Spontaneous Exchange of Tax Rulings (SETR), and the Automatic Exchange of Financial Account Information (AEOI), were driven by the US and EU and adopted by other commodity trading hubs such as the UK. Switzerland has aligned its information-exchange framework with these international standards. Research finds that they are primarily oriented towards advanced economies, as most EOIR agreements are concluded with such states, while lower-income countries remain largely

excluded due to capacity and legislative constraints, limiting the ability to detect commodity trade mispricing.[297]

From Germany's perspective as a commodity importer, Saulich[573] notes that a substantial share of metals entering Germany passes through non-EU trading hubs such as Switzerland and the UK, which are subject to less stringent **sustainability and due diligence** requirements than those imposed under Germany's Supply Chain Act and the EU CSRD.

While Switzerland supports the Extractive Industries Transparency Initiative (EITI), it does not implement it. The Swiss Code of Obligations mandates disclosure of **payments to governments** only for companies active in the extractive sector and for payments exceeding CHF 100,000, leaving commodity trading firms outside the scope of the regulation. Comparable transparency gaps exist in the London trading hub, suggesting that the Swiss regulatory framework does not differ substantially from those of other major European commodity trading centres.[573]

In a comparative analysis of Switzerland and the US on the **regulation of gold imports** and their effects on human rights in gold-mining countries, Gomez[574] observes that Switzerland has been slow to update its regulations. In the US, gold trade has been mostly governed by the Dodd-Frank Act since 2010, which puts mandatory due diligence requirements on firms that trade in or use conflict minerals. In Switzerland, gold trade is regulated by the Federal Act on the Control of Trade in Precious Metals, which requires firms engaged in gold trading or manufacturing to obtain licences for these activities and, since 2021, to mark imported gold and document its origin. Gomez contends that the comparatively weak Swiss regulation of gold trading, more akin to a voluntary standard that has not kept pace with newer regulations, was due to a lack of government incentive, given concerns that stricter regulation could damage the international competitiveness of Swiss gold refiners and traders.

The above findings suggest that Switzerland has **gradually introduced** regulatory measures to improve the sustainability of commodity trading. However, the scope and stringency of these measures often remain more limited than those adopted in other jurisdictions and generally align with, rather than exceed, prevailing international standards and practices in comparable commodity trading hubs. This regulatory approach is evident in the regulation of soft commodities, where voluntary private standards are often preferred over binding legal requirements.[575] While the EU and the US have introduced measures addressing issues such as forced labour and deforestation in supply chains, Switzerland has so far adopted a more limited regulatory approach[576] and continues to rely in part on voluntary corporate initiatives, including the Swiss Platform for Sustainable Cocoa and the Swiss Sustainable Coffee Platform.

12.5 Implications for policy and research

Beyond the legal discipline, there is **limited scholarship** on sustainability-related regulation in commodity trading. Existing studies also tend to focus selectively on specific commodities. The considerable attention devoted to precious metals – particularly gold – is unsurprising, given Switzerland's central role in global gold refining. Some research addresses agricultural commodities, especially cocoa and palm oil, but this remains less developed than work on precious metals.

In light of recent regulatory developments, **further research is needed** to examine how firms adapt to evolving requirements, how these changes affect commodity-producing countries, and to what extent they achieve their stated policy objectives. More commodity-specific analyses are particularly important to capture the differentiated impacts of regulatory interventions and to better inform policy design. There is comparatively limited social science and economic research examining how developments in Swiss law affect commodity trading firms operating in Switzerland, and how these effects compare with those of firms operating in other jurisdictions. One important reason may be persistent data limitations and methodological challenges in identifying causal effects.

More broadly, Switzerland's role as a major global commodity trading hub – hosting a dense network of intermediaries – remains underexplored in the literature, particularly from a **comparative perspective**.

The academic literature on the evolution of Swiss sustainable commodity trading law remains largely descriptive and normative, including the comparative literature. Future research should address the effects of regulatory diffusion processes and competitive pressures from other commodity trading hubs, with a particular focus on identifying causal mechanisms.

Existing comparative studies primarily focus on Western hubs, especially the UK and the US, while largely overlooking newer commodity trading centres such as Singapore, Dubai, Hong Kong or Shanghai. Examining how these **emerging hubs** shape Swiss regulatory choices and how their regulatory frameworks compare to those in Switzerland would provide valuable insights into the dynamics of regulatory competition and adaptation.

The literature has also paid limited attention to the political, legal, and societal discourse. Future research could examine the **roles of different political actors** and their influence, as well as how dominant discourses and narratives shape the current regulatory landscape. In addition, **public opinion** remains underexplored. New evidence from surveys and survey experiments on how Swiss citizens perceive sustainable commodity trading could help disentangle egocentric and sociotropic preferences. The same applies to expert surveys, where further research is needed to assess how economic and political elites support different types of regulatory initiatives.

As commodity trade does not operate in isolation from the broader economic dynamics, further research is needed on how national and global economic conditions shape Swiss regulatory initiatives. This is particularly relevant in the context of Russia's invasion of Ukraine and the renewed focus on **economic security** in trade and investment policy, which has contributed to increased demand for certain commodities. Future research could examine the extent to which developments in Swiss regulations governing sustainability in commodity trading have been affected by such shocks and shifts in the global political economy.[577]

13 Responsible business conduct

As sustainable development gained more attention, the concept of sustainable business practices also went global: the idea that corporations needed to heed environmental and social values, and the recognition that achieving the SDGs requires a fundamental transformation of business models.[578] From a business ethics perspective, contributing to substantial positive societal and environmental impact entails moving beyond Milton Friedman's shareholder-centric view, in which firms exist solely to maximise shareholder value, and externalities are left to governments, towards a **stakeholder model** that seeks to create value for all affected parties.[579] Yet, despite its conceptual strengths, stakeholder theory faces significant obstacles. Dominant incentive structures continue to prioritise shareholder value,[580, 581] while balancing competing stakeholder interests poses significant managerial challenges.[582] As a result, firms tend to focus on SDGs aligned with existing business and innovate where it benefits shareholder value,[583] or they engage only superficially, reinforcing business-as-usual practices.[584, 585]

The predominant way to guide companies towards stakeholder-oriented corporate governance is through **human rights due diligence** (HRDD), established within the UN Guiding Principles on Business and Human Rights (UNGP). HRDD is a management tool for identifying, preventing, mitigating, and addressing negative impacts on the human rights of workers, suppliers, communities, and customers.[586] Embedding respect for human rights enables businesses to contribute to the SDGs,[587] HRDD was expanded to other areas, such as environment, corruption and bribery, with the concept of **risk-based due diligence** in the OECD Guidelines. Scholars and policymakers, therefore, increasingly frame this expanded role as **responsible business conduct** (RBC), which we define as proactive business engagement, through risk-based due diligence built on HRDD, with human rights, environmental, and governance issues.[588]

13.1 Conceptualising sustainability regimes in commodity value chains

Hard and soft commodity value chains differ conceptually, with implications for sustainability governance and RBC. Hard commodities are **point resources** with geologically determined deposits, capital-intensive operations, a strong role of the government in licensing, centralised revenue collection, and a few actors involved in extraction, marketing and trade. Sustainability contestation primarily centres on performance at the project site and on tax collection and reinvestment. Soft commodities, in contrast, are **diffuse resources** with spatially dispersed, labour-intensive production, a high level of informality, and many suppliers, aggregators, and traders involved, with sustainability management focusing on supplier upgrading, system-building and traceability. Plantation production and artisanal mining systems are exceptions in this categorisation. Table 5 summarises characteristics and governance implications from a global value chain perspective.[8]

Responsible business conduct is being promoted via three complementary channels.[588] **Company-level strategies** include goal-based commitments, i.e., self-imposed, forward-looking, and often ambitious targets[589] to signal future behaviour to stakeholders.[590] To deliver, companies need to translate sustainability commitments into operational strategies, governance frameworks, programmes and processes, tools, and the capacity to implement and monitor sustainability transformations across value chains.[40] **Supplier codes of conduct** are prescriptive guidelines that companies use to govern, monitor, and control suppliers in order to fulfil their due diligence responsibilities.[591–594] Through proprietary sustainability schemes, trading companies define behavioural standards, e.g., on human and worker rights, deforestation, and land conversion, against which suppliers are verified. Some agricultural commodity traders also roll out proprietary sustainability standards for their clients.[34, 595–600]

Multi-stakeholder initiatives (MSI) are voluntary private governance institutions sponsored by various combinations of businesses and business organisations, governments, civil society organisations, and trade unions, which emerged in the 2000s[601] and have become increasingly important for managing environmental and human rights impacts across many supply chains and for providing traceability.[602] **Principle-based MSIs** mobilise collective action and learning among participants to foster continuous improvement of mutually agreed-upon issues. **Certification-based MSIs** focus on compliance with defined regulations and rely on third-party validation.[603] They are often the basis of customer-facing labels such as Fair Trade or Rainforest Alliance,[588] which are expected to promote ethical consumerism despite attitude-behaviour gap concerns. Evidence suggests that consumers' purchasing decisions often diverge from their stated support for fair-trade food,[604] Responsible gold certification, meanwhile, appears to have only marginal effects on jewellers' knowledge and communication.[605]

Point resources Hard commodities (oil, gas, minerals); plantations	Diffuse resources Soft commodities (agricultural products); artisanal mining
Source characteristics	
– Spatially fixed on a few sites, capital-intensive, few actors and a strong state role in licensing and rent capture – Governance through places/extractive projects and licenses	– Spatially dispersed, labour-intensive with many suppliers and tiers, mixed land tenure, high informality – Governance through networks and relationships
Sustainability issues	
– Site legitimacy (human rights, community consent/conflict, security risks, labour conditions, environmental performance) – State sovereignty (revenue transparency, anti-corruption, state licensing, taxation)	– Production systems, deforestation and land conversion – Farmer income; labour conditions – Traceability and leakage
Transaction characteristics for sustainability governance: Complexity (attributes to be controlled, e.g., quality, legality, traceability); Codifiability of requirements; Supplier capability (level of support required); Compliance level	
– Complexity: high, spatially concentrated – Codifiability: relatively high for many 'hard' parameters; mixed for 'soft' ones – Supplier capability: typically high, but can vary by jurisdiction and company maturity – Compliance can be attached to a site/licensed project	– Complexity: high, spatially distributed – Codifiability: lower for key harms (deforestation leakage, child labour, informal work) – Supplier capability: often low and heterogeneous – Compliance must be enforced across actors, governed through networks
Commodity traders as value chain orchestrators ('Lead firms without owning production')	
– Counterparty selection; offtake agreements, pre-financing; deal structuring – Typically less operational leverage than the site operator or the state	– System-builders across tiers; supplier upgrading; segregation/mass balance decisions; traceability and verification – Architects of 'how the chain works' under sustainability constraints, weak regulation and fragmented supply

Table 5: Conceptual differences between point resources and diffuse resources commodity value chains, implications for sustainability governance.
Source: authors

International and national **public regulation** has evolved from voluntary and simple encouragement to reporting requirements for transparency in mineral supply chains,[556, 606] and binding legislation to ensure supply chain traceability and human rights due diligence. These developments are particularly evident in the EU and some of its member states.[592, 607–618] In Switzerland, due diligence provisions entered into force in 2023;[619] discussions on new legal obligations began in 2025 with RBI II[563] and the proposed Federal Act on Sustainable Corporate Governance.[564] In parallel, producer countries have also begun to expand their regulatory engagement.[620–623]

13.2 The political economy and effectiveness of RBC sustainability regimes

We synthesise the collective evidence on the development, implementation, and effectiveness of sustainability regimes to promote RBC, along a simplified **logic model** of how RBC regimes are expected to lead to sustainability outcomes (Figure 12). In short, the effectiveness of a regime, understood as its contribution to SDG outcomes, depends on several interrelated factors. First, it depends on the quality of the underlying problem diagnosis, including how well the causes of negative sustainability outcomes are identified and how competing demands from business and other stakeholders are reconciled. Second, effectiveness is shaped by regime design, including the definition of scope and target actors, the incentives for adoption, and mechanisms that ensure accountability and integrity. The relative positioning of a regime vis-à-vis competing frameworks also matters, as sustainability regimes have become a market in their own right. Third, implementation modalities, ranging from support and capacity building to cost allocation, monitoring and delegation, affect how widely regimes are adopted and how consistently they are followed. Finally, in real-world conditions, implementation interacts with contextual conditions, including political, economic, and cultural factors, which ultimately shape the regime's real-world impact on SDG outcomes.

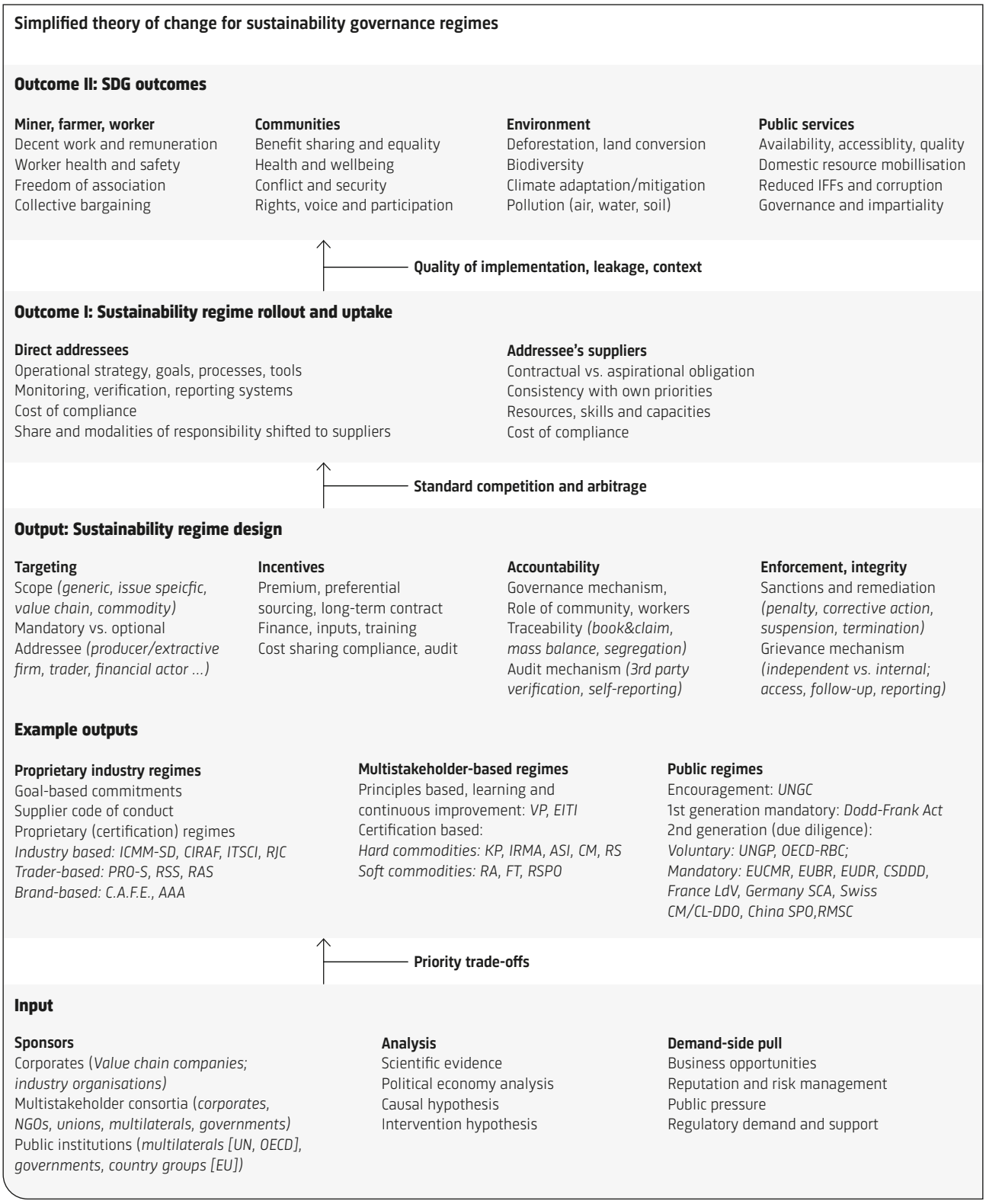


Figure 12: The theory of change illustrates how sustainability regimes are supposed to translate into real-world SDG outcomes.
Source: authors (see Abbreviations, p. 62)

13.2.1 Designing RBC regimes (input)

Priority trade-offs: Proprietary RBC standards entail an inherent tension between the priorities of the (corporate) sponsors of the standard and those of the producers, suppliers, and communities whose livelihoods they are intended to improve.[624, 625] Proprietary certification can function as a market-access mechanism,[626] privatise sustainability information, and undermine – rather than complement – existing efforts to promote RBC.[627] These trade-offs are evident in practice. For example, trading companies were instrumental in establishing purchasing moratoria on unsustainable soy through the Amazon Soy Moratorium.[403, 628] At the same time, they have acted as influential veto players in efforts to extend similar arrangements to other sourcing regions, including the Cerrado.[629, 630] Political dynamics further shape these processes. In Brazil, public authorities have responded to private-sector coordination by initiating antitrust investigations and withdrawing tax incentives, leading to the dissolution of such trading company collaborations.[26, 27, 50, 51]

Standard competition and arbitrage: Some consumer brands created proprietary sustainability schemes to replace third-party certification, reduce costs, and increase flexibility,[631–635] often delegating implementation to international trading houses.[34, 597, 600, 627] In parallel, international trading houses use proprietary standards to supply sustainably sourced commodities at lower prices than those of third-party-certified products, particularly in coffee, cocoa, and tea.[633, 636, 637] This dynamic creates opportunities for standard competition and regulatory arbitrage across certification regimes.

Market-driven innovation and commodification: Market-based instruments such as tradable certificates embedded in voluntary sustainability standards (e.g., RSPO, voluntary carbon credits, and some forest protection mechanisms), can contribute to the commodification of sustainability[638] by translating complex social and environmental objectives into price signals. This process depoliticises sustainability governance and turns it into a reputational technique, while obscuring underlying integrity concerns and the impact of price volatility on those supposed to benefit. Similarly, ongoing efforts to develop low-carbon offerings and carbon offsets face integrity and accountability tradeoffs.[620] Transition minerals initiatives reflect downstream priorities and remain firm-centred.[639–641]

13.2.2 Sustainability regime features (output)

Institutional design is a key determinant of the effectiveness of private sustainability governance across both soft and hard commodities. Initiatives vary widely in goals, standards, governance structures, and monitoring and compliance mechanisms. Evidence suggests that outcomes tend to improve when rules are clear, enforceable, and backed by credible monitoring and auditing systems, and when rule-setting processes include meaningful multistakeholder participation, though significant gaps persist in practice.[612, 642–647] Proprietary sustainability regimes developed by trading companies[45, 403] feature comparatively stricter zero-deforestation commitments than those adopted by many consumer-facing brands.[648] The theory of change for zero-deforestation sourcing commitments assumes that trading houses possess sufficient bargaining power over suppliers to induce behavioural change.[649] Empirical evidence shows a mixed picture,[358, 576] with companies either relying on coercive and exclusionary practices that marginalise smallholders,[34] or exerting uneven influence over suppliers.[46, 650, 651]

Legitimacy: RBC regime design is largely driven by Global North actors who often frame problems through their own lens or in ambiguous terms[603, 652, 653] while local producers, the 'governed', are frequently excluded from design and decision-making, weakening norm justification and legitimacy while reproducing power asymmetries in global value chains.[632, 654, 655] Some scholars argue that democratic legitimacy could be strengthened by legitimising dissent and deliberately managing contestation, rather than suppressing it.[656] At the same time, research finds that multistakeholder RBC regimes do not provide rights-holders with access to effective grievance mechanisms or remedies.[657] In response to these dynamics, countries from the Global South have advanced discussions at the UN on a legally binding instrument on business and human rights.[658]

Fragmentation: The proliferation of overlapping and poorly coordinated standards dilutes impact, complicates progress assessment, and creates compliance burdens that invite regulatory arbitrage. The integration of the due diligence approach across RBC regimes[659] increases coordination and defines sector-specific implementation[660] but also entails the risk of repurposing due diligence requirements in ways that prioritise corporate interests.[659, 660] One proposed avenue to address fragmentation and regulatory leakage is to build on existing regulatory regimes, such as the EU Unfair Trading Practices Directive, thereby improving coherence across regimes.[661–664]

Regulatory uncertainty: Recent legislative initiatives in the EU have encountered resistance, particularly due to concerns about unintended consequences for mid-sized MNEs, rising compliance costs, and potential competitive disadvantages.[665] In response, the EU adopted the Omnibus Package 1 on sustainability, which diluted the original regulations, including the CSRD, CSDDD, CBAM and

EU Taxonomy regulations.[666] Such developments contribute to ongoing regulatory uncertainty regarding the scope, timing, and stringency of sustainability requirements.

13.2.3 Rollout and uptake of sustainability regimes (outcome I)

Rollout and uptake of certification schemes remain limited (Figure 13). For soft commodities, the share of MSI-certified land ranges from 3% to 50%.[405] While some certifications have been around since the 1990s, such as Fairtrade, the last major MSI regime for soft commodities was introduced back in 2011. Data on the share of land under proprietary certification regimes are not publicly available.

Transaction cost: Lead firms typically shift compliance costs and responsibility upstream,[592, 667] with insufficient commitment[626] and rarely accompanied by adequate resources to help build their capacities,[655] reducing effectiveness.[668]

Production systems: Rolling out standards to producers, particularly in agricultural value chains,[34, 595–597] gives midstream actors a privileged role in influencing farmers' sustainable production decisions[34, 37, 596, 669–671] and shaping regional development outcomes.[36] Key factors include value chain governance structures, coordination model, and the level of trust between trading companies and producers.[34, 36, 672, 673] In artisanal mining, adopting standards or certification can generate positive impacts on the environment[674, 675] and workers[291] but seems not to translate to broad social impacts.[291, 675] However, empirical evidence is still thin.

Power relations: Private sustainability governance often reinforces existing asymmetries, with traders and midstream actors capturing benefits while shifting costs to

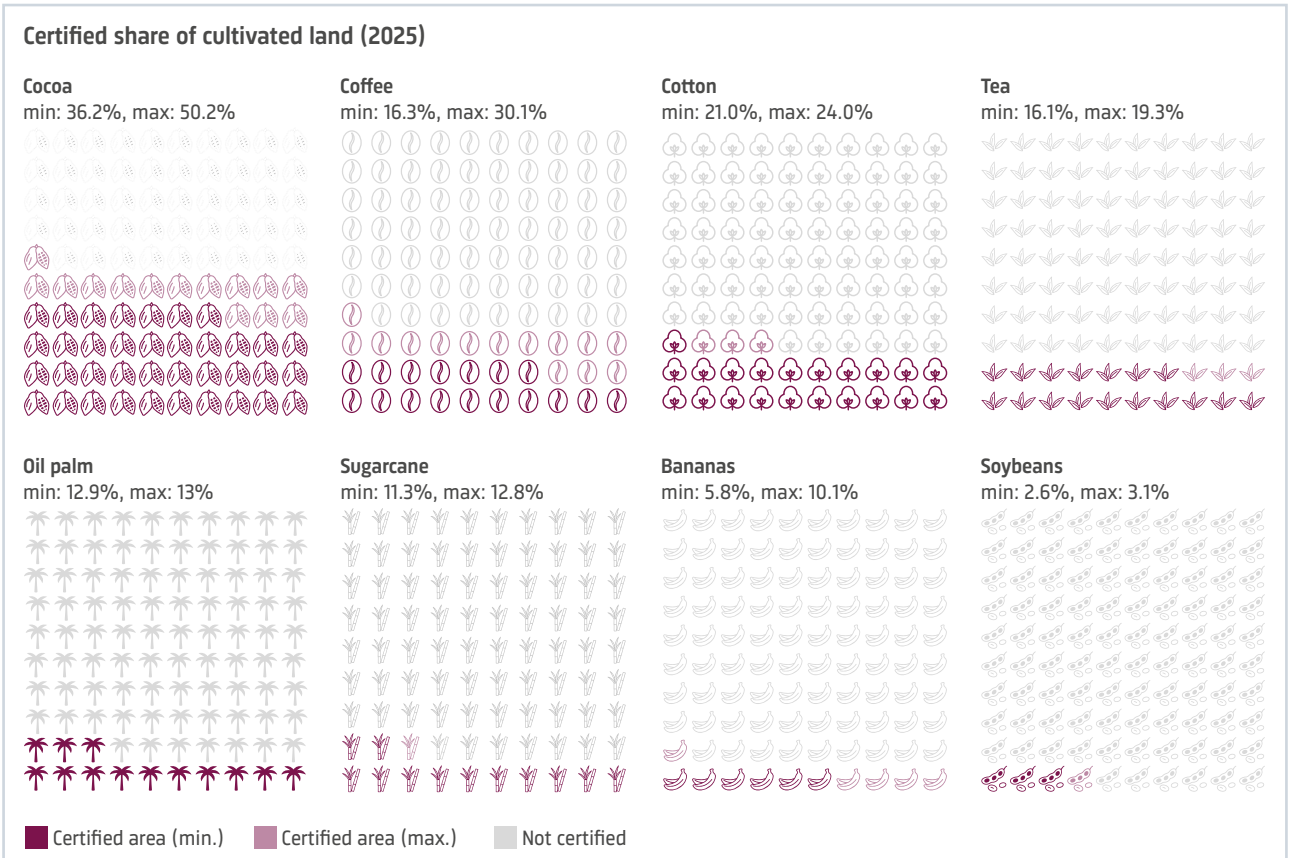


Figure 13: Producer uptake of the eleven most relevant multistakeholder-based sustainability certification regimes for soft commodities. All certifications have been in the market for 15 years or more. Source: authors, based on data from Kemper et al., 2025[405]

suppliers[676–681] and deepening their dependence.[600, 671, 672, 682, 685] Across soft and hard commodities, the concentration of power among firms, trading houses, and finance weakens accountability. This has led some scholars to argue that sustainability initiatives emanating from actors within the existing market system are unlikely to be transformative[19, 21, 639] and may instead reinforce corporate control, structural inequalities, and imperial dynamics.[686–689] In response, purpose-driven trading companies have emerged as 'brokers'[690, 691] that seek to bridge structural holes in supply chains and advance the interests of (smallholder) suppliers.[600, 692–695]

Trader compliance: Systematic research on the implementation of, and (non-)compliance with, sustainability standards by trading companies remains limited. Existing evidence is largely anecdotal and points to instances of enforcement and circumvention, such as sourcing certified and non-certified products from the same cooperative, or offsetting Fairtrade premiums by lowering prices on non-certified volumes.[632] The prevalence of such practices, including non-compliance with pre-financing and minimum purchasing requirements[662, 696] is difficult to assess beyond case-based evidence.[670, 680, 697, 698]

13.2.4 Producer-uptake of sustainability standards (outcome I)

Implementation quality: In soft commodity value chains, traders and lead firms provide access to finance, distribute inputs, carry out capacity-building, monitoring, and audits, and transfer price premiums, de facto acting as the enforcers of private sustainability governance.[37, 404, 627] The quality of traceability, monitoring, and support to producers has been identified as a critical factor for effective implementation.[34, 596, 670] In hard commodities, effective implementation is often undermined because due diligence and traceability requirements rely on organisational capacities and cooperation from midstream actors that are frequently lacking or strategically withheld, weakening enforcement.[699, 700] Diverging priorities between local producers and the sustainability regime requirements can weaken producer buy-in and undermine the behavioural changes needed to achieve sustainability objectives.[622, 653, 701, 702]

Economic incentives: Reliable price premiums, market access, and long-term sourcing relationships support the adoption of sustainable practice.[632, 643, 670, 703] The reliability of premium also depends on the ability of the industry to absorb the total volume of certified products. For example, only 26% of certified coffee was purchased by the industry in 2021; the other 74% of the sustainable coffee available was marketed as conventional coffee and therefore did not earn a premium.[704] This reduces the incentive to make upfront investments to comply with standards, and those who did suffer a reduction in profitability.

Institutional context: Private sustainability governance works best when embedded in a supportive policy mix that aligns incentives and reduces opportunities for free-riding. Mandatory due diligence obligations and market access requirements can increase firms' willingness to invest in monitoring, traceability, and supplier engagement, thereby strengthening the relevance of private sustainability governance.[614, 644, 705] In soft commodities, outcomes hinge on functioning public institutions, such as land governance, labour inspection, and extension services, which private schemes can complement but rarely replace. In hard commodities, weak state capacity, corruption, limited judicial independence, and geopolitical supply-security priorities, especially around critical minerals, systematically undermine effectiveness and incentivise extraction over sustainability.[639, 641, 703, 706–708]

Regulatory arbitrage: Transnational traders and financial actors can exploit regulatory asymmetries and supply chain opacity to avoid oversight, reinforcing the conclusion that private sustainability governance cannot substitute for strong public institutions and remains structurally limited.[612, 699] Limited stringency and weak enforcement of mandatory requirements, for example, under Swiss due diligence obligations, further constrain implementation effectiveness.[619] Firms are found to comply with sustainability commitments in monitored chains while deforestation, labour abuses, or illicit practices continue in unmonitored or informal channels.[41, 404, 613, 649, 709–711] Mandatory EU rules are shaping global markets, but firms still redirect noncompliant products to less-regulated regions.[610] Regulatory uncertainty around the EUDR and CSDDD dampened initially positive responses from firms.[636]

Selection bias, leakage: High entry barriers tend to favour better-off farmers while excluding poorer producers and those using the most environmentally harmful practices, thereby reinforcing inequalities and limiting reach.[331, 649, 712–714] Indirect sourcing and informal trade undermine effectiveness and complicate traceability.[41, 404, 699, 711, 715] In response, landscape projects and jurisdictional initiatives have adopted a more geographically integrated approach.[623, 716] However, these models introduce new challenges in securing cooperation among competing traders in shared sourcing regions.[40, 627, 716] Empirical research on the effectiveness of landscape initiatives is still limited.[623]

13.2.5 SDG outcomes (outcome II)

For private sustainability governance effectiveness in **soft commodities**, evidence is relatively rich but uneven, with research concentrated on a few crops, especially coffee and cocoa, and on well-established RBC regimes such as Fairtrade. Most studies are quantitative impact evaluations focusing on farm-level outcomes, including yields, prices, incomes, agro-ecological practices, and labour standards.[596, 713, 717]

A consistent finding is that private sustainability governance in hard and soft commodity sectors is **not inherently transformative**. Participation in RBC regimes can yield modest gains in environmental practices, incomes, or yields, but effects are generally small, uneven, and highly context-dependent, varying across regions, commodities, and producer groups.[644, 677, 681, 713] RBC regimes tend to **deliver marginal improvements** rather than address structural constraints such as land access, price volatility, or unequal bargaining power, leaving many certified producers below a living income or exposed to environmental risks. Evidence on firms' in-house schemes is thinner but suggests similar limitations.[712]

For RBC regime effectiveness in **hard commodities**, evidence is sparse and dominated by qualitative and political-economy studies rather than impact evaluations.[613, 639, 703] Consequently, there is little systematic evidence linking RBC regimes to direct improvements in labour conditions, environmental outcomes, or community well-being.

Where outcomes are assessed, studies find **weak or negligible effectiveness**. RBC initiatives in mining are often technocratic and procedural, emphasising reporting and risk management over changes in extraction practices or power relations, and frequently function as reputational tools.[703, 706] Evidence from initiatives such as EITI and IRMA shows mixed, highly context-dependent impacts on transparency, corruption, environmental protection, and development. For example, while EITI improves transparency, it has a limited impact on reducing corruption.[304, 306, 528, 611, 700, 718]

Opposite outcomes: Evidence on the impacts of the Dodd-Frank Act initially pointed to adverse effects, including lower exports, displacement of illicit activities, and increased violence[719–724] as companies struggled with implementation or withdrew from sourcing altogether.[606, 618, 725] More recent studies, however, suggest more positive dynamics, including a recovery in exports[726] and, in some contexts, conflict-reducing effects.[727] Beyond the Dodd-Frank Act, research identifying potential opposite outcomes is only weakly developed.

13.3 Implications for policy and research

Despite the rich literature on RBC regimes, research gaps remain. There is limited understanding of the conditions under which large buyers can generate benefits for smallholder farmers, how **buyer power** is exercised vis-à-vis smallholder producers,[20] and the mechanisms through which midstream actors exert power and influence.[36]

A better understanding is also needed of the conditions under which **market concentration** in supply chains can be beneficial or harmful to socio-economic and environmental outcomes, and of how competition law can be applied without undermining sustainability collaborations and their potential benefits.[728, 729]

Little attention has been devoted to evaluating the potential effectiveness of **related regulatory approaches**, such as the unfair trading practices prohibition, and their applicability to global value chains that extend beyond the EU. Recent innovations in sustainability regulations in the context of the energy transition, such as the EU Battery Regulation and its mandatory battery passport, are only beginning to be implemented, and further research will be needed to assess their effectiveness in practice.

Conclusion

14 Aligning commodity trade and sustainable development

This interdisciplinary review takes stock of the academic literature on commodity trade and sustainable development. It analyses the evolution of commodity trade, sustainability impacts, and the effectiveness of regulation.

14.1 Key findings

The findings cluster around three dynamics.

From global integration to strategic fragmentation: Rising geopolitical tensions and related fragmentation of the rule-based international order are reshaping commodity trade from a system organised around just-in-time efficiency to one increasingly structured by strategic and political considerations and a supply security logic. Fragmentation of markets, regulatory regimes, and trade relations is intensifying, creating expanded scope for regulatory and geographic arbitrage by firms operating across borders. At the same time, increased uncertainty around market access and supply security reinforces strategic behaviour by both states and firms, with important implications for price formation, investment patterns, and sustainability outcomes.

From trading to intermediation: Trading houses have evolved from brokers and arbitrageurs into sophisticated commodity intermediaries occupying strategic roles along value chains. They have vertically integrated upstream and downstream, increased horizontal market concentration, and, through growing participation in the derivatives market and financial intermediation, increasingly become part of the financial system. Trading houses are today best conceptualised as financialised, integrated commodity intermediaries. This shift has been driven by the growing commercial value of securing access to supplies, controlling logistics, acquiring proprietary, information and expanding financial operations. Rising supply chain fragmentation and growing uncertainty over resource access are driving a renewed push towards vertical integration, enabling intermediaries to further consolidate their strategic position.

From linear chains to amplified feedback loops: The relationship between commodity trade and sustainable development is not a linear cause-and-effect chain, but mediated through reinforcing feedback loops embedded in the organisation of global value chains and their financial and regulatory architecture. These loops originate in the intermediation role of trading actors and propagate across production and consumption systems, cumulatively shaping environmental, social, and economic outcomes.

Three reinforcing feedback mechanisms emerge from the literature (Figure 14):

Telecoupling (the externalisation feedback loop)
Commodity consumption in one region drives economic effects, environmental pressures, labour conditions, and social transformations in geographically distant producing areas, mediated by trading actors. These impacts, in turn, reshape production conditions and trigger governance responses, ranging from certification to due diligence, which alter sourcing strategies and supply configuration. The current set of policy regimes has not yet created a positive, self-reinforcing feedback loop resulting in new customary sustainability practices accross commodity value chains with measurable SDG outcomes. Rather, regulatory responses are fragmented and evidence shows impacts are incremental, generally modest, uneven and context-dependent. More recently, growing supply security concerns risk relegating sustainability issues to matters of secondary importance. This also suggests Switzerland's latest interim report on the Sustainable Development Goals,[730] published just after the work on this review was concluded. The Federal Council states that tensions and crises are shaping the implementation of the SDGs. As a result, it now treats goals previously understood as a transformation agenda as 'a pragmatic framework for reference'.

Value capture strategies (the distribution feedback loop)
Bargaining asymmetries and market concentration enable commodity actors to capture a disproportionate share of value. Profit-shifting practices further disconnect taxation from value creation, reducing public revenues in producing countries. Limited fiscal space and constrained upgrading opportunities can reinforce producer dependency, thereby strengthening intermediaries' market power and their ability to capture value, including windfall profits during price upswings. This dynamic creates structural pressures towards unequal value distribution along the value chain, the magnitude of which depends on the effectiveness of regulatory and governance frameworks in strengthening producers' bargaining

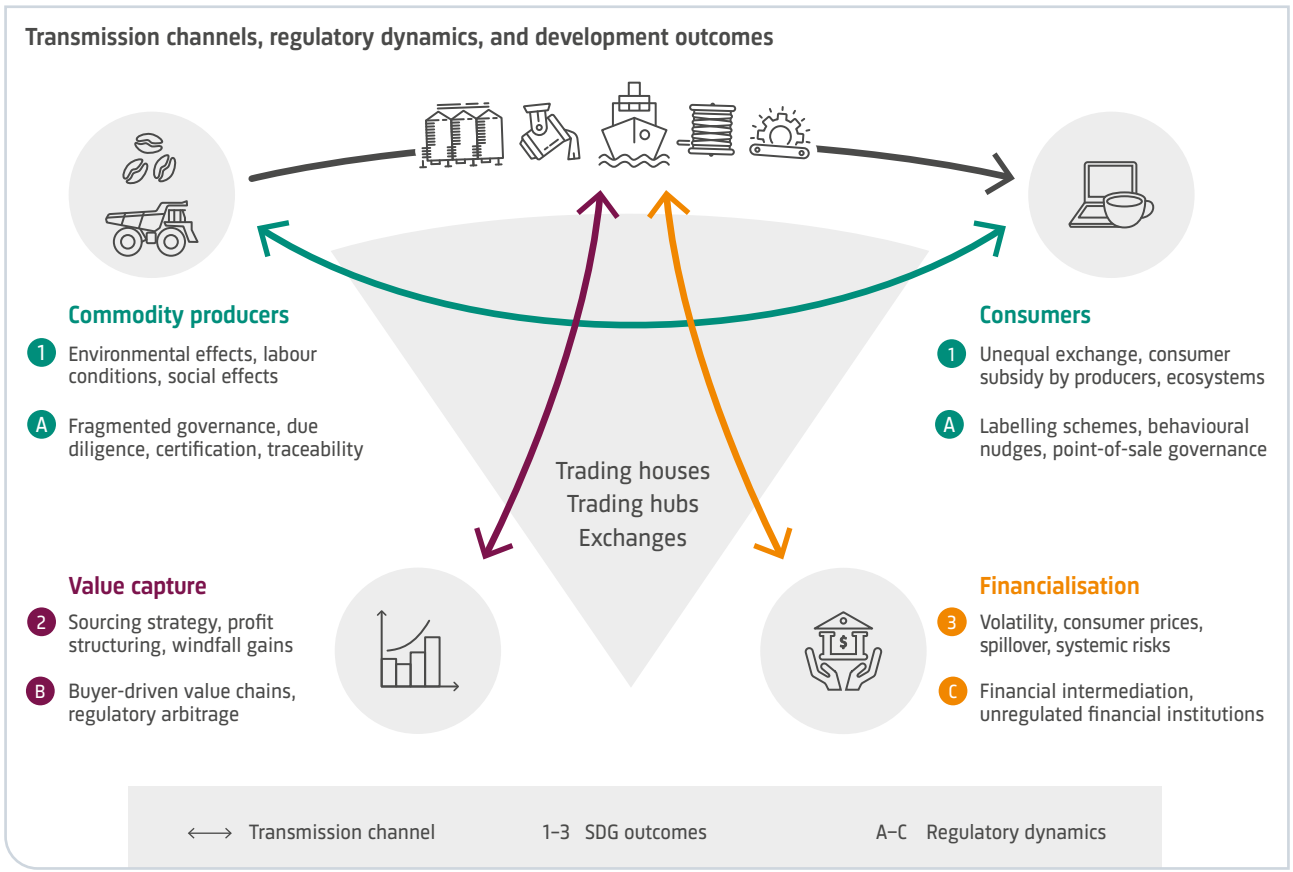


Figure 14: The sustainability outcomes from global commodity trade are mediated through complementary transmission channels. A more systemic approach can improve the effectiveness of policy regulation. Source: authors

power and ensuring fair taxation. Policy engagement has advanced in the field of taxation, but it remains limited and implementation is uneven.

Financialisation (the volatility feedback loop)
The increasing role of commodities as an asset class, together with the expansion of financial intermediation, has amplified the influence of financial actors in commodity trading and contributed to more pronounced price dynamics. While such features are characteristic of highly financialised systems, broader spillovers and systemic risks tend to materialise primarily during periods of market stress, when interconnected financial and trading positions transmit shocks across markets and affect consumers potentially with wider economic fallout. The extent of these risks depends on the effectiveness of regulatory and oversight frameworks in enhancing transparency, including in shadow market segments, and in monitoring and containing systemic exposures. This is an emerging area of policy attention. Understanding of the underlying mechanisms remains limited, and regulatory responses are still nascent.

14.2 Policy priorities

The current regulatory approach to global commodity trade and sustainable development is highly fragmented. There is no overarching framework for commodity regulation across sustainability dimensions or the identified transmission channels, which limits regulatory effectiveness.

Many policy implications have been identified throughout this review at the end of each chapter; some are short-term, low-hanging fruits, while others take a more long-term perspective. Taken together, they converge around three priorities.

Clear, concise, and consistent regulatory approaches, binding and non-binding, enable integrated governance of the sector, accounting for cross-sectoral, transboundary and intergenerational spillovers and strengthening stability and sustainable development. This reduces regulatory fragmentation, which has led to below-expectation outcomes across sustainability dimensions, invites regulatory arbitrage, and carries higher compliance costs.

Increased traceability and transparency, extending beyond origin preservation to physical commodity transactions while fully preserving confidentiality, can serve as a strategic orientation. Traceability and transparency are critical enablers of sustainability efforts across all three transmission channels and protect legitimate trade against illicit trade. This, in turn, increases public revenue, enhances business integrity, strengthens market stability and advances sustainable development goals.

Greater coordination among commodity trading hubs, including Switzerland, could harness their pivotal role in the global commodity trading architecture to advance sustainable development. Hub economies and commodity exchanges are well placed to serve as anchors for responsible sourcing and trading practices. Stronger alignment of regulatory requirements creates clearer and more efficient operating conditions for private sector actors, and reduces compliance costs.

14.3 Research priorities

A wide range of disciplinary research has been reviewed for this report. Continued work across these fields remains essential to address persistent knowledge gaps and to engage with new questions arising from evolving business practices, policy responses, and geopolitical dynamics. Yet, the growing complexity of commodity trade systems also points to the limits of incremental expansion alone and underscores the need for a conceptual shift across three interconnected dimensions.

Adopting a systemic perspective, that conceptualises commodity trade as a form of critical global infrastructure, comparable to financial or digital systems, can yield more integrated insights into hidden but interlinked vulnerabilities, cross-sector spillovers, and governance trade-offs.

Access to more and better data, as emphasised throughout the report, is a critical enabler of a systemic approach to commodity trade. Some of this data needs to be generated; other relevant data exist but are not in the public domain. The former will require dedicated resources and efforts; the latter will need purpose-driven cooperation and sharing arrangements to serve the public interest while respecting privacy.

Engaging in transdisciplinary collaboration, including with researchers from producing countries and the Global South more generally, underpins the generation of system-level evidence. Research across disciplines is most promising when it is problem-driven and anchored in real-world complexity, builds on shared analytical frameworks, and combines methodological pluralism with explicit integration points across disciplines and public, private, and civil society stakeholders.

A research agenda building on this perspective supports a shift from reactive governance and crisis management towards more **anticipatory, strategic, and coordinated modes of governance**. Generating policy-relevant insights, such as scenario analysis, trade-off assessments, and the ex-ante evaluation of alternative governance models, is essential for informed decision-making. Their importance is amplified by emerging trading blocs vying for greater autonomy in sourcing strategic commodities, alongside the growing pressure on producer states and trading houses. Switzerland, as a centrally positioned neutral state, can play a catalytic role in advancing a more coordinated approach across hub jurisdictions.

The growing weaponisation of trade is placing commodity sectors under heightened scrutiny for economic and political security. This evolving securitisation agenda introduces additional, and at times competing, priorities alongside sustainability objectives, often framing **security and sustainability** as perceived trade-offs. Yet, long-term economic and global political security depends on sustainable, resilient and equitable commodity systems. Recognising this **interdependence** is critical, particularly for transition minerals, energy and food commodities, which are at the centre of the trade-sustainability nexus.

Abbreviations

AAA	Nespresso AAA Sustainable Quality Programme
ABCD	Archer Daniels Midland (ADM), Bunge, Cargill, Louis Dreyfus
AEOI	Automatic Exchange of Financial Account Information
AML	Anti-Money Laundering
AMLA	Anti-Money Laundering Act
ASI	Aluminium Stewardship Initiative
ASM	Artisanal Small-Scale Mining
BA	Banking and Savings Banks Act (Switzerland)
BASEL III	Regulatory measures of the Basel Committee on Banking Supervision post 2007–2009 financial crisis
BAFT	Bankers Association for Finance and Trade
BEPS	Base Erosion and Profit Shifting
BFS	Federal Office of Statistics
BHR	Business and Human Rights
PRO-S	Bunge Certification Program for Sustainable Agricultural Sourcing
C.A.F.E.	Coffee and Farmer Equity Practices, Starbucks' sustainable sourcing programme
CBAM	Carbon Border Adjustment Mechanism
CEPA	Comprehensive Economic Partnership Agreement
CFC	Common Fund for Commodities
CFTC	Commodity Futures Trading Commission
CIRAF	Cobalt Industry Responsible Assessment Framework
CM	Copper Mark Assurance Framework
CM/CL-DDO	Conflict minerals and child labour due diligence obligation
CMR	Conflict Minerals Regulation
CO	Code of Obligations (Switzerland)
CSDDD	Corporate Sustainability Due Diligence Directive
CSRD	Corporate Sustainability Reporting Directive
CTA	Commodity Trading Advisor
DNFBP	Designated non-financial businesses and professions
EGPS	Extractives Global Programmatic Support (World Bank programme)
EITI	Extractive Industries Transparency Initiative
EmbA	Embargo Act (Federal Act on the Implementation of International Sanctions, Switzerland)
EMIR	European Markets Infrastructure Regulation
EOIR	Exchange of Information on Request
ESMA	European Securities and Markets Authority
ETF	Exchange-traded fund
EUBR	EU Battery Regulation
EUCMR	EU Conflict Minerals Regulation
EUDR	Deforestation Regulation
FATF	Financial Action Task Force
FIAA	Foreign Illicit Assets Act
FinIA	Financial Institutions Act (Switzerland)
FinMIA	Financial Market Infrastructure Act (Federal Act on Financial Market Infrastructures and Market Conduct in Securities and Derivatives Trading, Switzerland)
FT	Fair Trade standard
GATT	General Agreement on Tariffs and Trade
GHG	Greenhouse gas
GVC	Global value chain
HRDD	Human rights due diligence

ICC	International Chamber of Commerce
ICE	InterContinental Exchange
ICMM-SD	International Council on Mining and Metals' Sustainable Development Framework
IEA	International Energy Agency
IEL	International Economic Law
IFF	Illicit financial flows
IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
ILO	International Labour Organisation
INGO	International Non-govermental organisation
IOSCO	International Organisation of Securities Commissions
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IRMA	Initiative for Responsible Mining Assurance Standard
ITSCI	International Tin Supply Chain Initiative
KP	Kimberley Process
LBMA	London Bullion Markets Association
LdV	Loi de vigilence
LETA	Transparency of Legal Entities and the Identification of Beneficial Owners Act (Switzerland)
LME	London Metals Exchange
LMIC	Low- and middle-income country
MiFID II	Markets in Financial Instruments Directive and
MiFIR	Markets in Financial Instruments Regulation
MSI	Multistakeholder initiative
NBFI	Non-bank financial institution
NCD	Non-Communicable Disease
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-Operation and Development
OECD-RBC	OECD Guidelines for Multinational Enterprises on Responsible Business Conduct
OHS	Occupational health and safety
PEPs	Politically exposed persons
RA	Rainforest Alliance standard
RAS	COFCO Responsible Agriculture Standard
RBI	Responsible Business Initiative (Konzernverantwortungsinitiative)
RJC	Responsible Jewellery Council
RMSC	China Responsible Mineral Supply Chain Guidelines
RS	Responsible Steel Standard
RSPO	Roundtable on Sustainable Palm Oil
RSS	ADM Responsible Soybean Standard
RTRS	Round Table on Responsible Soy
SCA	Supply Chain Act
SDG	Sustainable Development Goal
SETR	Spontaneous Exchange of Tax Rulings
SNB	Swiss National Bank
SPO	China Sustainable Palm Oil Guidelines
UN	United Nations
UNGC	UN Global Compact
UNGP	UN Guiding Principles on Business and Human Rights
UAE	United Arab Emirates
UK	United Kingdom
US	United States of America
VSS	Voluntary Sustainability Standard
WTO	World Trade Organisation

Glossary

Backwardation
Market condition in which futures prices are lower than the current spot price of a commodity or than near-term futures prices. Backwardation often reflects tight physical supply, high inventory-holding costs, or disruptions driven by geopolitics, weather, or logistics. It contrasts with contango, in which futures prices exceed spot prices, typically due to abundant supply and storage costs.

Certified warehouse
Part of the commodity trade infrastructure. They turn a commodity into a deliverable instrument through standardisation, with defined quality, weighing/sampling rules, and document standards (warrants). Warehouse receipts make commodities accepted as collateral. Certified warehouses also provide inventory signals by publishing stock and inflow/outflow data, even though most physical trade is OTC.

Clearinghouse
The commodity exchange has a clearinghouse that acts as a middleman between buyers and sellers. The clearinghouse ensures that both parties fulfil their obligations under the trade. If a buyer or seller fails to fulfil their obligations, the clearinghouse steps in and settles the trade.

Commodity trading advisors (CTA)
Professional investor or fund that trades futures, options, and other derivatives – often across commodities, currencies, equities, and interest rates – typically using systematic, rules-based strategies such as momentum or trend-following. CTAs are part of the broader universe of institutional investors, alongside hedge funds and index funds. In commodity markets, they provide liquidity and diversification but can also reinforce price trends due to their strategy-driven trading behaviour.

Contagion
Market condition in which futures prices are higher than the current spot price (or than near-term futures prices). Contango is often associated with periods of surplus production, weak demand, or strategic stockpiling, and it creates incentives for storage and carry trades. It contrasts with backwardation, which signals tight physical markets and high immediate demand.

Dealers
Institutions that enter bilateral OTC contracts with clients and take exposure onto their own balance sheet. Typical dealers in commodity markets include large investment banks, commodity trading desks within global banks, specialist commodity dealers, firms focused on derivatives rather than physical trading, and integrated commodity trading houses (in some roles). This means that 'Dealer' refers to the counterparty role in OTC markets, not to exchange trading per se.

Derivatives
Financial contracts whose price is derived specifically from assets such as commodities, precious metals, shares, bonds, or from reference values such as currencies, interest rates and indices.

Expiration Date
The date specified on the futures contract at which ownership of the commodity takes place.

Forward Contracts
A forward contract is an agreement between a supplier and a demander for future delivery at a predetermined point in time. In forward contracts, the price, quantity, and quality (basically every aspect of the contract) are negotiated and agreed upon before delivery. Most forward contracts are not traded on exchanges, nor are they standardised. They are bilateral contracts between buyer and seller and are alternative ways to hedge (limit) risk to the producer.

Futures Contracts
Contractual agreements made between two parties through a regulated exchange. The two parties enter into a contract to buy/sell an asset at a future date for an agreed price. Each individual contract specifies the quantity and quality of the item, the expiration (maturity) month, and the delivery time. Not all contracts require delivery at the end of the contract; some call for a cash settlement. Most market participants don't hold the contracts until expiration; most are settled in cash. For example, on the Chicago Board of Trade, only 2% of all agricultural contracts are terminated with delivery of an actual product.

Futures contracts arise from anticipated price changes in a commodity expected to occur before a specific future date. Most businesses face an ongoing price risk, and futures contracts can be used to limit (hedge) risk. For hedgers, the futures market reduces price risk, helping stabilise revenue, while for speculators, it presents potentially profitable opportunities.

Futures Market
A standardised exchange-based market where participants buy and sell futures contracts, i.e., agreements to purchase or sell a commodity (or financial asset) at a predetermined price at a specified future date. Most contracts are settled or offset before physical delivery occurs.

Futures Price
The price per standard contract unit at which commodity ownership would change on the futures contract date. The futures market price is based on expected supply and demand at a definite time in the future.

Health outcome
A measurable change in the health status of an individual or population that results from exposure to a risk factor or intervention, such as a mining project. Health outcomes can be positive (e.g., improved well-being or reduced disease transmission) or negative (e.g., illness, disability, or mortality).

Hedging
A risk management strategy in which a market participant takes a position in a financial instrument (e.g., futures, options, or a forward contract) to offset potential losses from adverse price movements in a physical commodity. The goal of hedging is to reduce price uncertainty and stabilise revenues or costs rather than to generate speculative profit. Market participants (usually commodity suppliers or demanders) seeking to limit price risk are called 'hedgers'.

Index investment
Investment strategy in which investors gain passive exposure to commodity markets. The index defines which commodities are included (e.g., oil, copper, wheat), their weights, and rebalancing rules. Rather than buying physical commodities, investors typically invest through futures contracts that replicate the index's performance. This instrument is mainly used by large, institutional, and long-term investors (pension funds, sovereign wealth funds, insurance companies, asset managers, endowments and foundations. Retail investors use it indirectly through commodity ETFs, usually in smaller allocations.

Leverage
The use of borrowed capital to control a much larger position than the initial investment, amplifying both potential profits and losses. By putting down a fraction of the total trade value (margining), traders can multiply their exposure to market price fluctuations, but risks include losses exceeding the initial deposit.

Long Position
A position in which a market participant has bought a futures contract (or other asset) and stands to gain from an increase in its price.

Maintenance Margin
The minimum balance that must be kept in the account to keep the position open.

Margin Call
A demand for additional funds if the account balance falls below the maintenance level due to adverse price movements.

Margining
The mandatory, upfront deposit (collateral) required by a broker or exchange to open and maintain a leveraged futures position, representing only a fraction of the total contract value. It serves as a security deposit to cover potential losses from price volatility, enabling traders to take on larger positions with limited capital. Key components of commodity margining include: Initial Margin: the minimum capital required to enter into a futures contract.

Mark to market
The practice of valuing trading positions at prevailing market prices, with unrealised gains and losses recognised as prices change rather than only when transactions are settled. This matters for risk management as firms see their true exposure in real time. It also matters for margining as exchanges and banks require cash (margin) based on mark-to-market valuation. For physical traders, this means inventory, forward sales, and hedges are revalued regularly, which can create liquidity stress if prices move sharply, even when the underlying business is profitable in the long run.

Momentum trading
Trading strategy that relies on rule-based signals that exploit price trends (e.g., buying assets with recent price increases and selling those with recent declines). It is one of the core strategies in quantitative trading and is well-suited to automated execution.

Non-communicable diseases (NCDs)
Diseases that are not transmitted from person to person and are typically long-lasting and slow in progression. They are often influenced by genetic, environmental and behavioural factors. Common examples include cardiovascular diseases, diabetes, cancer and chronic respiratory diseases.

Options Contracts on Futures
Options on futures are the option to buy or sell the underlying futures contract for a particular commodity or financial asset at a certain price (the strike price) for a limited period of time. The seller (writer) of the option is the only person obligated to perform in this type of contract. The buyer may decide not to exercise the option. Two different types of options can be purchased – a call option, which gives the buyer the right to purchase (also referred to as 'go long on') the underlying futures contract at a stated price (the strike price) before the option expiration date. Traders can also purchase a put option, which gives the buyer the right to sell ('go short on') the underlying futures contract. Options are purchased for a premium, usually stated on a per-unit basis. The option premium accounts for both the intrinsic value and the time value. Options are yet another way for producers to limit risk and for speculators to make a profit.

Origination
Finding and securing new sources of supply (e.g., mines, oil fields, farms, or producers). This involves building relationships with producers, negotiating supply contracts, and can, particularly when supply is scarce, also involve prefinancing of production or investing in production projects.

Over-the-counter (OTC)
Trades negotiated bilaterally between two parties (often informed by the spot price as the starting point of the negotiation)

Risk warehousing
A business function performed mainly by banks and commodity dealers. It refers to the practice of temporarily holding ('warehousing') commodity price risk on the dealer's own balance sheet after entering OTC derivatives with clients (instead of immediately passing the risk on to another party or fully hedging it).

Short Position
Ownership of a futures contract to deliver the commodity at the expiration date.

Speculation
A trading strategy in which a market participant takes a position in a commodity or related financial instrument (e.g., futures, options) with the primary aim of profiting from anticipated price movements. In contrast to hedging, speculation typically occurs without an underlying exposure to or ownership of the physical commodity, and therefore involves accepting price risk rather than reducing exposure to it.

Spot Market
The spot market handles the purchase and sale of physical goods in real time, accommodating producers who want to sell goods immediately. The spot market determines price through buyer-seller negotiation and current supply and demand. Multiple spot markets can exist for a single commodity, and each can have a different price depending on the region and events affecting it at any given time. Spot markets can be regulated or operate privately.

Spot Price
The cash price per standard unit of the commodity required to achieve an immediate ownership change; spot market price is based on current supply and demand.

Transit Trade
Also called merchanting. The commodities do not enter the jurisdiction from which the trader operates and accordingly are not recorded in import and export statistics.

Value/mean reverting
Trading strategy based on the expectation that prices will return towards a perceived fundamental or historical average after deviating from it, assuming that extreme price movements are temporary. In practice, these strategies identify commodities or contracts that appear overvalued or undervalued relative to benchmarks such as historical price ranges, production costs, inventory levels, seasonal patterns, or related spreads, and take positions anticipating a reversal. Traders typically sell when prices are judged to be excessively high and buy when they are unusually low, profiting from price normalisation rather than trend continuation.

Vector-related diseases
Illnesses caused by pathogens, such as viruses, bacteria, or parasites, that are transmitted to humans through living carriers known as vectors. These vectors are typically blood-feeding organisms (e.g., mosquitoes, flies, ticks) that transmit infectious agents that cause the disease (e.g., malaria, dengue, yellow fever, lymphatic filariasis).

Windfall profit
A large, unexpected, and sudden increase in income or profit, typically caused by external events outside of a company's or individual's control, rather than through increased effort or investment. These gains often arise from supply shortages, sudden demand surges, or policy changes. In discussions about taxing windfall profits, it is usually defined as profit that exceeds the average profit of a certain reference period by a defined margin. For example, windfall profits are profits that exceed 120% of the average profit from 2022 to 2025.

Bibliography

1. UNCTAD (2025) The State of Commodity Dependence 2025. UN Conference on Trade and Development UNCTAD, Geneva
2. Pirrong C (2014) The economics of commodity trading firms. Trafigura, Houston
3. Aldous M (2024) 1 From traders to planters: The evolving role and importance of trading companies in the 19th century Anglo-Indian Indigo trade. In: Creat. Glob. Capital. Routledge, pp 17–34
4. Casson M (1998) The economic analysis of multinational trading companies. Multinatl Traders. https://doi.org/10.4324/9780203450703
5. van Driel H (2003) The Role of Middlemen in the International Coffee Trade since 1870: The Dutch Case. Bus Hist 45:77–101
6. Blas J, Farchy J (2021) The World for Sale: money, power, and the traders who barter the Earth's resources. Oxford University Press and Penguin Random House, Oxford
7. Boon M, Storli E (2023) Creating global capitalism: An introduction to commodity trading companies and the first global economy. Bus Hist 65:787–802
8. Gereffi G, Humphrey J, Sturgeon T (2005) The governance of global value chains. Rev Int Polit Econ 12:78–104
9. Soumaré I (2022) Commodity Exchanges: Concepts, Tools and Guidelines. https://doi.org/10.4337/9781800887046
10. Laing E, Lucey B, Lütkemeyer T (2019) Which form of hedging matters – Operational or financial? Evidence from the US oil and gas sector. Res Int Bus Finance 51:101088
11. Babenko I, Bessembinder H, Tserlukevich Y (2020) Debt Financing and Risk Management. Soc Sci Res Netw. https://doi.org/10.2139/ssrn.3675898
12. Chen J, King T (2014) Corporate hedging and the cost of debt. J Corp Finance 29:221–245
13. van der Marel F, Rechsteiner R, Tywuschik S (2026) At the threshold of a new era in commodity trading. McKinsey & Company
14. Abdelrehim N (2025) Coup D'état and Industry Dynamics: the Case of Anglo Iranian Oil Company 1901-1979. Eurasian J Bus Manag. https://doi.org/10.15604/ejbm.2024.12.0304.004
15. Yamani AZ (2016) The Oil Industry in Transition. Nat Resour Lawyer 8:391–398
16. Imsirovic A (2021) Trading and price discovery for crude oils: Growth and development of international oil markets. Springer
17. Imsirovic A (2023) Brent Crude Oil: Genesis and Development of the World's Most Important Oil Benchmark. Springer
18. Imsirovic A, Bryce C (2025) The Rivers of Money. Springer Nature Switzerland
19. Clapp J (2022) The rise of big food and agriculture: corporate influence in the food system. In: Res. Agenda Food Syst. Edward Elgar Publishing, pp 45–66
20. Clapp J, Vriezen R, Laila A, Conti C, Gordon L, Hicks C, Rao N (2025) Corporate concentration and power matter for agency in food systems. Food Policy 134:102897
21. Sneyd A (2014) When Governance Gets Going: Certifying 'Better Cotton' and 'Better Sugarcane.' Dev Change 45:231–256
22. Xu T (2025) Grain Trade: A Literature Review and Research Outlook. Rev Econ Assess 3:1–14
23. Giraudo ME (2020) Dependent development in South America: China and the soybean nexus. J Agrar Change 20:60–78
24. Wilson WW, Bullock DW, Dubovoy I (2025) Dynamic changes in the structure and concentration of the international grain and oilseed trading industry. Appl Econ Perspect Policy 47:1561–1582
25. Dermawan A, Hospes O (2018) When the State Brings Itself Back into GVC: The Case of the Indonesian Palm Oil Pledge. Glob Policy 9:21–28
26. Dermawan A, Hospes O (2018) Sustainability pathways in oil palm cultivation: a comparison of Indonesia, Colombia and Cameroon. Rival A (ed) Burleigh Dodds Ser. Agric. Sci. Burleigh Dodds Science Publishing, pp 33–48
27. Grattan S (2025) What Brazil's soy moratorium fight means – and what happens next. The Independent. https://www.independent.co.uk/news/brazil-amazon-bogota-colombia-greenpeace-b2816550.html. Accessed 19 Dec 2025
28. Schabram J, Rechsteiner R (2025) How to capture the next S-curve in commodity trading. McKinsey & Company
29. Cammelli F, Levy SA, Grabs J, Valentim JF, Garrett RD (2022) Effectiveness-equity tradeoffs in enforcing exclusionary supply chain policies: Lessons from the Amazonian cattle sector. J Clean Prod 332:130031
30. Glavee-Geo R, Engelseth P, Buvik A (2022) Power Imbalance and the Dark Side of the Captive Agri-food Supplier–Buyer Relationship. J Bus Ethics 178:609–628
31. Stucke M (2013) Looking at the Monopsony in the Mirror. Emory Law J 62:1509
32. Swinnen J, Kuijpers R (2019) Value chain innovations for technology transfer in developing and emerging economies: Conceptual issues, typology, and policy implications. Food Policy 83:298–309
33. Schaafsma M, Dreoni I, Ayompe LM, et al (2023) A framework to understand the social impacts of agricultural trade. Sustain Dev 31:138–150
34. Tennhardt LM, Lambin EF, Curran M, Schader C (2023) Implementation of sustainable farming practices by cocoa farmers in Ecuador and Uganda: the influence of value chain factors. Front Sustain Food Syst. https://doi.org/10.3389/fsufs.2023.1167683
35. Da Silva RFB, Batistella M, Moran E, Celidonio OLDM, Millington JDA (2020) The Soybean Trap: Challenges and Risks for Brazilian Producers. Front Sustain Food Syst. https://doi.org/10.3389/fsufs.2020.00012
36. Dos Reis TNP, Bastos Lima MG, Russo Lopes G, Meyfroidt P (2024) Not all supply chains are created equal: The linkages between soy local trade relations and development outcomes in Brazil. World Dev 175:106475
37. Grabs J, Carodenuto S, Jespersen K, et al (2024) The role of midstream actors in advancing the sustainability of agri-food supply chains. Nat Sustain 7:527–535

38. Bürgi Bonanomi E, Wehrli J, Bucher D, et al (2015) The Commodity Sector and Related Governance Challenges from a Sustainable Development Perspective: The Example of Switzerland. https://doi.org/10.7892/boris.71327
39. Eggert N, Ferro-Luzzi G, Ouyang D (2017) Commodity Trading Monitoring Report. Université de Genève, Geneva
40. Gupta R, Mejia C, Sadreghazi S, Sano Y, Muchangos LSD, Sekiguchi T, Nakamura H, Kajikawa Y (2024) Traders as ecosystem orchestrators for sustainable foods supply chain transformation. Bus Strategy Environ 33:4024–4038
41. zu Ermgassen EKHJ, Bastos Lima MG, Bellfield H, et al (2022) Addressing indirect sourcing in zero deforestation commodity supply chains. Sci Adv 8:eabn3132
42. De Petrillo E, Tuninetti M, Ridolfi L, Laio F (2023) International corporations trading Brazilian soy are keystone actors for water stewardship. Commun Earth Environ 4:87
43. Folke C, Österblom H, Jouffray J-B, et al (2019) Transnational corporations and the challenge of biosphere stewardship. Nat Ecol Evol 3:1396–1403
44. Leins S (2025) Beyond mining: physical commodity traders, market intermediation and the role of (de-)coupling. J Cult Econ 18:531–546
45. Grabs J, Cammelli F, Levy SA, Garrett RD (2021) Designing effective and equitable zero-deforestation supply chain policies. Glob Environ Change 70:102357
46. Grabs J, Garrett RD (2023) Goal-Based Private Sustainability Governance and Its Paradoxes in the Indonesian Palm Oil Sector. J Bus Ethics 188:467–507
47. Heron T, Prado P, West C (2018) Global Value Chains and the Governance of 'Embedded' Food Commodities: The Case of Soy. Glob Policy 9:29–37
48. Rueda X, Garrett RD, Lambin EF (2017) Corporate investments in supply chain sustainability: Selecting instruments in the agri-food industry. J Clean Prod 142:2480–2492
49. Ziegert RF, Sotirov M (2024) Regulatory politics and hybrid governance: the case of Brazil's Amazon Soy Moratorium. Glob Environ Change 88:102916
50. Mano A, Andreoni M (2025) Exclusive: Soy trading firms to abandon Amazon protection pact in Brazil. Reuters
51. Andreoni M, Mano A (2026) Global grain traders' green pledges face skepticism as deal to protect Brazil's rainforest unravels. Reuters
52. Probst BS, Toetzke M, Kontoleon A, et al (2024) Systematic assessment of the achieved emission reductions of carbon crediting projects. Nat Commun 15:9562
53. West TAP, Wunder S, Sills EO, Börner J, Rifai SW, Neidermeier AN, Frey GP, Kontoleon A (2023) Action needed to make carbon offsets from forest conservation work for climate change mitigation. Science 381:873–877
54. West TAP, Börner J, Sills EO, Kontoleon A (2020) Overstated carbon emission reductions from voluntary REDD+ projects in the Brazilian Amazon. Proc Natl Acad Sci 117:24188–24194
55. Tang Y, Yang C, Wu H, et al (2025) Tropical forest carbon offsets deliver partial gains amid persistent over-crediting. Science 390:182–187
56. Gill-Wiehl A, Kammen DM, Haya BK (2024) Pervasive over-crediting from cookstove offset methodologies. Nat Sustain 7:191–202
57. Gill-Wiehl A, Hogan M, Haya BK (2026) Quantifying the additionality of cookstove carbon projects. Carbon Manag 17:2618350
58. Keilmann J, Koch T (2024) When Environmental Claims are Empty Promises: How Greenwashing Affects Corporate Reputation and Credibility. Environ Commun 18:266–284
59. Trencher G, Nick S, Carlson J, Johnson M (2024) Demand for low-quality offsets by major companies undermines climate integrity of the voluntary carbon market. Nat Commun 15:6863
60. Wang C (2003) The behavior and performance of major types of futures traders. J Futur Mark 23:1–31
61. Adam T, Fernando C (2006) Hedging, speculation, and shareholder value. J Financ Econ 81:283–309
62. Thieffry G (2016) Basel III and Commodity Trade Finance: An Update. J Int Bank Law Regul 31:124–132
63. FSB (2023) The Financial Stability Aspects of Commodities Markets. Financial Stability Board (FSB), Basel
64. UNCTAD (2025) Trade and Development Report 2025. On the brink. Trade, finance and the reshaping of the global economy. UN Conference on Trade and Development UNCTAD, Geneva
65. Africa Intelligence (2026) Behind the scenes of Oligui Nguema's $3bn Trafigura deal. Afr. Intell.
66. Trafigura (2026) Trafigura Signs Oil Prepayment Agreement with the Republic of Gabon. https://www.trafigura.com/news-and-insights/press-releases/2026/trafigura-signs-oil-prepayment-agreement-with-the-republic-of-gabon. Accessed 17 Apr 2026
67. Shimizu T (2022) Use of barter contracts in Mato Grosso state, Brazil. Rev Polit Agríc XXXI:136–151
68. Wion A, Luciano A, Gonzalez SN, Kuepper B, Linnaeus Tannor L, Vander Stichele M (2024) The role of commodity traders in shaping agricultural markets. Oligopoly and Vertical Integration: ABCDs, Emerging Players, Novel Strategies, and Potential EU Intervention. European Parliament, Policy Department for Structural and Cohesion Policies, Brussels
69. swissinfo SWI (2024) Traders Are Desperate for Copper Deals and Miners Are Cashing In. SWI Swissinfoch
70. Mihalyi D, Adam A, Hwang J (2020) ResourceBacked Loans: Pitfalls and Potential. Natural Resource Governance Institute NRGI, London and New York
71. Hunter A, Farchy J (2024) Traders Are Desperate for Copper Deals and Miners Are Cashing In. Bloomberg.com
72. Hedge Week (2025) Hedge funds move into physical commodities to boost returns – Hedgeweek.
73. Pollard A, Millard R, Mourselas C (2025) Hedge funds pile into commodities in search of fresh source of returns. Financ. Times
74. Africa Intelligence (2026) Africa • Touton's sale to hedge fund Hartree clouds cocoa and coffee outlook - 07/01/2026. Afr. Intell. https://www.africaintelligence.com/the-continent/2026/01/07/touton-s-sale-to-hedge-fund-hartree-clouds-cocoa-and-coffee-outlook,110592026-eve. Accessed 27 Feb 2026
75. Baines J, Hager SB (2022) Commodity traders in a storm: financialization, corporate power and ecological crisis. Rev Int Polit Econ 29:1053–1084

76. BfS (2025) Rohstoffhändlersstruktur. https://www.bfs.admin.ch/bfs/de/home/statistiken/industrie-dienstleistungen/sektorielle-portraits/rohstoffhaendler/unternehmen-beschaeftigte.html. Accessed 4 Feb 2026
77. BfS (2025) Commodity trading generated CHF 19.2 billion in value added in 2024. Bundesamt für Statistik BFS, Neuchâtel
78. Jungbluth N, Meili C (2018) Pilot-study for the analysis of the environmental impacts of commodities traded in Switzerland. ESU-Services, Schaffhausen
79. Swiss National Bank (2025) Swiss balance of payments.
80. SECO (2019) Spezialthema Leistungsbilanz. Staate Secretariat for Economic Affairs
81. BfS (2025) Statistics on commodity traders – monetary data – Frequently asked questions. Bundesamt für Statistik BFS/ Federal Statistical Office (BFS), Neuchâtel
82. AGEFI (2026) Après Suissenégoce, Public Eye dénonce une sous-estimation du poids économique du négoce. https://agefi.com/actualites/entreprises/apres-suissenegoce-public-eye-denonce-une-sous-estimation-du-poids-economique-du-commerce-de-matieres-premieres. Accessed 12 Feb 2026
83. Wanner GA (1959) Die Basler Handelsgesellschaft A.G., 1859–1959. Basel: Handels-Gesellschaft A.G., 1959, Basel
84. Wanner GA (1969) Zweieinhalb Jahrhunderte im internationalen Wollhandel. Simonius, Vischer & Co. 1719-1969. Grollimund Verlag, 1969, Basel
85. Siber Hegner (ed) (1965) Hundert Jahre im Dienste des Handels (1865–1965). Zurich
86. Eggenberger J (1987) Das Haus Diethelm im Wandel der Zeit, 1887–1987. Diethelm und Co. AG 1987, Zurich
87. André & Cie (ed) (1977) André & Cie SA 1877–1977. André & Cie 1977, Lausanne
88. Rambousek WH, Vogt A, Volkart HR (1990) Volkart. Die Geschichte einer Welthandelsfirma. Insel Verlag, Frankfurt am Main
89. Bartu F (2005) The Fan Tree Company: Three Swiss Merchants in Asia. Diethelm Keller Holding Limited
90. Geering T (1920) Die Zahlungsbilanz der Schweiz vor und seit dem Kriege. Z Für Schweiz Stat Volkswirtsch 56:98–136
91. Zollinger W (1914) Die Bilanz der internationalen Wertübertragungen. Eine Studie über die Zahlungsbilanz und die ausländische Kapitalanlage der Schweiz. G. Fischer, Jena
92. Geering T, Hotz R (1910) Wirtschaftskunde der Schweiz. Mit einem geologischen Querprofil, einer Industriekarte und einer Eisenbahnkarte der Schweiz, 4th ed. Schulthess & Co, Zurich
93. Hauser-Dora AM (1986) Die wirtschaftlichen und handelspolitischen Beziehungen der Schweiz zu überseeischen Gebieten 1873–1913, unter Berücksichtigung der konjunkturellen Entwicklung. Lang, Bern
94. Landmann J (1925) Die schweizerische Volkswirtschaft. Benziger, Einsiedeln
95. Mangold F (1935) Der schweizerische Transithandel. Ergebnis einer Enquete. Basel
96. Ackermann E (1935) Kapitalverkehr. Vortrag an der Jahresversammlung der Schweizerischen Statistischen Gesellschaft in Zurich, 31. Mai 1935. Schweiz Z Für Volkswirtsch Stat 2:187–211
97. Gsell E (1956) Wandlungen und Bedeutung des schweizerischen Transit- und Welthandels. Entwurf vom 2. Juni 1956. kowal
98. Lichtenberg R (1959) Foreword. In: Role Middleman Trans. World Trade. National Bureau of Economic Research, New York, pp v–x
99. Waszkis H (1987) Philipp Brothers. The Rise and Fall of a Trading Giant. Metal Bulletin Books, Worcester Park
100. Leimgruber M (2015) 'Kansas City on Lake Geneva'. Business Hubs, Tax Evasion, and International Connections Around 1960. Z Für Unternehmensgeschichte J Bus Hist 60:123–140
101. Lüscher S (2011) Ölmekka Schweiz. Bilanz
102. EDA, EFD, WBF (2013) Grundlagenbericht Rohstoffe. Bericht der interdepartementalen Plattform Rohstoffe an den Bundesrat. EDA, EFD, WBF, Bern
103. Farquet C (2018) Histoire du paradis fiscal suisse. Expansion et relations internationales du centre offshore suisse au XX^{e} siècle. Les Presses de Sciences Po, Paris
104. Kowalski P, Legendre C (2023) Raw materials critical for the green transition: Production, international trade and export restrictions. https://doi.org/10.1787/c6bb598b-en
105. Mulder N (2022) The Economic Weapon. The Rise of Sanctions as a Tool of Modern War. https://doi.org/10.2307/j.ctv240df1m
106. Mulder N (2022) The Sanctions Weapon. Finance and Development (June 2022)
107. Pavlínek P (2024) Geopolitical Decoupling in Global Production Networks. Econ Geogr 100:138–169
108. Yang C, Chan DY-T (2023) Geopolitical risks of strategic decoupling and recoupling in the mobile phone production shift from China to Vietnam: Evidence from the Sino-US trade war and COVID-19 pandemic. Appl Geogr 158:103028
109. Rodrik D (2021) Why Does Globalization Fuel Populism? Economics, Culture, and the Rise of Right-Wing Populism. Annu Rev Econ 13:133–170
110. Broz JL, Frieden J, Weymouth S (2021) Populism in Place: The Economic Geography of the Globalization Backlash. Int Organ 75:464–494
111. Rodríguez-Pose A, Terrero-Dávila J, Lee N (2023) Article Navigation Journal Article Left-behind versus unequal places: interpersonal inequality, economic decline and the rise of populism in the USA and Europe. J Econ Geogr 23:951–977
112. Bisbee J, Mosley L, Pepinsky TB, Rosendorff BP (2020) Decompensating domestically: the political economy of anti-globalism. J Eur Public Policy 27:1090–1102
113. Pástor Ľ, Veronesi P (2021) Inequality Aversion, Populism, and the Backlash against Globalization. J Finance 76:2857–2906
114. Solt F (2011) Diversionary Nationalism: Economic Inequality and the Formation of National Pride. J Polit 73:821–830
115. Rodrik D (2018) Straight Talk on Trade. Ideas for a Sane World Economy. Princeton University Press, Princeton
116. Lins C, Perkins A, Franke A, Zimmerlin M (2025) Balancing Act: A New Baseline for Commodity Trading Growth. Oliver Wyman
117. Duca I, Dumitrescu BA, Tănăsescu P, Leonida I, Bozagiu A-M, Poleac D (2025) Geopolitical Risk and Firm Profitability in Complex Socio-Economic Systems: A Heterogeneous Dynamics Perspective. Systems 13:945
118. Ingulstad M, Perchard A, Storli E (2015) Tin and Global Capitalism: A History of the Devil's Metal, 1850-2000. Routledge, New York and London

119. Weber IM (2022) Big Oil's Profits and Inflation: Winners and Losers. Challenge 65:151–159
120. Borgards O, Czudaj RL, Hoang THV (2021) Price overreactions in the commodity futures market: An intraday analysis of the Covid-19 pandemic impact. Resour Policy 71:101966
121. Semieniuk G, Weber IM, Weaver IS, Wasner E, Braun B, Holden PB, Salas P, Mercure J-F, Edwards NR (2025) Best of times, worst of times: record fossil-fuel profits, inflation and inequality. Energy Res Soc Sci 127:104221
122. EESC (2022) Food price crisis in the aftermath of the Ukraine war. Food price crisis: the role of speculation and concrete proposals for action in the aftermath of the Ukraine war. European Economic and Social Committee, Brussels
123. Weber IM, Wasner E (2023) Sellers' inflation, profits and conflict: why can large firms hike prices in an emergency? Rev Keynes Econ 11:183–213
124. Weber IM, Wasner E, Lang M, Braun B, Van T Klooster J (2025) Implicit coordination in sellers' inflation: How cost shocks facilitate price hikes. Struct Change Econ Dyn 74:690–712
125. Lin F, Li X, Jia N, Feng F, Huang H, Huang J, Fan S, Ciais P, Song X-P (2023) The impact of Russia-Ukraine conflict on global food security. Glob Food Secur 36:100661
126. Al-Saidi M (2023) Caught off guard and beaten: The Ukraine war and food security in the Middle East. Front Nutr 10:983346
127. Melnychuk T (2025) Illegal grain market in Ukraine: Harvesting war opportunities. J Econ Criminol 8:100160
128. UN (2023) Black Sea Grain Initiative Joint Coordination Centre. https://www.un.org/en/black-sea-grain-initiative. Accessed 29 Oct 2025
129. EU (2022) Regulation(EU) 2022/870 fo the European Parliament and of the Council of 30 May 2022. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32022R0870. Accessed 29 Oct 2025
130. Ulybina D, Rastogi C (2024) Global wheat shipments withstood the shock of Russia's invasion of Ukraine. World Bank Blogs. https://blogs.worldbank.org/en/trade/global-wheat-shipments-withstood-shock-russias-invasion-ukraine. Accessed 29 Oct 2025
131. IOSCO (2016) The Impact of Storage and Delivery Infrastructure on Commodity Derivatives Market Pricing. International Organization of Securities Commissions, Madrid
132. Imsirovic A (2024) International Oil Markets in the Age of Climate Change. Springer Nature Switzerland
133. NYT (2025) Trump Announces Inquiry That Could Lead to Tariffs on Copper. N. Y. Times
134. Saccomanno I, Dilley A, Scoles S (2025) President Trump Orders 50 percent Section 232 Tariff on Copper Imports. White Case
135. NYT (2025) Trump Targets Copper With Tariffs, Tough Not as Aggressively as Expected. N. Y. Times
136. Home A (2025) Will the real Doctor Copper please step forward? Reuters
137. Bouchouev I (2024) Energy Quantamentals: Who is Who in Financial Barrels? Oxf. Inst. Energy Stud.
138. Bouchouev I (2023) Virtual Barrels. Springer
139. Bouchouev I (2025) Energy Quantamentals: To Follow the Crowd or To Fade the Extremes? Oxf. Inst. Energy Stud.
140. Bouchouev I (2025) Energy Quantamentals: A Tale of Two Algorithms and OPEC+. Oxf. Inst. Energy Stud.
141. Johnson O, Townsley A (2021) The State of 'Speculative positions' in Oil Derivatives: Less is not More. Oxford Institute for Energy Studies (OIES), Oxford
142. van der Ploeg F, Poelhekke S (2009) Volatility and the natural resource curse. Oxf Econ Pap 61:727–760
143. Morgan TC, Syropoulos C, Yotov YV (2023) Economic Sanctions: Evolution, Consequences, and Challenges. J Econ Perspect 37:3–29
144. Felbermayr G, Morgan TC, Syropoulos C, Yotov YV (2021) Understanding economic sanctions: Interdisciplinary perspectives on theory and evidence. Eur Econ Rev 135:103720
145. Herbert G (2022) The Unintended Consequences of Economic Sanctions. https://doi.org/10.19088/K4D.2022.100
146. Early B (2015) Busted Sanctions. https://doi.org/10.1515/9780804794329
147. Early BR, Cilizoglu M (2020) Economic Sanctions in Flux: Enduring Challenges, New Policies, and Defining the Future Research Agenda. Int Stud Perspect 21:438–477
148. Secrier O, Berkok U (2025) Sanctions, sanctions-busting, and secondary sanctions: A game theoretic analysis. Econ Peace Secur J 20:42–54
149. Volcker PA, Goldstone RJ, Pieth M (2005) Final Report of the Independent Inquiry Committee (IIC) on the Oil-for-Food Programme: UN, New York
150. FT (2023) US taps big trading houses to help move price-capped Russian oil. Financ. Times
151. Soguel D (2023) Investigating Swiss traders' links to murky world of Russian oil. Swissinfo SWI
152. Parker J, Davies N (2025) On the front line of Europe's standoff with Russia's sanction-busting shadow fleet. BBC
153. Storli E (2015) The Birth of the World's Largest Tin Merchant. Tin Glob. Capital. Hist. Devil's Met. 1850-2000
154. Wilson T (2023) How Dubai became 'the new Geneva' for Russian oil trade. SWI
155. Crozet M, Hinz J, Stammann A, Wanner J (2021) Worth the pain? Firms' exporting behaviour to countries under sanctions. Eur Econ Rev 134:103683
156. Rohalska N (2021) Raiding, cooperation with militants and bringing the state port to bankruptcy: what is the suspicion of the Odesa-based Transship group? https://www.stopcor.org/ukr/section-ekonomika/news-rejderstvo-spivpratsya-z-bojovikami-j-dovedennya-derzhportu-do-bankrutstva-u-chomu-pidozryuyut-odesku-grupu-transship-10-08-2021.html. Accessed 29 Oct 2025
157. Ballinger O (2023) Grain Trail: Traking Russia's Ghost Ships with Satellite Imagery. https://www.bellingcat.com/news/2023/05/11/grain-trail-tracking-russias-ghost-ships-with-satellite-imagery/. Accessed 29 Oct 2025
158. Fisman R, Wei S-J (2004) Tax rates and tax evasion: Evidence from 'missing imports' in China. J Polit Econ 112:471–496
159. Su Y (2021) Trade Plants the Flag: Sanctions-busting and the Signing of New Preferential Trade Agreements. Foreign Policy Anal 17:67–85
160. Peksen D (2019) When Do Imposed Economic Sanctions Work? A Critical Review of the Sanctions Effectiveness Literature. Def Peace Econ 30:635–647

161. Özdamar Ö, Shahin E (2021) Consequences of Economic Sanctions: The State of the Art and Paths Forward. Int Stud Rev 23:1646–1671

162. Downs E, Nephew R (2025) America's Toothless Sanctions on Russian Oil. Foreign Aff.

163. McCreesh S (2025) Trump Imposes Sanctions on Russian oil Companies as His Frustration With Putin Mounts. N. Y. Times

164. Verma N (2025) India poised to sharply cut Russian oil imports after sanctions, sources say. Reuters

165. swissinfo (2025) Lukoil's Oil Trading Business Sheds Staff as Sanctions Near. SWI Swissinfo

166. FT (2025) Gunvor's $22bn gamble: how Torbjörn Törnqvist's Russia deal collapsed. Financ. Times

167. FT (2025) Torbjörn Törnqvist quits Gunvor after pressure over Russia links. Financ. Times

168. Wilkes TR (2024) Switzerland defends decision to omit subsidiaries from Russian sanctions. Reuters

169. Etienne R (2025) A Genève, la fermeture de Litasco, la filiale de Lukoil, se dessine. Le Temps

170. Ampatzidi D (2025) The Rise of the Shadow Fleet: An October 2025 Overview. Kpler

171. Rodriguez-Diaz E, Alcaide JI, Endrina N (2025) Shadow Fleets: A Growing Challenge in Global Maritime Commerce. Appl Sci. https://doi.org/10.3390/app15126424

172. Ford JH, Wilcox C (2019) Shedding light on the dark side of maritime trade – A new approach for identifying countries as flags of convenience. Mar Policy 99:298–303

173. Tripathy AK, Shaikh I, Bisht NS (2024) Flag of convenience and the tragedy of the commons in maritime transportation. Mar Pollut Bull 208:117034

174. Van Bergeijk PAG (2025) Deglobalization and Resilience: A Historical Perspective. Crit Sociol 51:849–865

175. Van Bergeijk PAG (2025) Deglobalization: three scenarios. Camb J Reg Econ Soc 18:157–166

176. Chase-Dunn C, Álvarez A, Liao Y (2023) Waves of Structural Deglobalization: A World-Systems Perspective. Soc Sci 12:301

177. EXIM Bank (2026) Project Vault and the US Strategic Critical Mineral Reserve. Media Release

178. EC (2025) RESourceEU Action Plan: Accelerating our critical raw materials strategy to adapt to a new reality. European Commission, Brussels

179. Weber IM, Ghosh J, van Huellen S, Schulken M, Jain S (2025) Food Price Stabilization in an Age of Overlapping Emergencies: The Case for Multilevel Buffer Stocks. Political Economy Research Institute PERI, University of Massachusetts Amherst, Amherst

180. Weber IM, Schulken M (2024) Towards a Post-neoliberal Stabilization Paradigm: Revisiting International Buffer Stocks in an Age of Overlapping Emergencies Based on the Case of Food. Political Economy Research Institute PERI, University of Massachusetts Amherst, Amherst

181. Gilbert C (2011) International Agreements for Commodity Price Stabilisation: An Assessment. https://doi.org/10.1787/5kg0ps7ds0jl-en

182. Liao S, Wang F, Wu T, Pan W (2016) Crude oil price decision under considering emergency and release of strategic petroleum reserves. Energy 102:436–443

183. Larson DF, Lampietti J, Gouel C, Cafiero C, Roberts J (2014) Food Security and Storage in the Middle East and North Africa. World Bank Econ Rev 28:48–73

184. Schmitz A (2018) Commodity Price Stabilization under Unattainable Stocks. Theor Econ Lett 08:861–865

185. Kilian L, Zhou X (2020) Does Drawing Down the US Strategic Petroleum Reserve Help Stabilize Oil Prices? J Appl Econom. https://doi.org/10.1002/jae.2798

186. Bai Y, Dahl C (2018) Evaluating the management of US Strategic Petroleum Reserve during oil disruptions. Energy Policy 117:25–38

187. Sheng Y, Shen Y, Yang J, Sun X (2024) A structured risk scenario analysis framework and case study of reserve regulation in non-ferrous metal markets. Procedia Comput Sci 242:326–331

188. Li MH, Cui L, Lu J (2014) Varieties in state capitalism: Outward FDI strategies of central and local state-owned enterprises from emerging economy countries. J Int Bus Stud 45:980–1004

189. Ren M, Manning S, Vavilov S (2019) Does state ownership really matter? The dynamic alignment of China's resource environment and firm internationalization strategies. J Int Manag 25:100667

190. Gulley AL, McCullough EA, Shedd KB (2019) China's domestic and foreign influence in the global cobalt supply chain. Resour Policy 62:317–323

191. Seaman J (2025) Critical Raw Materials, Economic Statecraft and Europe's Dependence on China. Int Spect 60:20–37

192. UNEP (1972) Declaration on the Human Environment.

193. WCED (1987) Our Common Future. Report of the World Commission on Environment and Development (WCED). UN, New York

194. Kanie N, Biermann F (eds) (2017) Governing through Goals: Sustainable Development Goals as Governance Innovation. https://doi.org/10.7551/mitpress/10894.001.0001

195. Vijge MJ, Biermann F, Kim RE, Bogers M, Driel MV, Montesano FS, Yunita A, Kanie N (2020) Governance through Global Goals. In: Biermann F, Kim RE (eds) Archit. Earth Syst. Gov., 1st ed. Cambridge University Press, pp 254–274

196. Biermann F, Hickmann T, Sénit C-A, et al (2022) Scientific evidence on the political impact of the Sustainable Development Goals. Nat Sustain 5:795–800

197. US (2025) Remarks at the UN meeting entitled 58th Plenary Meeting of the General Assembly. US Mission to the UN, New York

198. Barros L, Martínez-Zarzoso I (2022) Systematic literature review on trade liberalization and sustainable development. Sustain Prod Consum 33:921–931

199. Bougiatiotis Y (2025) Means of Capitalist Development: A Radical Political Economy Critique of the Trade Regime Debate. Sci Soc 00368237251352651

200. Strange G (2020) Debating free international trade. Am J Econ Sociol 79:25–47

201. Evenett SJ (2019) Protectionism, state discrimination, and international business since the onset of the Global Financial Crisis. J Int Bus Policy 2:9–36

202. Baldwin R, Freeman R, Theodorakopoulos A (2024) Deconstructing deglobalization: the future of trade is in intermediate services. Asian Econ Policy Rev 19:18–37

203. Breinlich H (2018) The Economic Effects of Free Trade Agreements. Handb. Int. Trade Agreem. Ctry. Reg. Glob. Approaches

204. WTO (2022) Agreement on Fisheries Subsidies, Ministerial Decision of 17 June 2022. World Trade Organization (WTO), Geneva

205. WTO (2024) Investment Facilitation for Development. World Trade Organization (WTO), Geneva

206. Tienhaara K, Thrasher R, Simmons BA, Gallagher KP (2022) Investor-state disputes threaten the global green energy transition. Science 376:701–703

207. Songy M, Brauch MD (2025) How ISDS Interferes with the Governance of Critical Minerals for a Just Energy Transition – And What to Do About It. Columbia Center on Sustainable Investment (CCSI), New York

208. Sachs L, Johnson L (2019) Investment Treaties, Investor-State Dispute Settlement and Inequality: How International Rules and Institutions Can Exacerbate Domestic Disparities. Columbia Center on Sustainable Investment (CCSI), New York

209. Schefer KN (2021) Sustainability in International Investment Law: Building on What Exists by Enhancing the Right to Regulate SSDI/SVIR Annual Meeting 2020. Swiss Rev Int Eur Law 31:193–210

210. Beysulen Angin B (2025) The Right to Regulate vs Investment Protection: Unveiling the Causes of Imbalance and the Limits of Current Reform Efforts in International Investment Law. ICSID Rev – Foreign Invest Law J 40:11–41

211. OECD (2026) The interaction between investment treaty obligations and the 'right to regulate'. A scoping paper. OECD, Paris

212. Eckes C (2024) The Autonomy of the EU Legal Order: The Case of the Energy Charter Treaty. Eur Pap – J Law Integr 2023 8:14651494

213. Maghooa N (2025) Withdrawal from the Energy Charter Treaty: the Ostrich Effect? Arbitr Int 41:595–606

214. FTAF (2025) International Standards on Combating Money Laundering and the Financing of Terrorism & Proliferation: The FATF Recommendations, Recommendation 10 (Updated June 2025).

215. Wolfsberg Group, ICC, BAFT (2019) Trade Finance Principles: 2019 amendment.

216. United Nations (2003) United Nations Convention against Corruption.

217. OECD (1997) Convention on Combating Bribery of Foreign Public Officials in International Business Transactions. OECD, Paris

218. Low LA (2019) Dealing with Allegations of Corruption in International Arbitration. AJIL Unbound 113:341–345

219. Nadakavukaren Schefer K (2020) Crime in International Investment Arbitration. In: Chaisse J, Choukroune L, Jusoh S (eds) Handb. Int. Invest. Law Policy. Springer Singapore, Singapore, pp 1–35

220. ICJ (2025) Obligations of States in Respect of Climate Change. Advisory Opinion. International Court of Justice, The Hague

221. Tigre M, Bönnemann M, De Spiegeleir A (2025) The ICJ's Advisory Opinion on Climate Change. https://doi.org/10.17176/20251210-183825-0

222. Hohmann J, Weller M (eds) (2018) The UN Declaration on the Rights of Indigenous Peoples: A Commentary, 1st ed. https://doi.org/10.1093/law/9780199673223.001.0001

223. United Nations (2011) Guiding Principles on Business And Human Rights. United Nations

224. OECD (2023) OECD Guidelines for Multinational Enterprises on Responsible Business Conduct. https://doi.org/10.1787/81f92357-en

225. OECD (2018) OECD Due Diligence Guidance for Responsible Business Conduct. https://doi.org/10.1787/15f5f4b3-en

226. OECD (2018) Alignment Assessment of Industry Programmes with the OECD Minerals Guidance. https://doi.org/10.1787/f72b011d-en

227. Pauwelyn J, Wessel R, Wouters J (eds) (2012) Informal International Lawmaking. https://doi.org/10.1093/acprof:oso/9780199658589.001.0001

228. Schefer KN (2005) Stopping Trade in Conflict Diamonds: Exploring the Trade and Human Rights Interface with the WTO Waiver for the Kimberley Process. Cottier T, Pauwelyn J, Bürgi E (eds) Hum. Rights Int. Trade. Oxford University Press, pp 392–450

229. Geboye Desta M (2010) Commodities, International Regulation of Production and Trade. Max Planck Encycl. Public Int. Law

230. Morrison R J (1993) The London Monetary and Economic Conference of 1933: A Public Goods Analysis. Am J Econ Sociol 52:307–321

231. Bastida A (2022) The case for global cooperation concerning the sustainable management of mining and minerals chapter in N and E Nickless (eds). In: Handb. Extr. Ind. Sustain. Dev. Routledge, pp 191–207

232. EU Commission (2025) Assessment for recognition of the supply chain due diligence scheme 'Responsible Gold Guidance' owned by the London Bullion Market Association (LBMA) under Regulation (EU) 2017/821. Final Report. European Commission

233. IOSCO (2023) Report on International Work to Develop a Global Assurance Framework for Sustainability-related Corporate Reporting. International Organization of Securities Commissions, Madrid

234. Tang K, Xiong W (2012) Index investment and the financialization of commodities. Financ Anal J 68:54–74

235. Irwin SH, Sanders DR (2011) Index funds, financialisation, and commodity futures markets. Appl Econ Perspect Policy 33:1–31

236. Henderson BJ, Pearson ND, Wang L (2015) New evidence on the financialization of commodity markets. Rev Financ Stud 28:1285–1311

237. Cheng I-H, Kirilenko A, Xiong W (2015) Convective risk flows in commodity futures markets. Rev Finance 19:1733–1781

238. Adams Z, Glück T (2015) Financialization in commodity markets: A passing trend or the new normal? J Bank Finance 60:93–111

239. Kang W, Tang K, Wang N (2023) Financialization of commodity markets ten years later. J Commod Mark 30:100313

240. Silvennoinen A, Thorp S (2013) Financialization, crisis and commodity correlation dynamics. J Int Financ Mark Inst Money 24:42–65

241. Kilian L, Murphy DP (2014) The role of inventories and speculative trading in the global market for crude oil. J Appl Econom 29:454–478

242. Fattouh B, Kilian L, Mahadeva L (2013) The Role of Speculation in Oil Markets: What Have We Learned So Far? Energy J 34:7–33

243. Glück T, Adams Z (2025) Systemic risk of commodity traders. J Econ Dyn Control 179:105166

244. Tse Y, Williams M (2013) Does index speculation impact commodity prices? Financ Rev 48:365–383

245. Cheng I-H, Xiong W (2014) Financialization of commodity markets. Annu Rev Financ Econ 6:419–441

246. Gorton G, Rouwenhorst KG (2006) Facts and fantasies about commodity futures. Financ Anal J 62:47–68

247. Erb CB, Harvey CR (2006) The strategic and tactical value of commodity futures. Financ Anal J 62:69–97

248. Le Pen Y, Sévi B (2018) Futures trading and the excess comovement of commodity prices. J Empir Finance 47:76–92

249. Büyükşahin B, Harris JH (2011) Do speculators drive crude oil futures prices? Energy J 32:167–202

250. Büyükşahin B, Robe MA (2014) Speculators, commodities and cross-market linkages. J Int Financ Mark Inst Money 42:38–70

251. Carbonnier G, Zweynert de Cadena A (2015) Commodity Trading and Illicit Financial Flows. Rev Int Polit Dév. https://doi.org/10.4000/poldev.2054

252. Foroni C, Greco G, Marcucci J, Rahbek A (2024) The network of commodity risk. Energy Syst 15:167–213

253. Bellemare MF (2015) Rising food prices, food price volatility, and social unrest. Am J Agric Econ 97:1–21

254. Chen J, Tang J (2024) Will the financialisation of agricultural products exacerbate food security risks? Agric Econ – Czech 70:178–186

255. Manogna R, Kulkarni G (2024) Does the financialization of agricultural commodities impact food security? An empirical investigation? Borsa Istanb Rev 24:280–291

256. Kilian L (2009) Not all oil price shocks are alike. Rev Econ Stat 91:1053–1069

257. Singleton KJ (2014) Investor flows and the 2008 boom/bust in oil prices. Manag Sci 60:300–318

258. Hintermann B (2010) Allowance price drivers in the first phase of the EU ETS. Energy Econ 32:1–9

259. Koch N, Fuss S, Grosjean G, Edenhofer O (2014) Causes of the EU ETS price drop. Energy Policy 73:676–685

260. Elsby A (2020) Creaming off commodity profits: Europe's re-export boom and Africa's earnings crisis in the coffee and cocoa sectors. Rev Afr Polit Econ 47:638–650

261. Virdin J, Vegh T, Jouffray J-B, Blasiak R, Mason S, Osterblom H (2021) The Ocean 100: Transnational corporations in the ocean economy. Sci Adv 7:eabc8041

262. Mehrotra R, Carbonnier G (2021) Abnormal pricing in international commodity trade: Empirical evidence from Switzerland. Resour Policy 74:102352

263. Dube O, Vargas JF (2013) Commodity price shocks and civil conflict: Evidence from Colombia. Rev Econ Stud 80:1384–1421

264. Brückner M, Ciccone A (2010) International commodity prices, growth, and the outbreak of civil war in Sub-Saharan Africa. Econ J 120:519–534

265. Berman N, Couttenier M, Rohner D, Thoenig M (2017) This mine is mine! How minerals fuel conflicts in Africa. Rev Econ Stud. https://doi.org/10.1093/restud/rdw034

266. UNCTAD (ed) (2023) Statistical Measurement of Tax and Commercial Illicit Financial Flows. Pilot Testing Methodologies for SDG Indicator 16.4.1. UNCTAD, Geneva

267. Bratta B, Santomartino V, Acciari P (2024) Assessing Profit Shifting Using Country-by-Country Reports: A Nonlinear Response to Tax Rate Differentials. Natl Tax J 77:349–380

268. Kar D, Cartwright-Smith D (2008) Illicit Financial Flows from Developing Countries: 2002-2006. Global Financial Integrity, Washington D.C.

269. Paz LS (2022) Measuring illicit financial flows: A gravity model approach to estimate international trade misinvoicing. https://doi.org/10.35188/UNU-WIDER/2022/155-6

270. Lépissier A, Davis W, Ibrahim G (2021) Presenting a new atlas of illicit financial flows from trade misinvoicing. SSRN Electron J. https://doi.org/10.2139/ssrn.3984323

271. Pak SJ, Pak CH (2024) Methods of Estimating Trade Misinvoicing: Price-Filter Method, Partner-Country Method, and Modified Partner-Country Method. In: America RF (ed) Account. Colon. Springer International Publishing, Cham, pp 59–87

272. Carbonnier G, Marur S (2024) Drivers of abnormal pricing in Switzerland's commodity-trade. Graduate Institute of International and Development

273. Mehrotra R, Nolintha V, Sayavong V (2023) Commodity Trade Mispricing: Evidence from Lao P.D.R. Int Trade J 37:401–425

274. Ahene-Codjoe AA, Alu AA, Mehrotra R (2022) Abnormal pricing in international commodity trading: Evidence from Ghana. Int Econ 172:331–348

275. Wier L, Erasmus H (2023) The Dominant Role of Large Firms in Profit Shifting. IMF Econ Rev 71:791–816

276. Garcia-Bernardo J, Janský P (2024) Profit shifting of multinational corporations worldwide. World Dev. https://doi.org/10.1016/j.worlddev.2023.106527

277. Clifford S, Miethe J, Semelet C (2025) The distribution of profit shifting. EUTAX Observatory

278. Viertola M (2024) Transfer (mis) pricing of multinational enterprises: evidence from Finland. VATT Institute for Economic Research

279. Tørsløv T, Wier L, Zucman G (2023) The Missing Profits of Nations. Rev Econ Stud 90:1499–1534

280. Wier L, Zucman G (2022) Global profit shifting, 1975–2019. https://doi.org/10.35188/UNU-WIDER/2022/254-6

281. Chiocchetti A, Moreau-Kastler N (2025) The Global Allocation of Extractive Windfalls. 72

282. Damgaard J, Elkjaer T, Johannesen N (2024) What is real and what is not in the global FDI network? J Int Money Finance 140:102971

283. Damgaard J, Elkjaer T, Johannesen N (2019) The Rise of Phantom Investments. Empty corporate shells in tax havens undermine tax collection in advanced, emerging market, and developing economies. FD Mag 12–13

284. Wacker KM, Casella B, Borga M (2025) Measuring multinational production with foreign direct investment statistics: A survey of challenges and recent developments. J Econ Surv 39:1462–1487

285. Siranova M, Tiruneh MW, Fisera B (2021) Creating the illicit capital flows network in Europe – Do the net errors and omissions follow an economic pattern? Int Rev Econ Finance 71:955–973

286. Ummel M, Schulz Y (2024) On the Trail of African Gold. Quantifying Production and Trade to Combat Illicit Flows. Swissaid, Bern

287. Rettberg A, Ortiz-Riomalo JF (2016) Golden Opportunity, or a New Twist on the Resource–Conflict Relationship: Links Between the Drug Trade and Illegal Gold Mining in Colombia. World Dev 84:82–96

288. Narko W (2021) Understanding How Dirty Money Fuels Campaign Financing in Ghana. An Exploratory Study. Adam Smith International and Ghana Center for Democratic Development, Accra, Ghana

289. Brugger F, Zongo T, Proksik JJ, Bugmann A (2024) Unravelling the nexus of illicit gold trade, protection rackets, and political settlement dynamics: Evidence from Burkina Faso. World Dev 181:106682

290. Tetteh-Yankey AA, Brugger F, Dzanku FM (2026) Global syndrome at the local level: The politics of illicit financial flows in Ghana's artisanal small-scale gold mining sector. Extr Ind Soc 25:101791

291. Brugger F, Proksik JJ, Fischer F (2025) In Search of Success: Why Formalization of Artisanal Mining Fails More Often than it Works. https://doi.org/10.2139/ssrn.5200098

292. Brugger F, Proksik JJ, Fischer F (2024) The state and the legalisation of illicit financial flows: trading gold in Bolivia. New Polit Econ 29:560–578

293. Laudage Teles S, Riedel N, Strohmaier K (2024) On the effects of anti-profit shifting regulations: A developing country perspective. J Public Econ 235:105134

294. Bustos S, Pomeranz D, Serrato JCS, Vila-Belda J, Zucman G (2022) The race between tax enforcement and tax planning: Evidence from a natural experiment in chile. National Bureau of Economic Research

295. Toledo K, Alvarado A (2023) Tackling BEPS in the Global South: Evidence from Peru's tax reform. Econ Syst 47:101122

296. Knoll B, Kruse-Becher S, Riedel N (2023) The impact of transfer pricing laws on import mis-pricing – Evidence from Denmark. Econ Lett. https://doi.org/10.1016/j.econlet.2023.111361

297. Musselli I, Bürgi Bonanomi E (2022) Countering Commodity Trade Mispricing in Low-Income Countries: A Prescriptive Approach. J Int Econ Law 25:447–463

298. Readhead A, Tarus V, Lassourd T, Madzivanyika E, Schlenther B (eds) (2023) The future of resource taxation: 10 policy ideas to mobilize mining revenues. International Institute for Sustainable Development, Winnipeg, Manitoba

299. Matheson T, Beer S, Coelho M, Liu L, Luca O (2021) Formulary apportionment in theory and practice. In: Corp. Income Taxes Press. pp 283–252

300. Palanský M, Schultz A (2024) EU-Wide Unitary Taxation: A Path to a Fair Corporate Tax System. SSRN Electron J. https://doi.org/10.2139/ssrn.4811958

301. 3Chow T, Maydew EL, She G (2023) Cross-Border Income Shifting, Information Exchange, and the Physical Flow of Tangible Goods. SSRN Electron J. https://doi.org/10.2139/ssrn.4655783

302. Boas HF, Johannesen N, Kreiner CT, Larsen LT, Zucman G (2024) Taxing capital in a globalized world: The effects of automatic information exchange. National Bureau of Economic Research

303. Öge K (2016) Which transparency matters? Compliance with anti-corruption efforts in extractive industries. Resour Policy 49:41–50

304. Li Y, Umair M, Guliyeva S, Shakaraliyeva Z (2025) The extractive industries transparency initiative: Achieving disclosure, but falling short on corruption reduction. Extr Ind Soc 22:101602

305. Yanuardi Y, Vijge MJ, Biermann F (2021) Improving governance quality through global standard setting? Experiences from the Extractive Industries Transparency Initiative in Indonesia. Extr Ind Soc 8:100905

306. Sovacool BK, Walter G, Van De Graaf T, Andrews N (2016) Energy Governance, Transnational Rules, and the Resource Curse: Exploring the Effectiveness of the Extractive Industries Transparency Initiative (EITI). World Dev 83:179–192

307. Sovacool BK, Andrews N (2015) Does transparency matter? Evaluating the governance impacts of the Extractive Industries Transparency Initiative (EITI) in Azerbaijan and Liberia. Resour Policy 45:183–192

308. Kinda H, Thiombiano N (2024) Does transparency matter? Evaluating the Impacts of the Extractive Industries Transparency Initiative (EITI) on Deforestation in Resource-rich Developing Countries. World Dev 173:106431

309. Rustad SA, Le Billon P, Lujala P (2017) Has the Extractive Industries Transparency Initiative been a success? Identifying and evaluating EITI goals. Resour Policy 51:151–162

310. EITI (2020) Reporting Guidelines for companies buying oil, gas and minerals from governments. EITI International Secretariat, Oslo

311. Gunvor (2025) Brochures & Factsheets. https://gunvorgroup.com/media/brochures-factsheets. Accessed 26 Nov 2025

312. Mercuria (2024) Report on Payments to Governments.

313. Fitzgerald R (2016) The Rise of the Global Company: Multinationals and the Making of the Modern World. https://doi.org/10.1017/CBO9781139029209

314. Porter D, Anderson C (2021) Illicit financial flows in oil and gas commodity trade: Experience, lessons and proposals, OECD Publishing, Paris. OECD Publishing, Paris

315. OECD (2023) Oil commodity trading and addressing the risk of illicit financial flows. Development Co-operation Directorate, OECD Publishing, Paris

316. Mihalyi D, Hwang J, Rivetti D, Cust J (2021) Resource-Backed Loans in Sub-Saharan Africa. The World Bank, Washington D.C.

317. Brandt K (2023) Illicit financial flows and developing countries: A review of methods and evidence. J Econ Surv 37:789–820

318. FT (2017) Cargill chief warns against protectionist policies. Financ. Times

319. Faye S, Godar S, Moura C, Zucman G (2025) Global Offshore Wealth, 2001-2023. EUTAX Observatory

320. Brugger F, Proksik JJ (2024) The Battle over Policies to Curb Trade-Related Illicit Financial Flows: Findings from a Q-methodology Study. Rev Int Polit Dév. https://doi.org/10.4000/11q9d

321. Akhand Z, Mawani A (2023) Arm's Length Principle vs. Formulary Apportionment in BEPS Action 13: Stakeholders' Perspectives. Account Eur 20:225–243

322. Brugger F, Engebretsen R (2022) Defenders of the status quo: making sense of the international discourse on transfer pricing methodologies. Rev Int Polit Econ 29:307–335

323. Kastner T, Chaudhary A, Gingrich S, Marques A, Persson UM, Bidoglio G, Le Provost G, Schwarzmüller F (2021) Global agricultural trade and land system sustainability: Implications for ecosystem carbon storage, biodiversity, and human nutrition. One Earth 4:1425–1443

324. Dalin C, Rodríguez-Iturbe I (2016) Environmental impacts of food trade via resource use and greenhouse gas emissions. Environ Res Lett 11:035012

325. Meijaard E, Brooks TM, Carlson KM, et al (2020) The environmental impacts of palm oil in context. Nat Plants 6:1418–1426

326. Liu X, Klemeš JJ, Varbanov PS, Čuček L, Qian Y (2017) Virtual carbon and water flows embodied in international trade: a review on consumption-based analysis. J Clean Prod 146:20–28

327. Liu W, Antonelli M, Kummu M, Zhao X, Wu P, Liu J, Zhuo L, Yang H (2019) Savings and losses of global water resources in food-related virtual water trade. WIREs Water 6:e1320

328. Cabernard L, Pfister S (2022) Hotspots of Mining-Related Biodiversity Loss in Global Supply Chains and the Potential for Reduction through Renewable Electricity. Environ Sci Technol 56:16357–16368

329. Li H, Yang Z, Liu G, Casazza M, Yin X (2017) Analyzing virtual water pollution transfer embodied in economic activities based on gray water footprint: A case study. J Clean Prod 161:1064–1073

330. Tukker A, de Koning A, Owen A, Lutter S, Bruckner M, Giljum S, Stadler K, Wood R, Hoekstra R (2018) Towards Robust, Authoritative Assessments of Environmental Impacts Embodied in Trade: Current State and Recommendations. J Ind Ecol 22:585–598

331. Meemken E-M, Barrett CB, Michelson HC, Qaim M, Reardon T, Sellare J (2021) Sustainability standards in global agrifood supply chains. Nat Food 2:758–765

332. Cabernard L, Pfister S, Hellweg S (2024) Biodiversity impacts of recent land-use change driven by increases in agri-food imports. Nat Sustain 7:1512–1524

333. Calderon JL, Bazilian M, Sovacool B, Greene S (2020) Responsible or reckless? A critical review of the environmental and climate assessments of mineral supply chains. Environ Res Lett 15:103009

334. MacDonald GK, Brauman KA, Sun S, Carlson KM, Cassidy ES, Gerber JS, West PC (2015) Rethinking Agricultural Trade Relationships in an Era of Globalization. BioScience 65:275–289

335. Abrhám J, Vošta M, Čajka P, Rubáček F (2021) The specifics of selected agricultural commodities in international trade. Agric Resour Econ Int Sci E-J 7:5–19

336. Giljum S, Maus V, Sonter L, Luckeneder S, Werner T, Lutter S, Gershenzon J, Cole MJ, Siqueira-Gay J, Bebbington A (2025) Metal mining is a global driver of environmental change. Nat Rev Earth Environ 6:441–455

337. Hickel J, Dorninger C, Wieland H, Suwandi I (2022) Imperialist appropriation in the world economy: Drain from the global South through unequal exchange, 1990–2015. Glob Environ Change 73:102467

338. Dorninger C, Hornborg A, Abson DJ, Von Wehrden H, Schaffartzik A, Giljum S, Engler J-O, Feller RL, Hubacek K, Wieland H (2021) Global patterns of ecologically unequal exchange: Implications for sustainability in the 21st century. Ecol Econ 179:106824

339. Hickel J, Hanbury L, Barbour F, Mao X, Sullivan D, Zoomkawala H (2025) Unequal exchange. Glob. Inequal.

340. Wood R, Stadler K, Simas M, Bulavskaya T, Giljum S, Lutter S, Tukker A (2018) Growth in Environmental Footprints and Environmental Impacts Embodied in Trade: Resource Efficiency Indicators from EXIOBASE3. J Ind Ecol 22:553–564

341. Taherzadeh O, Caro D (2019) Drivers of water and land use embodied in international soybean trade. J Clean Prod 223:83–93

342. Sun L, Zhou W, Zhu X, Xia X (2023) Deforestation embodied in global trade: Integrating environmental extended input-output method and complex network analysis. J Environ Manage 325:116479

343. Pendrill F, Persson UM, Godar J, Kastner T (2019) Deforestation displaced: trade in forest-risk commodities and the prospects for a global forest transition. Environ Res Lett 14:055003

344. Wiebe KS, Yamano N (2016) Estimating CO_2 emissions embodied in final demand and trade using the OECD ICIO 2015: methodology and results.

345. Dhakal S, Minx JC, Toth FL, et al (2023) Emissions Trends and Drivers. Clim Change 2022 – Mitig Clim Change Work Group III Contrib Sixth Assess Rep Intergov Panel Clim Change 215–294

346. Xu Y, Dietzenbacher E (2014) A structural decomposition analysis of the emissions embodied in trade. Ecol Econ 101:10–20

347. Peters GP, Minx JC, Weber CL, Edenhofer O (2011) Growth in emission transfers via international trade from 1990 to 2008. Proc Natl Acad Sci 108:8903–8908

348. Wood R, Grubb M, Anger-Kraavi A, Pollitt H, Rizzo B, Alexandri E, Stadler K, Moran D, Hertwich E, Tukker A (2020) Beyond peak emission transfers: historical impacts of globalization and future impacts of climate policies on international emission transfers. Clim Policy 20:S14–S27

349. BFS (2025) Material and greenhouse gas footprint of Switzerland. Bundesamt für Statistik BFS/Federal Statistical Office (BFS), Neuchâtel

350. Hasanbeigi A, Darwili A (2022) Embodied carbon in trade: Carbon loophole. Glob Effic Intell 7–15

351. Mi Z, Meng J, Green F, Coffman DM, Guan D (2018) China's 'Exported Carbon' Peak: Patterns, Drivers, and Implications. Geophys Res Lett 45:4309–4318

352. Fan J-L, Wang Q, Yu S, Hou Y-B, Wei Y-M (2017) The evolution of CO2 emissions in international trade for major economies: a perspective from the global supply chain. Mitig Adapt Strateg Glob Change 22:1229–1248

353. Evrard A, Tchobanian C, Gateau F, Lhommeau B, Pujol S (2022) One third of the European Union's carbon footprint is due to its imports. Institut national de la statistique et des études économiques-Insee, Montrouge Cedex, France

354. Cezar R, Polge T (2020) CO_2 emissions in French international trade [Les émissions de CO_2 dans les échanges internationaux de la France]. Bull. Banq. Fr.

355. Yamano N, Guilhoto J (2020) CO_2 emissions embodied in international trade and domestic final demand: Methodology and results using the OECD Inter-Country Input-Output Database. OECD Sci Technol Ind Work Pap 2020:1–57

356. Herweijer C, Evison W, Mariam S, Khatri A, Albani M, Semov A, Long E Nature risk rising: Why the crisis engulfing nature matters for business and the economy. World Econ. Forum PwC

357. Linsley P, Abdelbadie R (2023) The Taskforce on Nature-related Financial Disclosures must engage widely and justify its market-led approach. Nat Ecol Evol 7:1343–1346

358. Green JMH, Croft SA, Durán AP, et al (2019) Linking global drivers of agricultural trade to on-the-ground impacts on biodiversity. Proc Natl Acad Sci 116:23202–23208

359. Lenzen M, Moran D, Kanemoto K, Foran B, Lobefaro L, Geschke A (2012) International trade drives biodiversity threats in developing nations. Nature 486:109–112

360. Page S, Mishra S, Agus F, et al (2022) Anthropogenic impacts on lowland tropical peatland biogeochemistry. Nat Rev Earth Environ 3:426–443

361. Evers S, Yule CM, Padfield R, O'Reilly P, Varkkey H (2017) Keep wetlands wet: the myth of sustainable development of tropical peatlands – implications for policies and management. Glob Change Biol 23:534–549

362. Albert JS, Carnaval AC, Flantua SGA, et al (2023) Human impacts outpace natural processes in the Amazon. Science 379:eabo5003

363. Lamers LPM, Vile MA, Grootjans AP, et al (2015) Ecological restoration of rich fens in Europe and North America: from trial and error to an evidence-based approach. Biol Rev 90:182–203

364. Zheng H, Wang L, Peng W, et al (2019) Realizing the values of natural capital for inclusive, sustainable development: Informing China's new ecological development strategy. Proc Natl Acad Sci 116:8623–8628

365. Prangel E, Kasari-Toussaint L, Neuenkamp L, et al (2023) Afforestation and abandonment of semi-natural grasslands lead to biodiversity loss and a decline in ecosystem services and functions. J Appl Ecol 60:825–836

366. Feuerbacher A (2025) Pollinator declines, international trade and global food security: Reassessing the global economic and nutritional impacts. Ecol Econ 232:108565

367. Saad R, Koellner T, Margni M (2013) Land use impacts on freshwater regulation, erosion regulation, and water purification: a spatial approach for a global scale level. Int J Life Cycle Assess 18:1253–1264

368. Hasan SS, Zhen L, Miah MG, Ahamed T, Samie A (2020) Impact of land use change on ecosystem services: A review. Environ Dev 34:100527

369. La Notte A, Marques A, Petracco M, Paracchini ML, Zurbaran-Nucci M, Grammatikopoulou I, Tamborra M (2025) The assessment of nature-related risks: From ecosystem services vulnerability to economic exposure and financial disclosures. Ecol Econ 235:108636

370. D'Odorico P, Carr J, Dalin C, et al (2019) Global virtual water trade and the hydrological cycle: patterns, drivers, and socio-environmental impacts. Environ Res Lett 14:053001

371. Allan JA (1998) Virtual water: a strategic resource. Ground Water 36:545–547

372. Tamea S, Tuninetti M, Soligno I, Laio F (2021) Virtual water trade and water footprint of agricultural goods: the 1961–2016 CWASI database. Earth Syst Sci Data 13:2025–2051

373. Steen-Olsen K, Weinzettel J, Cranston G, Ercin AE, Hertwich EG (2012) Carbon, Land, and Water Footprint Accounts for the European Union: Consumption, Production, and Displacements through International Trade. Environ Sci Technol 46:10883–10891

374. Chen W, Kang J-N, Han MS (2021) Global environmental inequality: Evidence from embodied land and virtual water trade. Sci Total Environ 783:146992

375. Rosa L, Chiarelli DD, Tu C, Rulli MC, D'Odorico P (2019) Global unsustainable virtual water flows in agricultural trade. Environ Res Lett 14:114001

376. Pfister S, Bayer P, Koehler A, Hellweg S (2011) Environmental Impacts of Water Use in Global Crop Production: Hotspots and Trade-Offs with Land Use. Environ Sci Technol 45:5761–5768

377. Chapagain AK, Hoekstra AY, Savenije HHG, Gautam R (2006) The water footprint of cotton consumption: An assessment of the impact of worldwide consumption of cotton products on the water resources in the cotton producing countries. Ecol Econ 60:186–203

378. Serrano A, Guan D, Duarte R, Paavola J (2016) Virtual Water Flows in the EU27: A Consumption-based Approach. J Ind Ecol 20:547–558

379. Weinzettel J, Pfister S (2019) International trade of global scarce water use in agriculture: Modeling on watershed level with monthly resolution. Ecol Econ 159:301–311

380. Graham NT, Hejazi MI, Kim SH, Davies EGR, Edmonds JA, Miralles-Wilhelm F (2020) Future changes in the trading of virtual water. Nat Commun 11:3632

381. Ma T, Wang Y (2021) Globalization and environment: Effects of international trade on emission intensity reduction of pollutants causing global and local concerns. J Environ Manage 297:113249

382. Yasmeen R, Li Y, Hafeez M (2019) Tracing the trade–pollution nexus in global value chains: evidence from air pollution indicators. Environ Sci Pollut Res 26:5221–5233

383. Oita A, Malik A, Kanemoto K, Geschke A, Nishijima S, Lenzen M (2016) Substantial nitrogen pollution embedded in international trade. Nat Geosci 9:111–115

384. Balazs C, Morello-Frosch R, Hubbard A, Ray I (2011) Social disparities in nitrate-contaminated drinking water in California's San Joaquin Valley. Env Health Perspect 119:1272–8

385. Rasmussen KH, Setiawati MD (2025) Water Unequal Exchange: Embedded Groundwater, Chemicals, and Wastewater in Textile Trade from Bangladesh to the EU and the USA (2000–2023). Sustainability 17:4818

386. Wang H, Zhang Y, Zhao H, et al (2017) Trade-driven relocation of air pollution and health impacts in China. Nat Commun 8:738

387. Zhao HY, Zhang Q, Guan DB, Davis SJ, Liu Z, Huo H, Lin JT, Liu WD, He KB (2015) Assessment of China's virtual air pollution transport embodied in trade by using a consumption-based emission inventory. Atmos Chem Phys 15:5443–5456

388. Lin J, Pan D, Davis SJ, Zhang Q, He K, Wang C, Streets DG, Wuebbles DJ, Guan D (2014) China's international trade and air pollution in the United States. Proc Natl Acad Sci 111:1736–1741

389. Wirtu YD, Tucho GT (2022) E-waste: Growing environmental and health problems and its management alternatives in developing countries. Environ Rev 30:524–536

390. Cotta B (2020) What goes around, comes around? Access and allocation problems in Global North–South waste trade. Int Environ Agreem Polit Law Econ 20:255–269

391. Ádám B, Göen T, Scheepers PTJ, et al (2021) From inequitable to sustainable e-waste processing for reduction of impact on human health and the environment. Environ Res 194:110728

392. Perkins DN, Brune Drisse M-N, Nxele T, Sly PD (2014) E-Waste: A Global Hazard. Ann Glob Health 80:286–295

393. Schmidt CW (2006) Unfair trade e-waste in Africa. Environ Health Perspect 114:A232

394. Ilankoon IMSK, Ghorbani Y, Chong MN, Herath G, Moyo T, Petersen J (2018) E-waste in the international context – A review of trade flows, regulations, hazards, waste management strategies and technologies for value recovery. Waste Manag 82:258–275

395. Brooks AL, Wang S, Jambeck JR (2018) The Chinese import ban and its impact on global plastic waste trade. Sci Adv 4:eaat0131

396. Liang Y, Tan Q, Song Q, Li J (2021) An analysis of the plastic waste trade and management in Asia. Waste Manag 119:242–253

397. Kibria MG, Masuk NI, Safayet R, Nguyen HQ, Mourshed M (2023) Plastic Waste: Challenges and Opportunities to Mitigate Pollution and Effective Management. Int J Environ Res 17:20

398. Borrelle SB, Ringma J, Law KL, et al (2020) Predicted growth in plastic waste exceeds efforts to mitigate plastic pollution. Science 369:1515–1518

399. Verma R, Vinoda KS, Papireddy M, Gowda ANS (2016) Toxic Pollutants from Plastic Waste- A Review. Procedia Environ Sci 35:701–708

400. MacLeod M, Arp HPH, Tekman MB, Jahnke A (2021) The global threat from plastic pollution. Science 373:61–65

401. Cowan EC, Wagner M, Kantai T, Lit FC, Huijben B, Paredis E, Cloodt M, Raubenheimer K, Vandenberg JM, Bharadwaj B (2025) The Global Plastic Treaty Odyssey. One Earth 8:101310

402. Dreyer E, Hansen T, Holmberg K, Kielhöfer L, Olsen T, Stripple J (2025) Towards a global plastics treaty: Navigating policy preferences and economic interests. Camb Prisms Plast 3:e36

403. Lambin EF, Furumo PR (2023) Deforestation-Free Commodity Supply Chains: Myth or Reality? Annu Rev Environ Resour 48:237–261

404. Gardner TA, Benzie M, Börner J, et al (2019) Transparency and sustainability in global commodity supply chains. World Dev 121:163–177

405. Kemper L, Sampson G, Larrea C, Schlatter B, Luna E, Dang TD, Willer H (2025) The State of Sustainable Markets 2025: Statistics and emerging trends. International Trade Centre, Geneva

406. Auzepy A, Tönjes E, Lenz D, Funk C (2023) Evaluating TCFD reporting – A new application of zero-shot analysis to climate-related financial disclosures. PLOS ONE 18:e0288052

407. Irvine-Broque A, Dempsey J (2023) Risky business: Protecting nature, protecting wealth? Conserv Lett 16:e12969

408. Jones M, Polasky S, Rueda X, et al (2026) IPBES Business and Biodiversity Assessment: Summary for Policymakers. https://doi.org/10.5281/ZENODO.15369060

409. Kulionis V, Dietzenbacher E (2025) Global carbon footprints: a detailed look at affluence and technology effects. Environ Res Commun 7:071003

410. Knight D, Ehrlich R, Cois A, Fielding K, Grant AD, Churchyard G (2020) Predictors of silicosis and variation in prevalence across mines among employed gold miners in South Africa. BMC Public Health 20:829

411. Mbuya AW, Mboya IB, Semvua HH, Mamuya SH, Howlett PJ, Msuya SE (2024) Prevalence and determinants of evidence of silicosis and impaired lung function among small scale tanzanite miners and the peri-mining community in northern Tanzania. PLOS Glob Public Health 4:e0002770

412. Erol I, Aydin H, Didari V, Ural S (2013) Pneumoconiosis and quartz content of respirable dusts in the coal mines in Zonguldak, Turkey. Int J Coal Geol 116–117:26–35

413. Akbar KA, Kallawicha K (2024) Black Lung Disease among Coal Miners: First Ever Evidence from Indonesia's National Coal Production Report. Aerosol Air Qual Res 24:240161

414. Vinnikov D (2016) Drillers and mill operators in an open-pit gold mine are at risk for impaired lung function. J Occup Med Toxicol 11:27

415. Rodríguez-Zamora MG, Medina-Escobar L, Mora G, Zock J-P, Van Wendel De Joode B, Mora AM (2017) Dust exposure in workers from grain storage facilities in Costa Rica. Int J Hyg Environ Health 220:1039–1045

416. Mabila SL, Almberg KS, Friedman L, Cohen RA, Ndlovu N, Vorajee N, Murray J (2020) Effects of commodity on the risk of emphysema in South African miners. Int Arch Occup Environ Health 93:315–323

417. Mabila SL, Almberg KS, Friedman L, Cohen R, Ndlovu N, Vorajee N, Murray J (2018) Occupational emphysema in South African miners at autopsy; 1975–2014. Int Arch Occup Environ Health 91:981–990

418. Mayala LP, Veiga MM, Khorzoughi MB (2016) Assessment of mine ventilation systems and air pollution impacts on artisanal tanzanite miners at Merelani, Tanzania. J Clean Prod 116:118–124

419. Ndlovu N, Musenge E, Park SK, Girdler-Brown B, Richards G, Murray J (2018) Four decades of pulmonary tuberculosis in deceased South African miners: trends and determinants. Occup Environ Med 75:767–775

420. Konaté AA, Kaba F, Hébélamou J, Traoré F (2025) Evaluation of the geo-environmental, socio-economic, and health impacts of artisanal gold mining in the sub-prefecture of Kounsitel, Gaoual. Discov Appl Sci 7:740

421. Aram SA (2021) Managing occupational health among goldminers in Ghana: Modelling the likelihood of experiencing occupational related health problems. PLOS ONE 16:e0254449

422. Joe-Asare T, Stemn E, Amegbey N (2023) Causal and contributing factors of accidents in the Ghanaian mining industry. Saf Sci 159:106036

423. Dursun AE (2020) Statistical analysis of methane explosions in Turkey's underground coal mines and some recommendations for the prevention of these accidents: 2010–2017. Nat Hazards 104:329–351

424. Otgonnasan A, Damdinbazar O, Damiran N, Erdenebayar E, Yundendorj G (2023) Diseases-attributable disability-adjusted life years in copper and molybdenum ore workers in Mongolia: 1999–2019. Int J Environ Health Res 33:661–669

425. Sahito WS, Bazuhair RW, Mimesh H (2022) Workstation Evaluation Regarding Ergonomic Awareness and Work-Related Musculoskeletal Disorders Among Coal Mine Workers. Eng Technol Appl Sci Res 12:8284–8288

426. Abaya S, Bråtveit M, Deressa W, Kumie A, Moen B (2025) Occupational Noise Exposure and Self-Reported Hearing Loss amongst Workers in Primary Coffee Processing Factories in Ethiopia. Noise Health 27:516–525

427. Tank ND, Rupani MP, Shah IA, Dhatrak SV (2024) Prevalence and predictors of high-frequency hearing loss among mine workers in Gujarat, western India: a cross-sectional study on the need to implement a comprehensive hearing conservation program. Int Arch Occup Environ Health 97:365–375

428. Vergara-Murillo F, González-Ospino S, Cepeda-Ortega N, Pomares-Herrera F, Johnson-Restrepo B (2022) Adverse Health Effects and Mercury Exposure in a Colombian Artisanal and Small-Scale Gold Mining Community. Toxics 10:723

429. Afrifa J, Essien-Baidoo S, Ephraim RKD, Nkrumah D, Dankyira DO (2017) Reduced egfr, elevated urine protein and low level of personal protective equipment compliance among artisanal small scale gold miners at Bibiani-Ghana: a cross-sectional study. BMC Public Health 17:601

430. Nandi S, Nimje S, Dhumne U, Dhatrak S (2020) Pulmonary tuberculosis among stone miners of India vis-à-vis silica exposure. Indian J Occup Environ Med 24:102

431. Tiwari M, Gupta M, Gokhale S (2025) Pulmonary impairment and its severity associated with particulate pollution near coal mines. Air Qual Atmosphere Health 18:3961–3973

432. Iyaloo S, Kootbodien T, Naicker N, Kgalamono S, Wilson KS, Rees D (2020) Respiratory Health in a Community Living in Close Proximity to Gold Mine Waste Dumps, Johannesburg, South Africa. Int J Environ Res Public Health 17:2240

433. Asmus CIRF, Mazoto ML, Figueiredo ND de, et al (2025) Health profile and metal exposure over three years in a child cohort study, Bruminha Project. Rev Saude Publica 59:e30

434. Armah FA, Luginaah I, Obiri S (2012) Assessing environmental exposure and health impacts of gold mining in Ghana. Toxicol Environ Chem 94:786–798

435. Arbex MA, Pereira LAA, Carvalho-Oliveira R, Saldiva PHDN, Braga ALF (2014) The effect of air pollution on pneumonia-related emergency department visits in a region of extensive sugar cane plantations: a 30-month time-series study. J Epidemiol Community Health 68:669–674

436. Amaya Lara JL, Rodríguez García J, Peñaloza Quintero RE, Mejía Rocha MM (2025) Factors associated with respiratory symptoms in communities living near to and away from the railway used for coal transportation in La Guajira, Colombia. Int J Occup Med Environ Health. https://doi.org/10.13075/ijomeh.1896.02424

437. Kasa VP, Samal B, Mittal C, Dubey BK, Das S, Sahu SK, Pujari M, Swain S, Jagu S, Tripathi U (2025) Respiratory health impacts of opencast coal mining in India: an epidemiological study. Air Qual Atmosphere Health 18:3915–3929

438. Yussef MGA, Santos MD, Penteado JO, Soares MCF, Muccillo-Baisch AL, Silva Júnior FMRD (2024) Lung function in children residents in the largest coal region in Brazil. An Acad Bras Ciênc 96:e20240270

439. Khan NU, Ali A, Khudadad U, Khan UR, Ali N, Soomar SM, Abid S, Jilani M, Jamali S, Razzak JA (2023) Challenges and health outcomes of the exposure to soybean dust in the harbor neighborhood of Karachi, Pakistan: a wake-up call. J Health Popul Nutr 42:136

440. Butscher F-M, Rakete S, Tobollik M, Mambrey V, Moyo D, Shoko D, Muteti-Fana S, Steckling-Muschack N, Bose-O'Reilly S (2020) Health-related quality of life (EQ-5D + C) among people living in artisanal and small-scale gold mining areas in Zimbabwe: a cross-sectional study. Health Qual Life Outcomes 18:284

441. Cavalheiro Paulelli AC, Cruz JC, Rocha BA, et al (2023) Association between urinary concentrations of toxic metals/metalloids and oxidative stress in Brazilians living in areas affected by the Fundão dam failure. Environ Res 238:117307

442. Milindi CS, Lubaba CB, Mokassa JL, Kaniki A, Ekwalanga MB, Muganza A, Kalau WAA (2025) Association between bone trace metal accumulation and idiopathic aseptic osteonecrosis of the femoral head in a mining region of Katanga (DR Congo). J Orthop Surg 20:960

443. Bjørklund G, Semenova Y (2025) Serum levels of glycosylated hemoglobin, insulin, total protein and their association with somatoform disorder in environmentally exposed populations in Kazakhstan. Environ Toxicol Pharmacol 114:104637

444. Kumar S, Priyaranjan, Basak D, Dasgupta B, Nastaran Quazi SS, Kumar A (2022) Oral Health Status and Treatment Needs of Chromium Mine Workers in India. Indian J Occup Environ Med 26:172–177

445. Moraes NGDR, Bonifácio ADS, Reis FO, Velho TDA, Ramires PF, Brum RDL, Penteado JO, Da Silva Júnior FMR (2024) Frequencies of micronuclei in buccal cells and their spatial distribution in a population living in proximity to coal mining areas in southern Brazil. Mutat Res - Genet Toxicol Environ Mutagen 897:503783

446. León-Mejía G, Rueda RA, Pérez Pérez J, et al (2023) Analysis of the cytotoxic and genotoxic effects in a population chronically exposed to coal mining residues. Environ Sci Pollut Res 30:54095–54105

447. Huang Q, Khan GD, Yoshida Y (2023) Assessing Health and Dietary Issues of Households Displaced Due to the Aynak Copper Mine Project, Afghanistan. Extr Ind Soc 15:101299

448. Sanna A, Lambert Y, Pelleau S, Musset L, Lazrek Y, Hureau L, Cairo H, Vreden S, White M, Douine M (2025) Assessment of Plasmodium vivax transmission and asymptomatic carriage risk among artisanal gold miners in western French Guiana, 2014–2020. Infect Dis Poverty 14:40

449. Knoblauch AM, Farnham A, Zabré HR, et al (2020) Community Health Impacts of the Trident Copper Mine Project in Northwestern Zambia: Results from Repeated Cross-Sectional Surveys. Int J Environ Res Public Health 17:3633

450. Dietler D, Farnham A, Loss G, Fink G, Winkler MS (2021) Impact of mining projects on water and sanitation infrastructures and associated child health outcomes: a multi-country analysis of Demographic and Health Surveys (DHS) in sub-Saharan Africa. Glob Health 17:70

451. Knoblauch A, Divall M, Owuor M, Archer C, Nduna K, Ng'uni H, Musunka G, Pascall A, Utzinger J, Winkler M (2017) Monitoring of Selected Health Indicators in Children Living in a Copper Mine Development Area in Northwestern Zambia. Int J Environ Res Public Health 14:315

452. Fuhrimann S, Van Den Brenk I, Atuhaire A, Mubeezi R, Staudacher P, Huss A, Kromhout H (2022) Recent pesticide exposure affects sleep: A cross-sectional study among smallholder farmers in Uganda. Environ Int 158:106878

453. Buralli R, Nazli SN, Cordoba L, Quiros-Alcala L, Hyland C, Muñoz-Quezada MT, Farías P, Handal AJ (2025) Children's environmental and occupational exposures to pesticides in low- and middle-income countries rural areas – an elephant in the room. Sci Total Environ 990:179887

454. Shekhar C, Khosya R, Thakur K, et al (2024) A Systematic Review of Pesticide Exposure, Associated Risks, and Long-Term Human Health Impacts. Toxicology Reports 13: 101840. https://doi.org/10.1016/j.toxrep.2024.101840

455. Pidoux N, De Hoogh K, Petitpierre A, Zinsstag L, Fuhrimann S (2025) Estimating past residential exposure to respiratory irritant pesticides in Valais, Switzerland: A crop exposure matrix informed by a Delphi expert survey. Environ Chall 21:101337

456. Staudacher P, Brugger C, Winkler MS, Stamm C, Farnham A, Mubeezi R, Eggen RIL, Günther I (2021) What agro-input dealers know, sell and say to smallholder farmers about pesticides: a mystery shopping and KAP analysis in Uganda. Environ Health 20:100

457. Staudacher P, Fuhrimann S, Farnham A, Mora AM, Atuhaire A, Niwagaba C, Stamm C, Eggen RI, Winkler MS (2020) Comparative Analysis of Pesticide Use Determinants Among Smallholder Farmers From Costa Rica and Uganda. Environ Health Insights 14:1178630220972417

458. Proksik JJ, Brugger F, Ayanore MA, Adongo PB (2025) An exploratory methodological approach to enhancing public health policy in Ghana's mining operations. Environ Impact Assess Rev 112:107817

459. Proksik JJ, Brugger F, Cossa H, Chavane L, Macete E (2024) Using Q-methodology for policy research and stakeholder engagement to strengthen public health in large-scale mining in Mozambique. Sustain Dev 33:1298–1314

460. Proksik JJ, Brugger F, Konkobo HM, Zabré HR, Diagbouga SP (2023) Exploring the policy space for public health in large-scale mining in Burkina Faso: A Q-methodology study. Resour Policy 86:104153

461. Brugger F, Proksik JJ, Cambaço O, Lyatuu I, Adongo P, Ayanore MA, Winkler MS (2025) 'Knowing how the machine works': a novel framework for engaging with the political determinants of health. BMJ Glob Health 10:e019640

462. IFC (2009) Introduction to Health Impact Assessment.

463. EPA (2020) The Equator Principles. A financial industry benchmark for determining, assessing and managing environmental and social risk in projects.

464. ICMM (2022) Mining Principles. Performance Expectations. International Council on Mining and Metals (ICMM)

465. IPIECA (2023) Ipieca Principles. Advancing environmental and social performance across the energy transition.

466. Dietler D, Lewinski R, Azevedo S, Engebretsen R, Brugger F, Utzinger J, Winkler MS (2020) Inclusion of Health in Impact Assessment: A Review of Current Practice in Sub-Saharan Africa. Int J Environ Res Public Health 17:4155

467. Engebretsen REH, Brugger F (2021) Divergent corporates: Explaining mining companies divergent performance in health impact assessments. Resour Policy 74:102355

468. Kesselring R (2025) Extraction, Global Commodity Trade, and Urban Development in Zambia's Northwestern Province. ZED Books/Bloomsbury Publishing

469. Shiquan D, Amuakwa-Mensah F, Deyi X, Yue C, Yue C (2022) The impact of mineral resource extraction on communities: How the vulnerable are harmed. Extr Ind Soc 10:101090

470. Leuenberger A, Winkler MS, Cambaco O, Cossa H, Kihwele F, Lyatuu I, Zabré HR, Farnham A, Macete E, Munguambe K (2021) Health impacts of industrial mining on surrounding communities: Local perspectives from three sub-Saharan African countries. PLOS ONE 16:e0252433

471. Loayza N, Rigolini J (2016) The Local Impact of Mining on Poverty and Inequality: Evidence from the Commodity Boom in Peru. World Dev 84:219–234

472. Gamu J, Le Billon P, Spiegel S (2015) Extractive industries and poverty: A review of recent findings and linkage mechanisms. Extr Ind Soc 2:162–176

473. Marais L, Denoon-Stevens S, Cloete J (2020) Mining towns and urban sprawl in South Africa. Land Use Policy 93:103953

474. Howe LB (2022) The spatiality of poverty and popular agency in the GCR: constituting an extended urban region. Urban Geogr 43:1287–1308

475. Bryceson DF, Gough KV, Jønsson JB, Kinabo C, Shand MC, Rodrigues CU, Yankson PWK (2022) Mineralized urbanization in Africa in the twenty-first century: Becoming Urban through Mining Extraction. Int J Urban Reg Res 46:342–369

476. Kirshner J, Power M (2015) Mining and extractive urbanism: Postdevelopment in a Mozambican boomtown. Geoforum 61:67–78

477. Hirschman AO (1964) The Strategy of Economic Development. Yale University Press

478. Moritz T, Ejdemo T, Söderholm P, Wårell L (2017) The local employment impacts of mining: an econometric analysis of job multipliers in northern Sweden. Miner Econ 30:53–65

479. Ireland G, Collier P (2018) Shared-use mining infrastructure: Why it matters and how to achieve it. Dev Policy Rev 36:51–68

480. Weldegiorgis FS, Dietsche E, Franks DM (2021) Building mining's economic linkages: A critical review of local content policy theory. Resour Policy 74:102312

481. Atienza M, Arias-Loyola M, Lufin M (2020) Building a case for regional local content policy: The hollowing out of mining regions in Chile. Extr Ind Soc 7:292–301

482. Atienza M, Lufin M, Soto J (2021) Mining linkages in the Chilean copper supply network and regional economic development. Resour Policy 70:101154

483. Kragelund P (2024) The Mining Industry and Local Content Policy in Zambia. Oxf Handb Zamb Econ. https://doi.org/10.1093/oxfordhb/9780192864222.013.45

484. Ross M (1999) The Political Economy of the Resource Curse. World Polit 51:297–322

485. Pengl Y, Cederman L-E (2022) Digging Deeper: On the Role of Grievances in African Mining Conflicts. Nat Resour Inequal Confl. https://doi.org/10.1007/978-3-030-73558-6_4

486. di John J (2007) Oil Abundance and Violent Political Conflict: A Critical Assessment. J Dev Stud 961–986

487. Le Billon P (2003) Fuelling War: Natural Resources and Armed Conflicts. Oxford University Press, Oxford and New York

488. Bebbington A, Williams M (2008) Water and Mining Conflicts in Peru. Mt Res Dev 28:190–195

489. Salem J, Amonkar Y, Maennling N, Lall U, Bonnafous L, Thakkar K (2021) An analysis of Peru: Is water driving mining conflicts? Resour Policy. https://doi.org/10.1016/j.resourpol.2018.09.010

490. Vasquez PI (2014) Oil Sparks in the Amazon. Local Conflicts, Indigenous Populations, and Natural Resources.

491. Haslam PA, Ary Tanimoune N (2016) The Determinants of Social Conflict in the Latin American Mining Sector: New Evidence with Quantitative Data. World Dev 78:401–419

492. Pegg S, Zabbey N (2013) Oil and water: the Bodo spills and the destruction of traditional livelihood structures in the Niger Delta. Community Dev J 48:391–405

493. Engels B (2018) Nothing will be as before: Shifting political opportunity structures in protests against gold mining in Burkina Faso. Extr Ind Soc 5:354–362

494. Engels B (2017) Not All Glitter Is Gold: Mining Conflicts in Burkina Faso. Contested Extr Soc State 149–169

495. Patel K, Rogan J, Cuba N, Bebbington A (2016) Evaluating conflict surrounding mineral extraction in Ghana: Assessing the spatial interactions of large and small-scale mining. Extr Ind Soc 3:450–463

496. Garvin T, McGee TK, Smoyer-Tomic KE, Aubynn EA (2009) Community-company relations in gold mining in Ghana. J Env Manage 90:571–86

497. Bezzola S (2022) Fueling Conflicts by Sharing Benefits? Qualitative Evidence from a Mining Conflict in Burkina Faso. Nat Resour Inequal Confl 185–215

498. Welker MA (2009) 'Corporate Security Begins in the Community': Mining, the Corporate Social Responsibility Industry, and Environmental Advocacy in Indonesia. Cult Anthropol 24:142–179

499. Furstenberg S, Toktomushev K (2021) Understanding gold mining and social conflicts in Kyrgyzstan. University of Central Asia – Institute of Public Policy and Administration (IPPA)

500. Wessman H, Salmi O, Kohl J, Kinnunen P, Saarivuori E, Mroueh U-M (2014) Water and society: mutual challenges for eco-efficient and socially acceptable mining in Finland. J Clean Prod 84:289–298

501. Ali SH (2009) Mining, the Environment, and Indigenous Development Conflicts.

502. Andrews T, Elizalde B, Le Billon P, Oh CH, Reyes D, Thomson I (2017) The Rise in Conflict Associated with Mining Operations: What Lies Beneath? https://doi.org/10.13140/RG.2.2.36488.62720

503. Bezzola S, Günther I, Brugger F, Lefol E (2022) CSR and local conflicts in African mining communities. World Dev. https://doi.org/10.1016/j.worlddev.2022.105968

504. Karwowski M, Raulinajtys-Grzybek M (2021) The application of corporate social responsibility (CSR) actions for mitigation of environmental, social, corporate governance (ESG) and reputational risk in integrated reports. Corp Soc Responsib Environ Manag 28:1270–1284

505. RMF (2019) Mine-site ESG data disclosure by small and mid-tier mining companies.

506. Christensen HB, Hail L, Leuz C (2021) Mandatory CSR and sustainability reporting: economic analysis and literature review. Rev Account Stud 26:1176–1248

507. Callahan MJ, Larcker DF, Tayan B (2021) The General Counsel View of ESG Risk. Stanf. Closer Look Ser.

508. Dell'Angelo J, Navas G, Witteman M, D'Alisa G, Scheidel A, Temper L (2021) Commons grabbing and agribusiness: Violence, resistance and social mobilization. Ecol Econ 184:107004

509. Gerber J (2011) Conflicts over industrial tree plantations in the South: Who, how and why? Glob Environ Change-Hum Policy Dimens 21:165–176

510. Pérez-Rincón M, Vargas-Morales J, Martínez-Alier J (2019) Mapping and Analyzing Ecological Distribution Conflicts in Andean Countries. Ecol Econ. https://doi.org/10.1016/j.ecolecon.2018.11.004

511. Sauer S (2018) Soy expansion into the agricultural frontiers of the Brazilian Amazon: The agribusiness economy and its social and environmental conflicts. Land Use Policy. https://doi.org/10.1016/j.landusepol.2018.08.030

512. Suryadi S, Dharmawan A, Barus B (2021) Expansion and Conflict at Oil Palm Plantations: A Case in Terantang Manuk Village, Pelalawan District, Riau. 8:167–178

513. Augstburger H, Käser F, Rist S (2019) Assessing Food Systems and Their Impact on Common Pool Resources and Resilience. Land 8:71

514. Bebber D (2022) The long road to a sustainable banana trade. Plants People Planet. 5: 662-671. https://doi.org/10.1002/ppp3.10331

515. Alvarado MA, Ramírez MS (2021) Trabajo asalariado en el monocultivo de piña en la Región Huetar Norte. https://doi.org/10.15517/rr.v0i0.46002

516. Ali A (2025) International agrarian conflict on palm oil plantations in Indonesia. J Law Sci. https://doi.org/10.35335/jls.v7i1.5875

517. Van Leeuwen M, Mathys G, De Vries L, Van Der Haar G (2020) From resolving land disputes to agrarian justice – dealing with the structural crisis of plantation agriculture in eastern DR Congo. J Peasant Stud 49:309–334

518. Crost B, Felter J (2020) Export Crops and Civil Conflict. J Eur Econ Assoc. https://doi.org/10.1093/jeea/jvz025

519. Grasse D (2022) Oil Crops and Social Conflict: Evidence From Indonesia. J Confl Resolut 66:1422–1448

520. Reis T, Ribeiro V, Garrett R, Kuemmerle T, Rufin P, Guidotti V, Amaral P, Meyfroidt P (2023) Explaining the stickiness of supply chain relations in the Brazilian soybean trade. Glob Environ Change. https://doi.org/10.1016/j.gloenvcha.2022.102633

521. Roger A (2025) Local Struggles as a Resource for Multinational Corporations: Romanian Farm Managers Facing Agricultural Commodity Traders. New Countryside. https://doi.org/10.55121/nc.v4i1.320

522. Alimahomed-Wilson J, Ness I (2018) Choke Points. Pluto Press, London

523. Sowers EA, Ciccantell PS, Smith DA (2017) Are Transport and Raw Materials Nodes in Global Commodity Chains Potential Places for Worker/Movement Organization? J Labor Soc 20:185–205

524. Clapp J, Isakson SR (2018) Risky Returns: The Implications of Financialization in the Food System. Dev Change 49:437–460

525. Goldthau A, Hughes L (2021) Saudi on the Rhine? Explaining the emergence of private governance in the global oil market. Rev Int Polit Econ 28:1410–1432

526. Rams D (2024) Commodity and supply chains. Open Encycl Anthropol. https://doi.org/10.29164/24commoditychains

527. Kesselring R, Leins S, Schulz Y (2019) Valueworks Effects of Financialization along the Copper Value Chain.

528. Dobler G, Kesselring R (2019) Swiss extractivism: Switzerland's role in Zambia's copper sector. J Mod Afr Stud 57:223–245

529. Hossain M, Islam MdT, Momin MA, Nahar S, Alam MdS (2019) Understanding Communication of Sustainability Reporting: Application of Symbolic Convergence Theory (SCT). J Bus Ethics 160:563–586

530. Fracarolli Nunes M, Lee Park C (2017) Self-claimed sustainability: Building social and environmental reputations with words. Sustain Prod Consum 11:46–57

531. Lublóy Á, Keresztúri JL, Berlinger E (2025) Quantifying firm-level greenwashing: A systematic literature review. J Environ Manage 373:123399

532. Newman A, Le H, North-Samardzic A, Cohen M (2020) Moral Disengagement at Work: A Review and Research Agenda. J Bus Ethics 167:535–570

533. Billio M, Costola M, Hristova I, Latino C, Pelizzon L (2024) Sustainable Finance: A Journey Toward ESG and Climate Risk. Int Rev Environ Resour Econ 18:1–75

534. Leins S (2018) Stories of Capitalism: inside the role of financial analysts. University of Chicago Press

535. Leins S (2020) 'Responsible investment': ESG and the post-crisis ethical order. Econ Soc 49:71–91

536. Gantenbein J (2025) Between Profit and Principle: how Swiss banks evaluate ESG risks in commodity trade finance. University of St Gallen

537. Berg F, Kölbel JF, Rigobon R (2022) Aggregate Confusion: The Divergence of ESG Ratings. Rev Finance 26:1315–1344

538. Boffo R, Patalano R (2020) ESG Investing: Practices, Progress and Challenges. OECD, Paris

539. Jámbor A, Zanócz A (2023) The Diversity of Environmental, Social, and Governance Aspects in Sustainability: A Systematic Literature Review. Sustainability 15:13958

540. Clément A, Robinot É, Trespeuch L (2022) Improving ESG Scores with Sustainability Concepts. Sustainability 14:13154

541. Linnenluecke MK (2022) Environmental, social and governance (ESG) performance in the context of multinational business research. Multinatl Bus Rev 30:1–16

542. Ferro A, Marazzina D, Stocco D (2025) Uncovering ESG Ratings: The (Im)Balance of Aspirational and Performance Features. Corp Soc Responsib Environ Manag 32:5895–5917

543. Kathan MC, Utz S, Dorfleitner G, Eckberg J, Chmel L (2025) What you see is not what you get: ESG scores and greenwashing risk. Finance Res Lett 74:106710

544. Yu EP, Luu BV, Chen CH (2020) Greenwashing in environmental, social and governance disclosures. Res Int Bus Finance 52:101192

545. ETH-NADEL (2025) Resource Impact Dashboard (RID). https://www.resource-impact.org/

546. Grama B (2022) Company-Administered Grievance Processes for External Stakeholders: A Means for Effective Remedy, Community Relations, or Private Power? Wis Int Law J 39:71–143

547. Kemp D, Owen JR, Gotzmann N, Bond CJ (2011) Just Relations and Company–Community Conflict in Mining. J Bus Ethics 101:93–109

548. Owen JR, Kemp D (2017) Extractive Relations: Countervailing Power and the Global Mining Industry. https://doi.org/10.4324/9781315150000

549. De Silva Lokuwaduge CS, De Silva KM (2022) ESG Risk Disclosure and the Risk of Green Washing. Australas Bus Account Finance J 16:146–159

550. Federal Council (2023) Stand der Umsetzung der Empfehlungen aus dem Bericht «Rohstoffsektor Schweiz: Standortbestimmung und Perspektiven». State Secretariat for Economic Affairs

551. Schäli J, Burger M, Bonanomi EB, Academy W (2025) A Stocktaking with a Perspective on Possible Implications for Artisanal and Small-Scale Gold Mining. Wyss Academy & Centre for Development and Environment, University of Bern, Bern

552. Tagmann A (2017) Switzerland. In: Fournier J, Heckendorn Urscheler L (eds) Regul. Hum. Rights Due Dilig. Corp. Comp. View. Schulthess Éditions Romandes, Genève, pp 157–182

553. Carnot DM (2021) Regulierung und Beaufsichtigung der Rohstoffbranche: ist eine Unterstellung der Rohwarenhändler unter das Geldwäschereigesetz ausreichend oder sind zusätzliche Massnahmen erforderlich? Schulthess

554. Bürgi Bonanomi E (2019) Die Nachhaltigkeit im Handelsabkommen mit Indonesien – Mit besonderem Fokus auf die Regulierung des Palmöl-Imports. Universität Bern, Bern

555. Sieber-Gasser C (2021) Palmöl in der EFTA-Indonesien Wirtschaftspartnerschaft: Details des neuen Präferenzmechanismus, Informationslage zum Zeitpunkt des Referendums und Gewährleistung der Abstimmungsfreiheit. Sui Generis. https://doi.org/10.21257/sg.191

556. Martin-Ortega O (2014) Human Rights Due Diligence for Corporations: From Voluntary Standards to Hard Law at Last? Neth Q Hum Rights 32:44–74

557. Schneider L (2020) The Swiss Responsible Business Initiative (SRBI) and the Need for Transnational Regulations. SSRN Electron J. https://doi.org/10.2139/ssrn.3576005

558. Martinelli A (2021) Suisse. Les enjeux du vote sur l'initiative « Entreprises responsables » : Chron Int IRES N° 173:3–16

559. Kaufmann C (2016) Konzernverantwortungsinitiative: Grenzenlose Verantwortlichkeit? Schweiz. Z. Für Wirtsch.-Finanz.

560. Werro F (2018) Indirekter Gegenentwurf zur Konzernverantwortungsinitiative – Haftungsnorm im Einklang mit der schweizerischen Tradition. Sui Generis. https://doi.org/10.21257/sg.85

561. Werro F (2019) The Swiss Responsible Business Initiative and the Counter-Proposal. J Eur Tort Law 10:166–184

562. Niederberger T, Haller T, Gambon H, Kobi M, Wenk I, Haller T (eds) (2016) The open cut: mining, transnational corporations and local populations. LIT, Zürich

563. KOVI (2025) Neue Konzernverantwortungsinitiative eingereicht. In: Koalition Für Konzernverantwortung. https://konzernverantwortung.ch/News/medienmitteilung-einreichung/ Accessed 20 Apr 2026

564. Federal Council (2026) Neues Gesetz für die nachhaltige Unternehmensführung erhöht Schutz für Menschenrechte sowie Umwelt und entlastet KMU. Federal Council, Berne

565. SIF (2024) Company taxation/BEPS. https://www.sif.admin.ch/en/company-taxation-beps. Accessed 15 Dec 2025

566. Savignac R (2025) From treaty abuse to tax integrity and sustainability: Swiss practices under OECD BEPS Action 6. Transform Sustain 1:150–158

567. Groulx Diggs EG, Regan MC, Parance B (2019) Business and Human Rights as a Galaxy of Norms. Georget J Int Law 50:309–359

568. FDFA, SECO (2018) The Commodity Trading Sector: Guidance on Implementing the UN Guiding Principles on Business and Human Rights. FDFA, SECO, Bern

569. Federal Council (2015) CSR Position Paper and Action Plan 2015-2019 of the Federal Council. Federal Council, Berne

570. Federal Council (2021) Recommendations from 'The Swiss commodities sector: current situation and outlook' – progress on implementation. State Secretariat for Economic Affairs, Bern

571. Bradford A (2020) The Brussels Effect: How the European Union Rules the World. Oxford University Press

572. Neri-Castracane G (2023) Sustainable purpose-driven enterprises. Swiss legal framework in a comparative law perspective. University of Geneva, Geneva

573. Saulich C (2023) Sorgfaltspflichten im Rohstoffhandel: Händler und Börsen als Nadelöhre für Nachhaltigkeit in metallischen Lieferketten. Stiftung Wissenschaft und Politik, German Institute for International and Security Affairs

574. Gomez A (2024) The Parts That Don't Glitter: A Comparative Analysis Between Switzerland and the United States on the Regulations of the Importation of Gold and Its Effect on Human Rights in Gold Mining Countries. Univ. Miami Int. Comp. Law Rev. 32:

575. Grohs H, Grumiller J (2021) Alles auf der Schokoladenseite? Nachhaltigkeit in der globalen und österreichischen Kakao- und Schokoladenwertschöpfungskette. Austrian Foundation for Development Research

576. Braunschweig T, Déclaration de Berne, Erklärung von Bern (2012) Rohstoff: das gefährlichste Geschäft der Schweiz, 2. Aufl. Salis Verlag, Zürich

577. Teichmann F (2025) The Effectiveness of Swiss Sanctions Against Russia in the Context of the Current Conflict in Ukraine. Kennedy G (ed) Econ. Warf. 21st Century. Springer Nature Switzerland, Cham, pp 209–238

578. Dyllick T, Muff K (2016) Clarifying the Meaning of Sustainable Business: Introducing a Typology From Business-as-Usual to True Business Sustainability. Organ Environ 29:156–174

579. Freeman RE, Harrison JS, Wicks AC (2007) Managing for Stakeholders. Yale University Press

580. Bebchuk LA, Kastiel K, Tallarita R (2020) For Whom Corporate Leaders Bargain. SSRN Electron J. https://doi.org/10.2139/ssrn.3677155

581. Yin Y, Wang Y, Lu Y (2025) How to Design Green Compensation to Promote Managers' Pro-Environmental Behavior? A Goal-Framing Perspective. J Bus Ethics 197:341–353

582. Hesselmans M, Stellinga B, El-Dardiry R, François D, Bijleveld C (2025) Good Business: Policy to Unlock Companies' Benefit for Society. https://doi.org/10.1007/978-3-031-90232-1

583. Visnjic I, Monteiro F, Tushman M (2025) Sustainability as a Business-Model Transformation. Havard Bus. Rev.

584. Song L, Zhan X, Zhang H, Xu M, Liu J, Zheng C (2022) How much is global business sectors contributing to sustainable development goals? Sustain Horiz 1:100012

585. Van Zanten JA, Van Tulder R (2018) Multinational enterprises and the Sustainable Development Goals: An institutional approach to corporate engagement. J Int Bus Policy 1:208–233

586. Ruggie JG, Rees C, Davis R (2021) Ten Years After: From UN Guiding Principles to Multi-Fiduciary Obligations. Bus Hum Rights J 6:179–197

587. Buhmann K, Jonsson J, Fisker M (2019) Do no harm and do more good too: connecting the SDGs with business and human rights and political CSR theory. Corp Gov Int J Bus Soc 19:389–403

588. Dorfmüller H, Kimotho W, Ebert I, Dey P, Wettstein F (2024) Responsible Business Conduct in Commodity Trading – A Multidisciplinary Review. J Bus Ethics 195:449–473

589. Freidberg S (2023) Metrics and Mētis: work and practical knowledge in Agri-food sustainability governance. Agric Hum Values 40:245–257

590. Wörner D, Letmathe N, Jovanovic M, Friedli T (2026) Structuring Private Sustainability Governance: Combining Rule-Based and Goal-Based Mechanisms. J Bus Ethics 203:631–648

591. Kaptein M, Schwartz MS (2008) The Effectiveness of Business Codes: A Critical Examination of Existing Studies and the Development of an Integrated Research Model. J Bus Ethics 77:111–127

592. Hofmann H, Schleper MC, Blome C (2018) Conflict Minerals and Supply Chain Due Diligence: An Exploratory Study of Multi-tier Supply Chains. J Bus Ethics 147:115–141

593. Vandenbroucke S (2024) The Evolution of Codes of Conduct to Ensure Labor Rights in Global Supply Chains. AJIL Unbound 118:297–302

594. Wilhelm M, Blome C, Wieck E, Xiao CY (2016) Implementing sustainability in multi-tier supply chains: Strategies and contingencies in managing sub-suppliers. Int J Prod Econ 182:196–212

595. Grabs J, Kilian B, Hernández DC, Dietz T (2016) Understanding coffee certification dynamics: A spatial analysis of voluntary sustainability standard proliferation. Int. Food Agribus. Manag. Rev. 19:

596. Bemelmans J, Depoorter C, Maertens M (2025) Corporate implementation of certification and its impact on cocoa producers in Indonesia. Dev Policy Rev 43:e70022

597. Renard M-C (2022) Values and the making of standards in 'sustainable' coffee networks: The case of 4C and Nestlé in México. Int Sociol 37:758–776

598. Alvarez G, Pilbeam C, Wilding R (2010) Nestlé Nespresso AAA sustainable quality program: an investigation into the governance dynamics in a multi-stakeholder supply chain network. Supply Chain Manag Int J 15:165–182

599. Boller ML, Bosch C, Heinzel K, Birkenberg A, Krupitzer C (2025) Brewing a sustainable future: a firm-level analysis of sustainability initiatives in the coffee sector. Environ Syst Decis 45:55

600. Wright DR, Bekessy SA, Gordon A, Bennett RE, Rodewald AD, Garrard GE, Lentini PE, Selinske MJ (2025) The Critical Role of Retailers in Leveraging Sustainability of a Global Supply Chain. Corp Soc Responsib Environ Manag 32:3371–3382

601. MSI Integrity (2020) Not Fit-for-Purpose: The Grand Experiment of Multi-Stakeholder Initiatives in Corporate Accountability, Human Rights and Global Governance.

602. Freidberg S (2017) Trading in the secretive commodity. Econ Soc 46:499–521

603. De Bakker FGA, Rasche A, Ponte S (2019) Multi-Stakeholder Initiatives on Sustainability: A Cross-Disciplinary Review and Research Agenda for Business Ethics. Bus Ethics Q 29:343–383

604. Lefoll E, van der Merwe A, Günther I (2025) Does Responsible Gold Certification Enhance Transparency? The Knowledge and Communication of Jewellers. In: Kenel P, Sawall PC, Pfeifer L, Bettig U, Michel J (eds) Fair Fash. Interdiscip. Perspect. Context Soc. Ecol. Econ. Cult. Sustain., 1st ed. transcript Verlag, Bielefeld, Germany, pp 121–142

605. Lefoll E, Günther I, Veronesi M (2022) Low Demand for Fair Trade Chocolate: Lack of Efficiency, Attention, Knowledge or Trust?

606. Kim YH, Davis GF (2016) Challenges for Global Supply Chain Sustainability: Evidence from Conflict Minerals Reports. Acad Manage J 59:1896–1916

607. Bright C, Marx A, Pineau N, Wouters J (2020) Toward a Corporate Duty for Lead Companies to Respect Human Rights in Their Global Value Chains? Bus Polit 22:667–697

608. Schilling-Vacaflor A, Gustafsson M-T (2024) Towards more sustainable global supply chains? Company compliance with new human rights and environmental due diligence laws. Environ Polit 33:422–443

609. Partzsch L, Vlaskamp MC (2016) Mandatory due diligence for 'conflict minerals' and illegally logged timber: Emergence and cascade of a new norm on foreign accountability. Extr Ind Soc 3:978–986

610. Bastos Lima MG, Schilling-Vacaflor A (2024) Supply chain divergence challenges a 'Brussels effect' from Europe's human rights and environmental due diligence laws. Glob Policy 15:260–275

611. Franken G, Schütte P (2022) Current trends in addressing environmental and social risks in mining and mineral supply chains by regulatory and voluntary approaches. Miner Econ 35:653–671

612. Grabs J (2020) Assessing the institutionalization of private sustainability governance in a changing coffee sector. Regul Gov 14:362–387

613. Heidingsfelder J (2019) Private sustainability governance in the making – A case study analysis of the fragmentation of sustainability governance for the gold sector. Resour Policy 63:101462

614. Muradian R, Cahyafitri R, Ferrando T, et al (2025) Will the EU deforestation-free products regulation (EUDR) reduce tropical forest loss? Insights from three producer countries. Ecol Econ 227:108389

615. Partzsch L (2018) The new EU Conflict Minerals Regulation: Normative Power in International Relations? Glob Policy 9:479–488

616. Schilling-Vacaflor A, Lenschow A (2021) Hardening foreign corporate accountability through mandatory due diligence in the European Union? New trends and persisting challenges. Regul Gov. https://doi.org/10.1111/rego.12402

617. Vlaskamp MC (2019) The European Union and natural resources that fund armed conflicts: Explaining the EU's policy choice for supply chain due-diligence requirements. Coop Confl 54:407–425

618. Voland T, Daly S (2018) The EU Regulation on Conflict Minerals: The Way Out of a Vicious Cycle? J. World Trade 52:

619. Bueno N, Kaufmann C (2021) The Swiss Human Rights Due Diligence Legislation: Between Law and Politics. Bus Hum Rights J 6:542–549

620. Schleifer P, Sun Y (2018) Emerging markets and private governance: the political economy of sustainable palm oil in China and India. Rev Int Polit Econ 25:190–214

621. Van Den Brink S, Kleijn R, Tukker A, Huisman J (2019) Approaches to responsible sourcing in mineral supply chains. Resour Conserv Recycl 145:389–398

622. Van Der Ven H, Sun Y, Cashore B (2021) Sustainable commodity governance and the global south. Ecol Econ 186:107062

623. Macdonald K, Diprose R, Grabs J, et al (2024) Jurisdictional approaches to sustainable agro-commodity governance: The state of knowledge and future research directions. Earth Syst Gov 22:100227

624. Bianco GB (2020) Climate change adaptation, coffee, and corporate social responsibility: challenges and opportunities. Int J Corp Soc Responsib 5:3

625. Revak H (2012) Corporate Codes of Conduct: Binding Contract or Ideal Publicity?

626. Bray JG, Neilson J (2017) Reviewing the impacts of coffee certification programmes on smallholder livelihoods. Int J Biodivers Sci Ecosyst Serv Manag 13:216–232

627. Grabs J, Carodenuto SL (2021) Traders as sustainability governance actors in global food supply chains: A research agenda. Bus Strategy Environ 30:1314–1332

628. Gibbs HK, Rausch L, Munger J, Schelly I, Morton DC, Noojipady P, Soares-Filho B, Barreto P, Micol L, Walker NF (2015) Brazil's Soy Moratorium. Science 347:377–378

629. Bastos Lima MG, Persson UM (2020) Commodity-Centric Landscape Governance as a Double-Edged Sword: The Case of Soy and the Cerrado Working Group in Brazil. Front For Glob Change. https://doi.org/10.3389/ffgc.2020.00027

630. Brandão J, Cardoso FC, Garrett R (2025) Why has the Brazilian Cerrado been left behind by voluntary environmental policies? Glob Environ Change 92:103005

631. Fransen L (2018) Beyond regulatory governance? On the evolutionary trajectory of transnational private sustainability governance. Ecol Econ 146:772–777

632. Grabs J (2020) Selling Sustainability Short? The Private Governance of Labor and the Environment in the Coffee Sector. Cambridge University Press, Cambridge

633. Nelson V, Phillips D (2018) Sector, Landscape or Rural Transformations? Exploring the Limits and Potential of Agricultural Sustainability Initiatives through a Cocoa Case Study. Bus Strategy Environ 27:252–262

634. Renard M-C (2010) In the Name of Conservation: CAFE Practices and Fair Trade in Mexico. J Bus Ethics 92:287–299

635. Thorlakson T (2018) A move beyond sustainability certification: The evolution of the chocolate industry's sustainable sourcing practices. Bus Strategy Environ 27:1653–1665

636. Grabs J (2025) The Construction of Compliance with the European Union Deforestation Regulation in Global Coffee Value Chains. Regul Gov rego.70103

637. Marschner S, Orsi L, Olper A, Stranieri S (2025) Sustainability Strategies in the Cocoa-Chocolate Value Chain: An Analysis Using Stakeholder Theory, Global Value Chain Theory, and Resource Dependence Theory. Agribusiness. https://doi.org/10.1002/agr.22044

638. Richardson B (2015) Making a Market for Sustainability: The Commodification of Certified Palm Oil. New Polit Econ 20:545–568

639. Le Billon P, Spiegel S (2022) Cleaning mineral supply chains? Political economies of exploitation and hidden costs of technical fixes. Rev Int Polit Econ 29:768–791

640. Liu B, Lyu Y (2024) Economic corruption, green recovery, and mineral trade relationships in emerging economies. Resour Policy 90:104725

641. Zhao P, Zhao T (2025) The relationships between geopolitics and global critical minerals shipping: A literature review. Ocean Coast Manag 262:107559

642. Depoorter C, Marx A (2024) Fostering compliance with voluntary sustainability standards through institutional design: An analytic framework and empirical application. Regul Gov 18:1132–1152

643. Dietz T, Grabs J (2021) Additionality and Implementation Gaps in Voluntary Sustainability Standards. New Polit Econ 22:1–22

644. Marx A, Depoorter C, Fernandez de Cordoba S, et al (2024) Global governance through voluntary sustainability standards: Developments, trends and challenges. Glob Policy. https://doi.org/10.1111/1758-5899.13401

645. Bennett EA (2017) Who governs socially-oriented voluntary sustainability standards? Not the producers of certified products. World Dev 91:53–69

646. Coral C, Plieninger T, Sieber S, Graw V (2024) Extractivism triggering new forms of governance for the rights of nature: The case of Northwest Ecuador. Geoforum 156:104111

647. Espinosa C (2022) Reducing power disparities in large-scale mining governance through counter-expertise: A synthesis of case studies from Ecuador. Extr Ind Soc 9:101000

648. Carodenuto S, Buluran M (2021) The effect of supply chain position on zero-deforestation commitments: evidence from the cocoa industry. J Environ Policy Plan 23:716–731

649. Garrett RD, Levy S, Carlson KM, Gardner TA, Godar J, Clapp J, Dauvergne P, Heilmayr R, de Waroux Y le P, Ayre B (2019) Criteria for effective zero-deforestation commitments. Glob Environ Change 54:135–147

650. Addoah T, Lyons-White J, Cammelli F, Kouakou KM-P, Carodenuto S, Thompson WJ, Renier C, Garrett RD (2025) Is the Implementation of Cocoa Companies' Forest Policies on Track to Effectively and Equitably Address Deforestation in West Africa? Sustain Dev 33:5197–5213

651. Reis TNPD, Meyfroidt P, Zu Ermgassen EKHJ, West C, Gardner T, Bager S, Croft S, Lathuillière MJ, Godar J (2020) Understanding the Stickiness of Commodity Supply Chains Is Key to Improving Their Sustainability. One Earth 3:100–115

652. Wijaya A, Glasbergen P, Leroy P, Darmastuti A (2018) Governance challenges of cocoa partnership projects in Indonesia: seeking synergy in multi-stakeholder arrangements for sustainable agriculture. Environ Dev Sustain 20:129–153

653. McQuilken JT (2016) 'Ethical gold' in sub-Saharan Africa: a viable empowerment strategy? Int Dev Plan Rev 38:179–199

654. Schleifer P, Fiorini M, Fransen L (2019) Missing the Bigger Picture: A Population-level Analysis of Transnational Private Governance Organizations Active in the Global South. Ecol Econ 164:106362

655. LeBaron G, Lister J (2022) The hidden costs of global supply chain solutions. Rev Int Polit Econ 29:669–695

656. Arenas D, Albareda L, Goodman J (2020) Contestation in Multi-Stakeholder Initiatives: Enhancing the Democratic Quality of Transnational Governance. Bus Ethics Q 30:169–199

657. Harrison J, Wielga M (2023) Grievance Mechanisms in Multi-Stakeholder Initiatives: Providing Effective Remedy for Human Rights Violations? Bus Hum Rights J 8:43–65

658. UN Human Rights Council (2014) Elaboration of an international legally binding instrument on transnational corporations and other business enterprises with respect to human rights. Resolution adoptedby the Human Rights Council. UN Human Rights Council, Geneva

659. Partiti E (2023) Human Rights Due Diligence and Evolution of Voluntary Sustainability Standards. In: Delimatsis P, Bijlmakers S, Borowicz MK (eds) Evol. Transnatl. Rule-Mak. Crises, 1st ed. Cambridge University Press, pp 133–153

660. Sarfaty GA, Deberdt R (2024) Supply Chain Governance at a Distance. Law Soc Inq 49:1036–1059

661. Samoggia A, Beyhan Z (2022) Fairness-Enabling Practices in Agro-Food Chain. Sustainability 14:6391

662. Molenaar JW, Blackmore E, Smith S, Van Bragt W, Petit dit de la Roche CRM, Heuvels S, Vorley B, Fearne A (2016) Fairness in trade matters for sustainability. An impact evaluation of Fairtrade's supply chain interventions. Aidenvironment & IIED

663. Swinnen J, Olper A, Vandevelde S (2021) From unfair prices to unfair trading practices: Political economy, value chains and 21st century agri-food policy. Agric Econ 52:771–788

664. 664. European Commission (2024) Unfair trading practices – Agriculture and rural development. https://agriculture.ec.europa.eu/common-agricultural-policy/agri-food-supply-chain/unfair-trading-practices_en. Accessed 19 Dec 2025

665. Sinnig J, Zetzsche DA (2025) The EU's Corporate Sustainability Due Diligence Directive: From Disclosure to Mandatory Prevention of Adverse Sustainability Impacts in Supply Chains. Eur J Risk Regul 16:628–652

666. Dey M, Abnett K (2025) EU strikes deal to weaken corporate sustainability laws.

667. Wilhelm M (2024) Mandatory due diligence legislation: a paradigm shift for the governance of sustainability in global value chains? J Int Bus Policy 7:459–465

668. Schleper MC, Blome C, Stevenson M, Thürer M, Tusell I (2022) When it's the slaves that pay: In search of a fair due diligence cost distribution in conflict mineral supply chains. Transp Res Part E Logist Transp Rev 164:102801

669. Bemelmans J, Maertens M (2025) Implementation and effectiveness of corporate-driven smallholder cocoa certification schemes in Indonesia. Agric Food Econ 13:30

670. Depoorter C, Bemelmans J, Marx A (2025) The role of intermediaries in the implementation of sustainability standards. A case study of buyer-driven Rainforest Alliance certification in the Indonesian cocoa sector. World Dev 195:107128

671. Kusnandar K, Apriyanto EB, Akbar M, Apriliyadi EK, Perdana T (2024) Understanding how governance arrangements within agricultural supply chains influence farmers' SAP adoption for adaptation and mitigation practices. Agric Syst 220:104085

672. Navarrete-Cruz A, Birkenberg A (2024) How do governance mechanisms between farmer and traders advance sustainability goals and enhance the resilience of agricultural value chains? World Dev Perspect 35:100618

673. Satama-Bermeo M, García-Espigares L, Lamotte L, Ramírez K, Santos A, Zambrano G, Olschewski R (2025) Sustainable cocoa production: a question of taste or survival? Eliciting farmers' preferences with a two-step choice experiment. J Agric Food Res 22:102051

674. Ribeiro-Duthie AC, Domingos LMB, Oliveira MF, Araujo PC, Alamino RCJ, Silva RSV, Ribeiro-Duthie JM, Castilhos ZC (2017) Sustainable development opportunities within corporate social responsibility practices from LSM to ASM in the gold mining industry. Miner Econ 30:141–152

675. Teku D (2025) Geo-environmental and socio-economic impacts of artisanal and small-scale mining in Ethiopia: challenges, opportunities, and sustainable solutions. Front Environ Sci 13:1505202

676. Grabs J, Auld G, Cashore B (2021) Private regulation, public policy, and the perils of adverse ontological selection. Regul Gov 15:1183–1208

677. Oberlack C, Blare T, Zambrino L, Bruelisauer S, Solar J, Villar G, Thomas E, Ramírez M (2023) With and beyond sustainability certification: Exploring inclusive business and solidarity economy strategies in Peru and Switzerland. World Dev 165:106187

678. Ponte S (2019) Business, Power and Sustainability in a World of Global Value Chains. https://doi.org/10.5040/9781350218826

679. Ponte S, das Nair R, Chisoro S (2023) Is sustainability governance abetting inequality? Reflections from the South African wine value chain. Geoforum 147:103877

680. Raynolds LT (2022) Can certification increase trade fairness and worker empowerment? Lessons from Fairtrade International-certified plantations in Ecuador. Int Sociol 37:716–739

681. van der Ven H (2018) Gatekeeper power: understanding the influence of lead firms over transnational sustainability standards. Rev Int Polit Econ 25:624–646

682. Boonaert E, Depoorter C, Marx A, Maertens M (2024) Carrots rather than Sticks: Governance of Voluntary Sustainability Standards and Farmer Welfare in Peru. Sustain Dev 32:6471–6492

683. Krumbiegel K, Tillie P (2024) Sustainable practices in cocoa production. The role of certification schemes and farmer cooperatives. Ecol Econ 222:108211

684. Sellare J, Meemken E-M, Kouamé C, Qaim M (2020) Do Sustainability Standards Benefit Smallholder Farmers Also When Accounting For Cooperative Effects? Evidence from Côte d'Ivoire. Am J Agric Econ 102:681–695

685. Middendorp RS, Boever O, Rueda X, Lambin EF (2020) Improving smallholder livelihoods and ecosystems through direct trade relations: High-quality cocoa producers in Ecuador. Bus Strategy Dev 3:165–184

686. Karp DJ (2023) Business and Human Rights in a Changing World Order: Beyond the Ethics of Disembedded Liberalism. Bus Hum Rights J 8:135–150

687. Choudhury B (2023) Corporate Law's Threat to Human Rights: Why Human Rights Due Diligence Might Not Be Enough. Bus Hum Rights J 8:180–196

688. Deva S (2023) Mandatory human rights due diligence laws in Europe: A mirage for rightsholders? Leiden J Int Law 36:389–414

689. Lichuma CO (2021) (Laws) Made in the 'First World': A TWAIL Critique of the Use of Domestic Legislation to Extraterritorially Regulate Global Value Chains. Z Für Ausländisches Öffentl Recht Völkerr Heidelb J Int Law 81:497–532

690. Reinecke J, Donaghey J, Wilkinson A, Wood G (2018) Global supply chains and social relations at work: Brokering across boundaries. Hum Relat 71:459–480

691. Soundararajan V, Khan Z, Tarba SY (2018) Beyond brokering: Sourcing agents, boundary work and working conditions in global supply chains. Hum Relat 71:481–509

692. Bennett EA, Grabs J (2025) How can sustainable business models distribute value more equitably in global value chains? Introducing 'value chain profit sharing' as an emerging alternative to fair trade, direct trade, or solidarity trade. Bus Ethics Environ Responsib 34:581–601

693. Borrella I, Mataix C, Carrasco-Gallego R (2015) Smallholder farmers in the speciality coffee industry: Opportunities, constraints and the businesses that are making it possible. IDS Bull 46:29–44

694. Keller J, Jung M, Lasch R (2022) Sustainability Governance: Insights from a Cocoa Supply Chain. Sustainability 14:10763

695. Rosca E, Pullman M, Pagell M (2025) Brokering for the Benefit of Others: How Purpose-Driven Organizations Create Sustainable Supply Chains. J Supply Chain Manag 61:77–97

696. Clark P, Hussey I (2016) Fair trade certification as oversight: an analysis of fair trade international and the small producers' symbol. New Polit Econ 21:220–237

697. Herman A (2019) Asymmetries and opportunities: Power and inequality in Fairtrade wine global production networks. Area 51:332–339

698. Carodenuto S, Cutler C, Dieng S, Adams MA, Thompson W (2025) Formalization through contracts: Implications for power in smallholder cocoa supply chains. Geoforum 164:104323

699. Heldt L, Pikuleva E (2024) When upstream suppliers drive traceability: A process study on blockchain adoption for sustainability. Int J Phys Distrib Logist Manag 55:196–222

700. Obaya M, Murguía DI, Sánchez-López D (2024) From local priorities to global responses: Assessing sustainability initiatives in South American lithium mining. Extr Ind Soc 19:101509

701. Carlson KM, Heilmayr R, Gibbs HK, Noojipady P, Burns DN, Morton DC, Walker NF, Paoli GD, Kremen C (2018) Effect of oil palm sustainability certification on deforestation and fire in Indonesia. Proc Natl Acad Sci 115:121–126

702. DeFries RS, Fanzo J, Mondal P, Remans R, Wood SA (2017) Is voluntary certification of tropical agricultural commodities achieving sustainability goals for small-scale producers? A review of the evidence. Environ Res Lett 12:033001

703. Auld G, Betsill M, VanDeveer SD (2018) Transnational Governance for Mining and the Mineral Lifecycle. Annu Rev Environ Resour 43:425–453

704. Panhuysen S, De Vries F (2023) Coffee Barometer. Coffee Barometer

705. Schleifer P, Fransen L (2024) Smart mix politics: business actors in the formulation of global supply chain regulation. Rev Int Polit Econ 31:1710–1734

706. Park S, Kramarz T, Johnson C (2024) Governance gaps and accountability traps in renewables extractivism. Environ Policy Gov 34:754–767

707. Srivastava N (2023) Trade in critical minerals: Revisiting the legal regime in times of energy transition. Resour Policy 82:103491

708. Vivoda V, Matthews R, McGregor N (2024) A critical minerals perspective on the emergence of geopolitical trade blocs. Resour Policy 89:104587

709. Alix-Garcia J, Gibbs HK (2017) Forest conservation effects of Brazil's zero deforestation cattle agreements undermined by leakage. Glob Environ Change 47:201–217

710. Meyfroidt P, Boerner J, Garrett R, Gardner T, Godar J, Kis-Katos K, Soares-Filho B, Wunder S (2020) Focus on leakage and spillovers: informing land-use governance in a tele-coupled world. Environ Res Lett. https://doi.org/10.1088/1748-9326/ab7397

711. Parra-Paitan C, zu Ermgassen EKHJ, Meyfroidt P, Verburg PH (2023) Large gaps in voluntary sustainability commitments covering the global cocoa trade. Glob Environ Change 81:102696

712. Dietz T, Estrella Chong A, Grabs J, Kilian B (2020) How Effective is Multiple Certification in Improving the Economic Conditions of Smallholder Farmers? Evidence from an Impact Evaluation in Colombia's Coffee Belt. J Dev Stud 56:1141–1160

713. Oya C, Schaefer F, Skalidou D (2018) The effectiveness of agricultural certification in developing countries: A systematic review. World Dev 112:282–312

714. Tayleur C, Balmford A, Buchanan GM, et al (2018) Where are commodity crops certified, and what does it mean for conservation and poverty alleviation? Biol Conserv 217:36–46

715. Vasconcelos AA, Bastos Lima MG, Gardner TA, McDermott CL (2024) Prospects and challenges for policy convergence between the EU and China to address imported deforestation. For Policy Econ 162:103183

716. Parra-Paitan C, Meyfroidt P, Verburg PH, zu Ermgassen EKHJ (2024) Deforestation and climate risk hotspots in the global cocoa value chain. Environ Sci Policy 158:103796

717. Meemken E-M (2020) Do smallholder farmers benefit from sustainability standards? A systematic review and meta-analysis. Glob Food Secur 26:100373

718. Johnson CA, Park S, Kramarz T (2025) The unbearable lightness of lithium governance: Legitimizing extraction for a just and sustainable energy transition. Earth Syst Gov 23:100235

719. Parker DP, Vadheim B (2017) Resource Cursed or Policy Cursed? US Regulation of Conflict Minerals and Violence in the Congo. J Assoc Environ Resour Econ 4:1–49

720. Stoop N, Verpoorten M, Van Der Windt P (2018) More legislation, more violence? The impact of Dodd-Frank in the DRC. PLOS ONE 13:e0201783

721. Iguma Wakenge C, Bashwira Nyenyezi M-R, Bergh SI, Cuvelier J (2021) From 'conflict minerals' to peace? Reviewing mining reforms, gender, and state performance in eastern Democratic Republic of Congo. Extr Ind Soc 8:100894

722. Diemel JA, Hilhorst DJM (2019) Unintended consequences or ambivalent policy objectives? Conflict minerals and mining reform in the Democratic Republic of Congo. Dev Policy Rev 37:453–469

723. Schwartz J (2015) The Conflict Minerals Experiment. SSRN Electron J. https://doi.org/10.2139/ssrn.2548267

724. Feld L (2026) Leading the Way or Crossing the Line? The Extraterritorial Dimension of the EU Directive on Corporate Sustainability Due Diligence. Bus Hum Rights J 1–23

725. Vogel C, Raeymaekers T (2016) Terr(it)or(ies) of Peace? The Congolese Mining Frontier and the Fight Against 'Conflict Minerals.' Antipode 48:1102–1121

726. Schütte P (2019) International mineral trade on the background of due diligence regulation: A case study of tantalum and tin supply chains from East and Central Africa. Resour Policy 62:674–689

727. Baik B, Even-Tov O, Han R, Park D (2024) The Real Effects of Supply Chain Transparency Regulation: Evidence from Section 1502 of the Dodd–Frank Act. J Account Res 62:551–587

728. Claassen R, Gerbrandy A (2018) Doing Good Together: Competition Law and the Political Legitimacy of Interfirm Cooperation. Bus Ethics Q 28:401–425

729. Holmes S, Middelschulte D, Snoep M (eds) (2021) Competition Law, Climate Change & Environmental Sustainability. Concurrences, Paris, New York, London

730. Federal Council (2026) Die Umsetzung Der Agenda 2030 für Nachhaltige Entwicklung. Länderbericht der Schweiz 2026. Swiss Confederation, Bern

SCNAT – Network of knowledge for the benefit of society

The **Swiss Academy of Sciences (SCNAT)** works at regional, national and international level for the future of science and society. It strengthens the awareness for the sciences as a central pillar of cultural and economic development. The breadth of its support makes it a representative partner for politics. The SCNAT links the sciences, provides expertise, promotes the dialogue between science and society, identifies and evaluates scientific developments and lays the foundation for the next generation of natural scientists. It is part of the association of the Swiss Academies of Arts and Sciences.

The **Swiss Alliance for Global Research Partnerships (GRP-Alliance)** strengthens global collaboration in research and education. It promotes equitable, inclusive and impactful partnerships that advance sciences for sustainable and equitable development. The Alliance connects researchers and institutions across disciplines and regions, fosters mutual learning and supports the development of global collaboration. Through expertise, networking, publications, training and dialogue, it contributes to addressing global challenges and strengthening international scientific cooperation. The GRP-Alliance is hosted by the Swiss Academy of Sciences (SCNAT) and brings together leading Swiss institutions engaged in global research and teaching collaborations.

