June 2024

Natural rubber

Production & Consumption

Global trade flows and potentially noncompliant Indonesian rubber cases with the EUDR

Photo credit: David Stanley @ Flickr

aid environment

Executive summary

This is the third and last report in a series of pilots under AidEnvironment's Realtime Deforestation Monitoring (RDM) system, that aims to expands its RDM system to identify recent, noncompliant case studies in the rubber sector. The report addresses global production and consumption patterns as well as trade flows and socioenvironmental impacts linked to rubber. The Indonesian case studies highlight the challenges of (remote) monitoring EUDR compliance linked to the rubber sector, the availability of public data sources to allow for monitoring, and transparency and traceability issues.

Under the European Union Deforestation Regulation (EUDR), rubber is one of the seven commodity products under the scope of Regulation. Thailand, Indonesia, and Vietnam were the top-3 global producing countries in 2022, and among the top-5 suppliers of natural rubber to the European market between 2021-2023 (next to Côte d'Ivoire and Malaysia). In the EU, 75 percent of the natural rubber consumed is used in the tyre industry. Therefore, tyre companies such as Michelin, Pirelli, and Goodyear, and automakers, such as BMW, Mercedes, Renault, and Volkswagen are large, European-based companies that have a crucial role in demand and consumption dynamics, influencing trade flows and the supply chain itself through their purchasing practices.

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Rubber production & consumption

Facts about rubber

Almost 99 percent of the world's natural rubber is produced by Pará rubber trees (*Hevea brasiliensis*). Originally from South America, this tree is currently grown in other tropical regions of the globe, namely in Southeast Asia and West Africa, in countries such as Malaysia, Indonesia, Thailand, Vietnam, Cambodia, Ivory Coast, Nigeria, Cameroon, Ghana, and Liberia.

Rubber trees take five to seven years to mature and have a productive life between 25 and 35 years. As expected of trees native to tropical areas, they develop best in warm, moist conditions and compete for land with tropical forests. Rubber trees can also be grown in plantations in association with ground cover and intercropping. Furthermore, rubber trees can grow in sloping terrain, which has allowed for and promoted its cultivation in upland areas.

Since the 2010s, demand for natural rubber increased and led to the rapid expansion of rubber plantations. Growing demand from China and the development of rubber tree varieties that can withstand cooler climates led to the increase of rubber, which incentivized the development of rubber plantations, particularly in countries such as Thailand, Vietnam, Laos, and Myanmar. Nonetheless, the price of natural rubber has proven very volatile in the long term, which has been attributed to the aspects such as the structure of the rubber production industry, the long ripening period of the tree and its vulnerability to natural phenomena (e.g., climatic events and pests).

Natural rubber and its derivatives are used in the manufacture of thousands of daily-use products, such as footwear, water-proof clothing, medical supplies and pharmaceutical closures, gloves, adhesives, and condoms. However, the largest share of this commodity, particularly its dry forms, is used in the tyre manufacturing sector, where it is incorporated in items applied in cars, trucks, motorcycles, and aircraft.

Rubber production is largely dominated by smallholders. Estimates indicate that eighty-five per cent of global rubber production comes from plantations of less than four hectares. Nonetheless, this is not a pattern found in all rubber producing regions. In Cambodia and Laos, for instance, most rubber is produced by industrial plantations, which are also relatively widespread in other rubber producing countries, such as Sri Lanka and China.

Rubber can be natural or synthetic. Natural rubber, in the form of latex, is harvested from rubber trees and synthetic rubber is derived from petrochemicals.

Rubber can be used by itself or in combination with other materials to produce a wide range of products applied in several economic sectors, such as apparel and footwear, automotive, construction, and medical.

Rubber is central to modern life, and, in many cases, it is considered an irreplaceable material. This has led several governments to label it a "critical raw material". For instance, the European Union (EU) has included natural rubber in its list of Critical Raw Materials in 2017.

Rubber production & consumption

Rubber production: Recent trends

Since the beginning of the 2000s, rubber production has seen significant growth. According to data from the Food and Agriculture Organisation (FAO), global production of natural rubber has increased by 109 percent and its harvested area by 72 percent between 2000 and 2020. Currently, the production of this commodity is highly concentrated in Southeast Asia (Fig. 1 and 2). In 2022, Thailand, Indonesia, and Vietnam, the top-3 producing countries in the referred year, comprised 62 percent of global production while Asian countries such as China, India, and Myanmar, also among the top-10 producing countries in 2022, accounted for only 14 percent. Ivory Coast is the only African country in the top-10 producing countries, being responsible for 9 percent of natural rubber production worldwide (Fig. 1). Considering production per world region, Latin America and the Caribbean have the lowest production (Fig. 2).

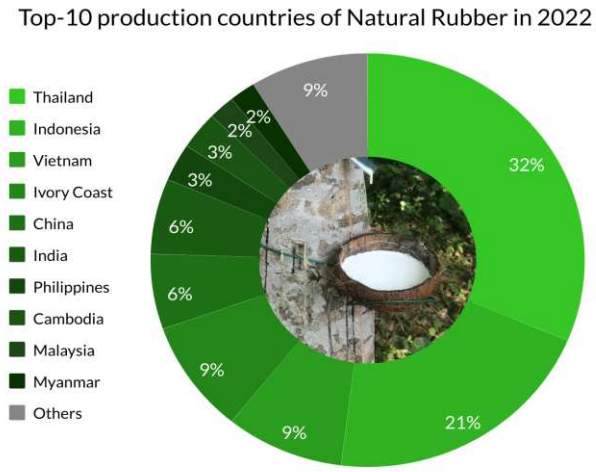


Figure 1. Top-10 producing countries of Natural rubber in 2022. Source: FAOSTAT. Accessed on 27/03/2024 from https://www.fao.org/faostat/en/#data/QCL

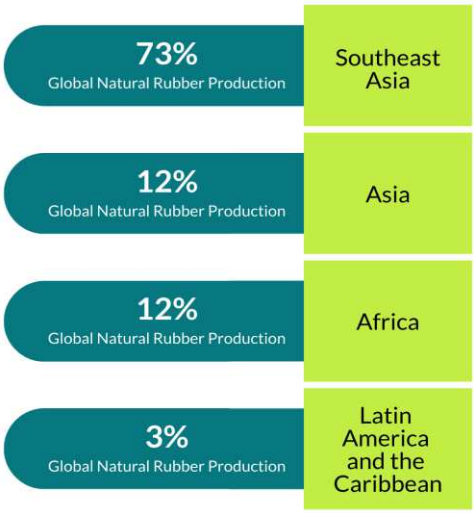


Figure 2. Main producing world regions of Natural rubber in 2022. Source: FAOSTAT. Accessed on 27/03/2024 from https://www.fao.org/faostat/en/#data/QCL

Production and harvesting systems are not the same in all countries and regions where natural rubber is produced. In Brazil and Peru, for instance, rubber trees occur naturally in forests and their intentional cultivation by tappers can happen in these settings without adverse impacts on the rainforest. A similar process, called '*jungle rubber*', is also found in Indonesia. This is an agroforestry technique where different crops (e.g., fruit trees, timber, rubber) are planted together (Fig. 3). In Indonesia, several types of agroforestry systems that include rubber trees have been used by smallholders for more than a century (jungle rubber being one of them), allowing smallholders to rely on other annual crops during the immature period of the rubber trees. However, many have replaced these practices by rubber monoculture due to higher yields and profitability, following the model of industrial plantations.

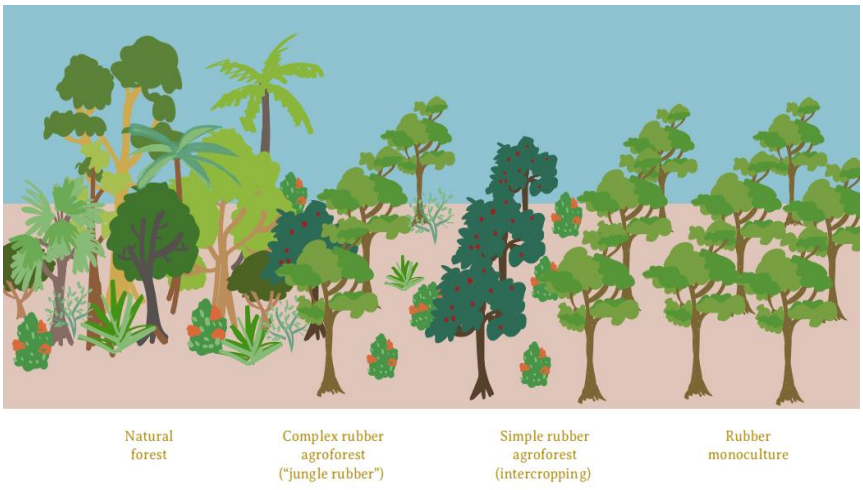


Figure 3. Natural Rubber Production Systems. Source: Partnerships for Forests' "Advancing smallholder farmers' voices in the Global Platform for Sustainable Natural Rubber" Case Study (2021).

Rubber production & consumption

Demand and consumption of Natural Rubber

Increased demand for rubber, both natural and synthetic, has been correlated with economic growth and industrialisation. One of the main mediating factors here is the growth of the automotive sector, where tyre manufacturing is particularly reliant on rubber and more so on natural rubber when considering the type of final products at stake. Although aspects like price and technology also influence the share of natural rubber in total rubber consumption, the increased use of radial tyres (the most common in modern vehicles and demanding the use of larger amounts of natural rubber than bias tyres) and heavy trucks' tyres in general (requiring a higher percentage of natural rubber than cars – 30 vs 15 percent, on average) will tend to lead to a larger share of natural rubber in total rubber consumption.

The automotive industry is, by far, the largest natural rubber consuming sector. It is estimated that more than 70 percent of the natural rubber produced worldwide is used in **tyre manufacturing**, particularly for automobile use. This makes the tyre industry the largest consumer of this commodity by a large margin. Besides tyres, natural rubber is largely applied in **General Rubber Goods (GRG)**, such as industrial products used, for instance, in the construction, mining, machinery and agricultural sectors, household appliances, and medical devices, and in **final consumer products**, such as latex products (e.g., adhesives, gloves, condoms), toys, leisure goods, and foot- and sportswear. According to the Fair Labor Association, six percent of the natural rubber produced globally is used in the manufacturing of footwear, and three percent in other products which may comprise some sporting goods.

Based on the European Commission's 2020 Critical Raw Materials Factsheets, 75 percent of the natural rubber consumed in the EU was used in the tyre industry (72 percent) and in other automotive parts (3 percent), such as car mats (Fig. 4). GRG, which here encompass final consumer goods, constitute the remainder 25 percent of natural rubber used in the European bloc, which largest share of natural rubber is used in equipment for the transport sector and in sectors wherein machinery is a key product (e.g., construction, mining, energy).

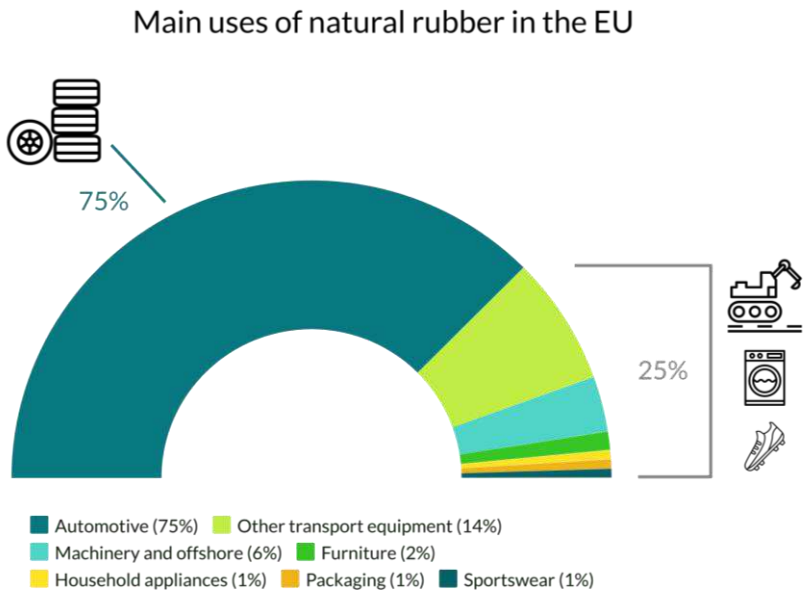


Figure 4. Main applications of Natural Rubber in the EU. Source: AidEnvironment adapted from the European Commission's Study on the EU's list of Critical Raw Materials (2020). The data displayed in the study mentioned is itself based on the rubber goods facts & figures (2016) produced by the European Tyre & Rubber Manufacturers Association (ETRMA).

Considering European consumption related to the automotive sector, it has been estimated that about 672,000 metric tons of natural rubber are used annually in vehicles with tyres registered in the EU, most of which (around two thirds) are passenger cars used for personal mobility. This is also linked to the fact that the EU is also a relevant importer of manufactured products used in this industry. Tyre companies such as Michelin, Pirelli, and Continental, and automakers, such as BMW, Mercedes, Renault, and Volkswagen are large, European-based companies that have a crucial role in demand and consumption dynamics, influencing trade flows and the supply chain itself through their purchasing practices.

Rubber production & consumption

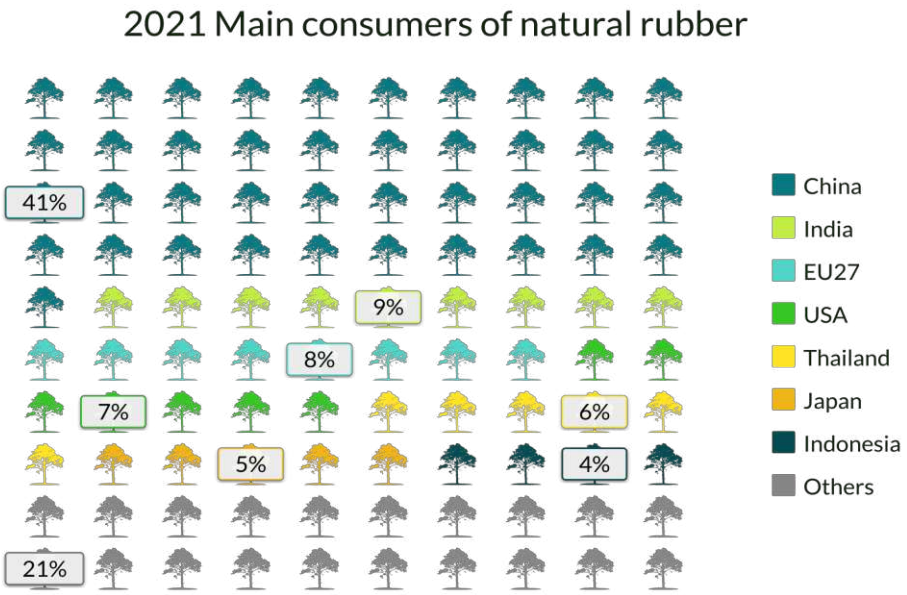


Figure 5. Main consumer countries/regions of natural rubber in 2021. Source: AidEnvironment adapted from 2022 "The Natural Rubber Supply Chain" brochure by ETRMA.

In the last two decades, China emerged as a key importer and consumer of natural rubber. From being an almost negligible importer in 2000 to becoming the largest consumer of natural rubber, China has remained undisputed in this position in recent years. In 2021, more than 40 per cent of global production of natural rubber ended up in China (Fig. 5). In the same year, the EU27 accounted for 8 percent of the global consumption, a staggering decrease from the bloc's demand for natural rubber in earlier years. This was reported to be around 25 percent in 2014, most of which was the responsibility of four EU Member States: Germany, France, Italy, and Spain.

The changes in natural rubber demand and consumption observed in mature markets such as the EU, which had a decrease of more than double its current levels in comparison to 2014, have been largely attributed to the COVID-19 pandemic. Nonetheless, it is likely that other factors contributed to this contraction as well, for instance, Brexit and the corresponding modifications in market dynamics that that might have implied. In any case, other markets have not faced the same level of shrinkage, such as China and India, maintaining their consumption patterns not only in 2021, but also 2022, which reveals broader economic trends and the strategic importance of industries that are key users of natural rubber in these countries.

Despite the high levels of demand already witnessed, the International Rubber Study Group (IRSG) forecasts that natural rubber demand will still soar in the coming years. The group expects this commodity to reach a demand of 16.9 million tons in 2030, an increase of 33 percent from 2020 levels. Unsurprisingly, this entails as well that natural rubber use for tyres and tyre products is expected to increase by 28 percent until the end of the current decade.


Photo credit: Jeff Boyd @ Flickr

Trade flows

Trade links to the EU27 and world trade flows

Rubber has been included in the scope of the EU Deforestation Regulation (EUDR) due to its relevance as a forest-risk commodity among the imports of the EU. It has been estimated that, between 1990 and 2008, the EU27 net imports of natural rubber were linked to 0.2 million hectares of deforestation. Thus, rubber was one of the seven commodities included in the scope of the regulation. Natural rubber (HS code 4001) is one of the twelve rubber derivatives included in the EUDR, and together with new pneumatic tyres (HS code 4011), they were the most imported rubber products into the EU market from non-EU countries between 2021 and 2023, from those that have been included in the regulation (see Table 1 below). This is not unexpected considering the centrality of the automotive industry in terms of use of natural rubber and the large European companies that operate in that sector.

HS codes and description	Imported volumes 2021 (kg)	Imported volumes 2021 (%)	Imported volumes 2022 (kg)	Imported volumes 2022 (%)	Imported volumes 2023 (kg)	Imported volumes 2023 (%)
4001 Natural rubber	1,251,917,105	26%	1,352,462,257	27%	1,020,975,354	24%
4005 Compounded rubber	94,173,587	2%	88,712,200	2%	89,360,064	2%
4006 Rods, bars, tubes...	10,263,999	0%	8,527,892	0%	6,342,575	0%
4007 Vulcanized rubber thread	11,741,637	0%	12,614,974	0%	8,914,306	0%
4008 Plates, sheets, strip...	115,599,572	2%	122,052,406	2%	103,712,074	2%
4010 Conveyor or transmission belts	78,714,286	2%	100,138,238	2%	88,002,876	2%
4011 New pneumatic tyres	2,198,842,649	46%	2,385,163,841	48%	2,194,786,636	51%
4012 Used pneumatic tyres	133,662,101	3%	145,072,429	3%	125,288,897	3%
4013 Inner tubes	37,644,306	1%	39,115,594	1%	20,106,783	0%
4015 Articles of apparel	438,993,563	9%	317,598,291	6%	251,518,911	6%
4016 Articles of vulcanized rubber	405,840,749	8%	416,598,617	8%	402,811,899	9%
4017 Hard rubber	3,220,772	0%	2,996,937	0%	2,810,968	0%

Table 1. EU imports of rubber products included in the EUDR from non-EU countries between 2021 and 2023. Source: AidEnvironment based on Access2Markets and Eurostat data. * The imported volumes in kilograms represent the total volumes of the products indicated that were imported into the EU market from non-EU countries in the period referred while the percentages correspond to the relative share of each rubber product in the total volume of the twelve rubber derivatives included in the EUDR.

Indonesia, Ivory Coast, Malaysia, Thailand and Vietnam were the five main countries of origin of the natural rubber imported into the EU market in 2021, 2022, and 2023 (Fig. 6). Albeit occupying different positions in the top-5 ranking in the years mentioned, these five countries remained the main suppliers of the EU27 with a margin, aggregating up to 89 percent of the total imports of natural rubber into the Union in the years referred. The imports of new pneumatic tyres show a similar trend: between 2021 and 2023, the top-5 importers were China, India, Russia (only in 2021), South Korea, Thailand (in 2022 and 2023), and Turkey. Overall, considering the total EU27 imports from these countries in the three-year period considered, the five that supplied the largest volumes of natural rubber to the EU27 were China, India, Turkey, South Korea, and Thailand (Fig. 7). In this case, the top-5 countries aggregated a lower percentage of the total EU27 imports of new pneumatic tyres in comparison to natural rubber, with a maximum of 76 percent in 2023 and a minimum of 51 percent in 2021 (which might have been a side effect of the COVID-19 pandemic). Nonetheless, for both these rubber products, a concentration of imports in the top-5 non-EU supplier countries is clear. For natural rubber, this is even more evident when looking at the top-10 suppliers to the EU between 2021-2023. For all the three years analysed, the top-10 countries concentrate 98 percent of the total amount of EU27 imports of natural rubber. Moreover, all the countries present in the top-10 are either Southeast Asian (Indonesia, Thailand, Malaysia, and Vietnam) or West African (Ivory Coast, Nigeria, Ghana, Liberia, Cameroon, and Guinea) countries, with the former region representing the highest share of EU27 imports (65 percent vs. 35 percent). This indicates that Southeast Asia, besides being the biggest producing region of natural rubber, is also the most important region in terms of EU imports while African countries also play a significant role as suppliers of this raw material to the EU market.

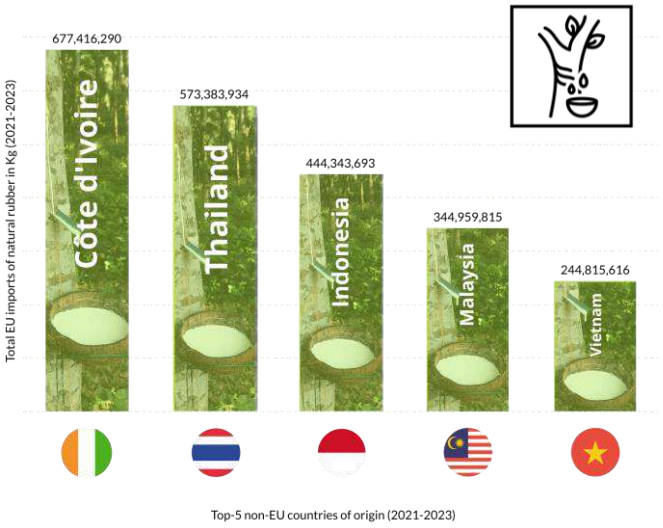


Figure 6. Main (top-5) non-EU supplier countries of natural rubber (HS 4001) to the EU market between 2021 and 2023 (inclusive). Source: AidEnvironment based on Access2Markets and Eurostat data.

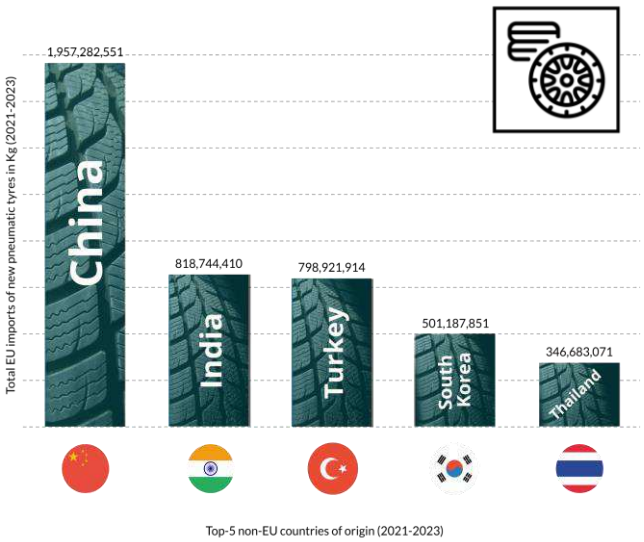


Figure 7. Main (top-5) non-EU supplier countries of new pneumatic tyres (HS 4011) to the EU market between 2021 and 2023 (inclusive). Source: AidEnvironment based on Access2Markets and Eurostat data.

In terms of global exports of natural rubber between 2021 and 2023, the scenario is relatively similar to that observed in the EU, even though there are some slight differences. According to data from the UN COMTRADE database, the ten countries with the largest total exports (to the world) of natural rubber are almost all located in Southeast Asia, except for Ivory Coast, Myanmar, and Belgium. On the other hand, the main global importing countries of natural rubber in the same period include several of the top-5 countries that supply the EU market with new pneumatic tyres (a product processed from natural rubber, as aforementioned), namely China, India, Turkey, and South Korea. Moreover, in the top-20 global importers of natural rubber, several EU27 countries can be found, namely Germany, Poland, Italy, France, Czechia, Slovakia, Spain, and the Netherlands. This is also relatively aligned with early findings on the highest consumers of natural rubber among EU Member States (see page five of this report). The trade data also corroborates literature findings that indicate that a number of developing countries are increasingly becoming relevant market outlets (importers) for other developing countries that export this raw material. That is for instance the case of Malaysia, Vietnam, and Thailand.

Rubber supply chain

Actors, roles, and supply chain linkages

The rubber supply chain is complex, counting with several different layers and actors from production to consumption. Independent smallholders are key players in the natural rubber chain (Fig. 8). Worldwide, it Is estimated that there are around six million rubber smallholders, who are responsible for 85 percent of global natural rubber production and are the foundational link of the supply chain in all regions of production (Latin America, Africa, and Asia). Rubber production has been historically linked to smallholder production and remains an important cash crop and income stream for families. In Indonesia, for instance, about 3.2 million hectares of farmed land is on the hands of smallholders dedicated to producing natural rubber, often in less than two hectares of land each. To increase and diversify their sources of income, smallholders adopt different strategies that can potentially lead to this outcome. They often cultivate other crops together with rubber trees and, for instance in Indonesia, it is not uncommon to see them clear their lands and replace their "jungle rubber" by other crops, namely palm oil, or to see attempts at increasing the size of their small estates to cultivate more rubber trees and thereby increase rubber production. However, production is not exclusively in the hands of smallholders as large-scale plantations of natural rubber are also present and have been gaining ground since the mid-20 century. The plantation/monoculture model has been replacing smallholder production practices – often based on agroforestry – in many areas and, in countries like Cambodia and Laos, natural rubber production in industrial plantations has been the established mode of production since the development boom of the sector, mostly promoted by large industry actors from neighboring countries such as Vietnam.

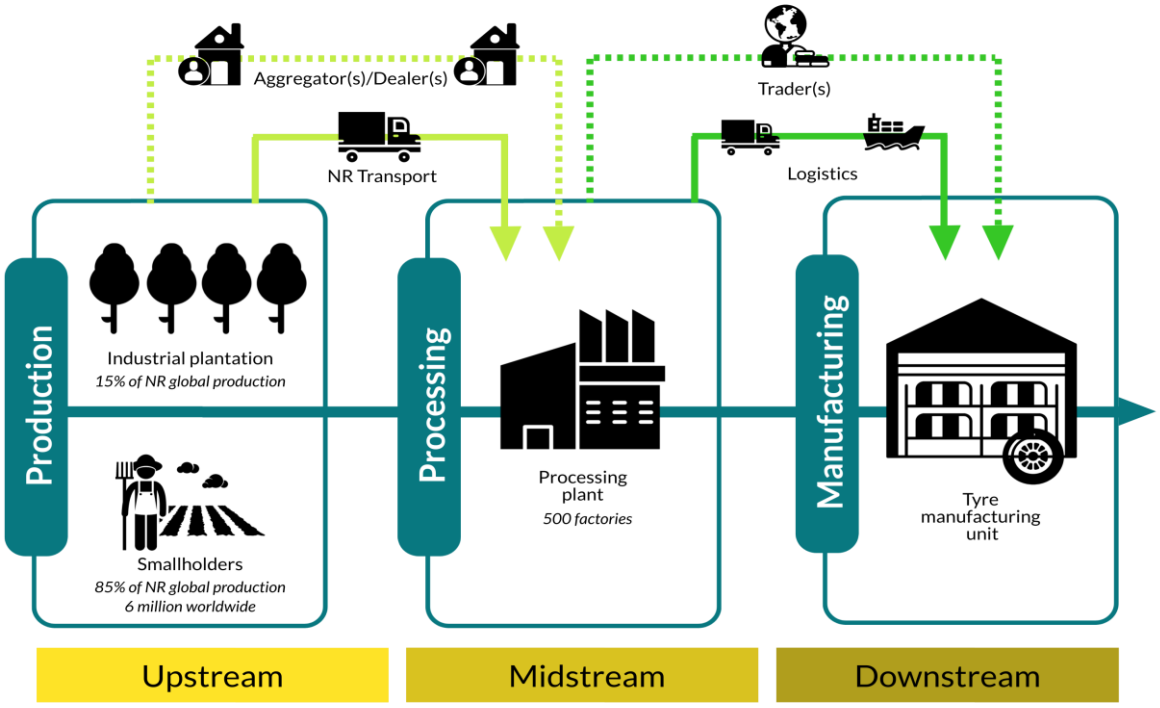


Figure 8. Natural Rubber-Tyre supply chain. Source: AidEnvironment based on ETRMA's "The Natural Rubber Supply Chain" (2022) and Partnership for Forests' "Advancing smallholder farmers' voices in the Global Platform for Sustainable Natural Rubber" (2021).

Besides smallholders, there are (or can be) several intermediary layers of aggregators and dealers in the natural rubber supply chain. These mediate between producers and processors, buying from and selling to the two groups they interlink. It is highly likely that the supply of (natural rubber) latex that reaches one rubber processor originates from innumerous smallholders and plots of land, producing in different areas and selling to local traders. Simply put, if natural rubber smallholders (approximately 6 million globally, as indicated in Fig. 8 above) sell their rubber produce to around 100 thousand dealers, these will end up collecting rubber volumes that are comprised by natural rubber produced by multiple smallholders. Local traders, on their turn, proceed to sell the rubber material acquired to processors (around 500 facilities globally), where it is refined and transformed in processed rubber derivatives.

Rubber supply chain

After the processing stage, the rubber products obtained can be either directly transferred to manufacturers by the processors themselves or through brokers/traders. Manufacturers can be present locally (have facilities in the same country where the natural rubber is produced, for instance) or overseas, in which case a logistics and distribution phase (eventually delegated to third-party actors) still needs to take place in order for the processed rubber product to reach the manufacturing facility of the final product (for instance, a tyre factory) (see Fig. 8).

Government entities, although not mentioned in the supply chain operations showcased before, are also important stakeholders. Various central and local regulators directly participate in several stages of the rubber supply chain. In Vietnam, for example, different ministries have responsibilities related to rubber production, manufacturing, and trade – the Ministry of Agriculture and Rural Development (MARD) deals with the management of natural rubber production and the Ministry of Industry and Trade with the manufacturing, import, and export of rubber goods. Vietnamese local governments have an enforcement role, checking compliance with existing policies, while also managing business activities that fall within their scope of action.

Important to note is that, although smallholders are core figures in the natural rubber supply chain, the intricacy of the chain and the wide network of stakeholders involved contributes to their limited understanding of its functioning and their actual impact in the industry, hampering their access as well to training, best practice exchanges, and lesson sharing.

General characteristics of rubber supply chains

Although different countries/regions might have distinct supply chain structures and differ in terms of their natural rubber sector organization, there are commonalities and factors that cross-cut all of them (see Fig. 9 below). First and foremost, it is undeniable that natural rubber supply chains are complex and fragmented, involving many stakeholders from upstream production operations to the downstream final product stage. They are also dynamic and non-exclusive, wherein smallholders can decide to whom they sell their rubber produce and traders/processor receive and mix supply from different origins. Natural rubber processing also implies operating with extensive supply zones which, given the non-perishable nature of the raw material, can go up to 500 kilometers or more.

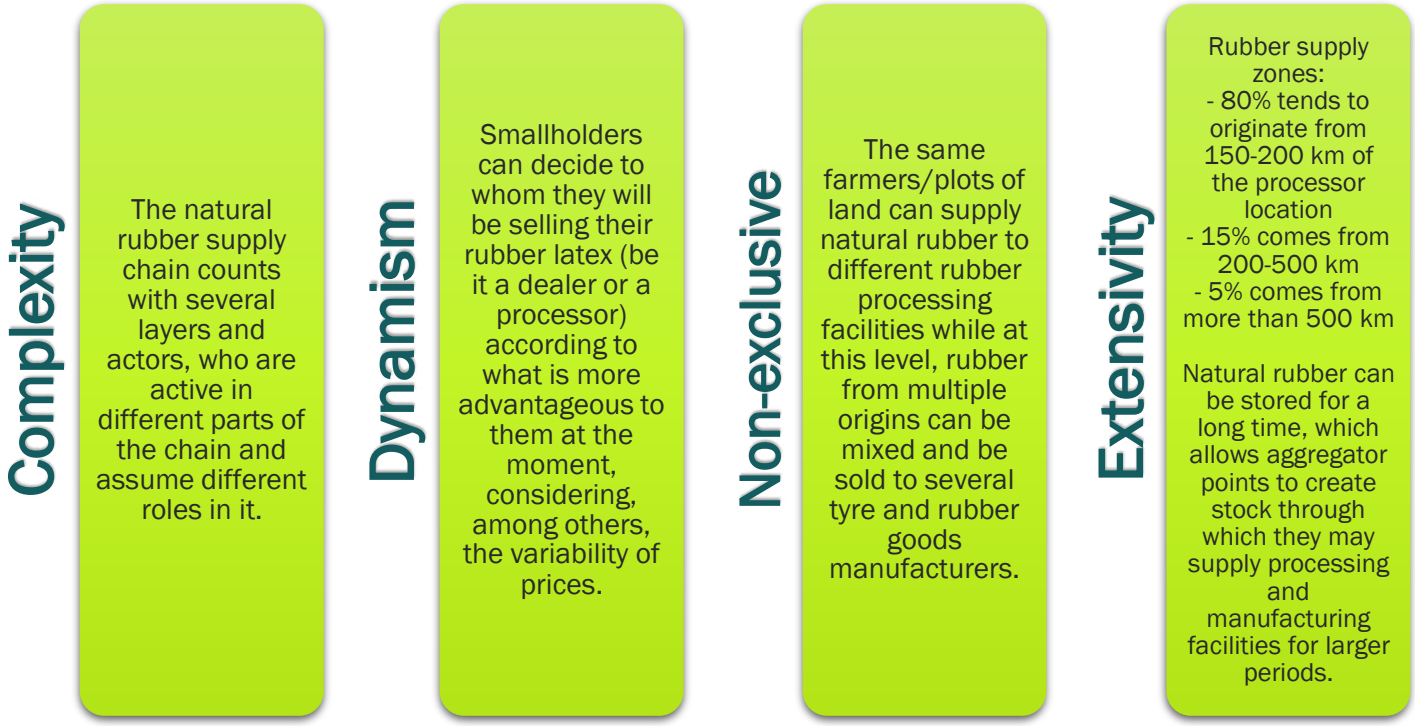


Figure 9. Natural Rubber supply chain characteristics. Source: AidEnvironment based on ETRMA's "The Natural Rubber Supply Chain" (2022)

Socioenvironmental impacts

Rubber production expansion and Forest loss

Since colonial times, rubber plantations have been associated with deforestation. In the 21st century, there was a rapid expansion of rubber cultivation during the first decade, particularly in Southeast Asia, which was attributed to higher rubber prices and increased demand from countries such as China. These developments have led to a higher prevalence of socioenvironmental problems in the natural rubber production sector, among which deforestation.

It has been estimated that, between 2001 and 2015, rubber plantations have replaced 2.1 million hectares of forest in seven producing countries - Brazil, Cambodia, Cameroon, DRC, India, Indonesia, and Malaysia. Indonesia, with about 1 million hectares replaced, and Southeast Asia were the country and region where this event was most prominent (Fig. 10).

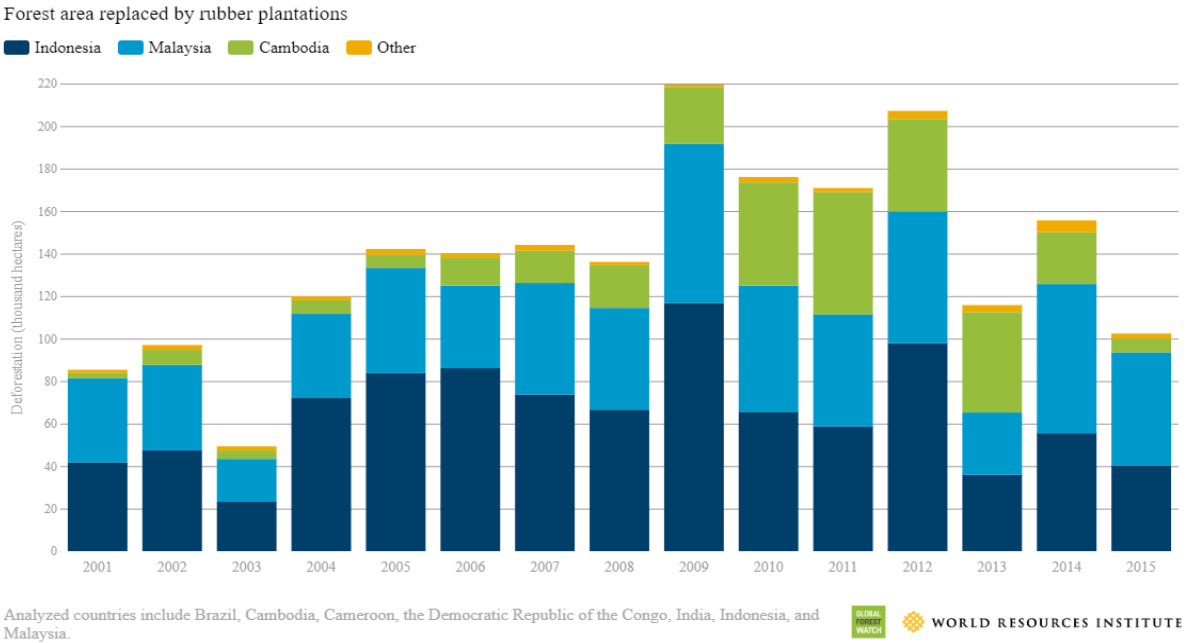


Figure 10. Forest area replaced by rubber plantations between 2000 and 2015. Source: World Resources Institute – Global Forest Review: Deforestation linked to agriculture. Accessed on 18/04/2024 from https://research.wri.org/gfr/forest-extent-indicators/deforestation-agriculture?utm_medium=blog&utm_source=insights&utm_campaign=globalforestreview#how-much-forest-has-been-replaced-by-plantation-rubber

A recent study by Wang *et al.* (2023) on rubber-linked deforestation in Southeast Asia states that, overall, deforestation-linked to rubber has been considerably underestimated, which may influence the attention provided to this raw material in dedicated policy initiatives. According to the study findings, 4.1 million hectares of forest were cleared between 1993 and 2016 to make room for rubber cultivation, and, out of these, between 2.5 and 3 million hectares were cleared since 2001. Thus, rubber-linked deforestation has not only been a historic problem but has also occurred at significant rates in more recent times. These trends were found to have been more prominent in Indonesia, Thailand, and Malaysia, with Cambodia also showing substantial deforestation linked to rubber since 2001. Additionally, the study concludes that, in 2021, more than 1 million hectares of rubber plantations in Southeast Asia were in key biodiversity areas.

These findings have nonetheless been disputed. A parallel study that looked into the methods used and analysis produced by Wang *et al*. has concluded that the findings are likely misleading because of 1) high omission and commission errors, and 2) unreliable estimates. Concretely, the overestimation of rubber-linked deforestation has been attributed to confusing rubber trees with other tree crops often associated with deforestation, such as oil palm and pulpwood, and wrongfully considering loss of old growth forest as tree loss. The deforestation estimates produced by Wang et al. were therefore deemed inflated and, in this study, they were calculated to be rather around 1.2 million hectares (0.57 ± 0.30 million hectares in only monoculture, and 0.60 ± 0.30 million hectares in monoculture and mixed cultivation).

Socioenvironmental impacts

These discrepancies in terms of rubber-linked deforestation are a testament to limitations that have already been identified and which can lead to inaccurate estimations of land clearance linked to rubber, namely:

- Remote sensing challenges in differentiating rubber trees from other types of trees.
- Lack of accurate and publicly available rubber plantation data that can allow for the distinction between actual tree cover loss and replanting of rubber plantations.

Despite this, as demand for natural rubber continues to increase, it is likely that the threat posed to tropical forests not only remains but keeps increasing. Most of the recent rubber-driven deforestation has been attributed to a growing adoption of monoculture techniques and large-scale plantations, which are more damaging than the traditional agroforestry systems already mentioned, and to the use of unsustainable farming practices. The slush-and-burn with discontinued fallow, for instance, is a common land clearing practice among rubber producing smallholders. Additionally, global rubber prices have also been found to significantly influence the expansion of rubber plantations and thereby to encourage deforestation in the tropical regions where this tree crop can be produced.

In this, not only forest loss is a concern, but also broader negative environmental impacts, such as further greenhouse gas emissions and lower soil health and biodiversity. Converting forests to rubber plantations has been linked to poorer soil quality and erosion, less water availability, fragmentation of habitats, decrease in species richness, and risks to the integrity of areas with High Conservation Value and High Carbon Stocks. In general, the existing impacts lead to poorer ecosystem services from which social issues are also likely to emerge.

Social impacts of rubber production

Besides environmental risks, there are social risks to be considered in rubber production. Many of the social risks observed have been linked to the environmental issues found in the sector, which often lead to further encroachment into forest and high conservation-value areas, more human-environmental conflicts, and a higher rate of social conflicts. As mentioned before, unsustainable practices and large-scale industrial plantations can cause negative impacts on water, soil, and food security and thereby on the health, economy, and livelihoods of Indigenous Peoples and Local Communities (IPLCs), as well as of smallholder producers (Fig. 11) These have been widely reported and are often manifestations of the power imbalances that exist between these communities and large companies or traders. The social issues found often involve:

Disputes due to land conflicts between local communities and industrial plantations are not uncommon. A known case involves the Vietnam Rubber Group which illegally seized land from local villagers in Cambodia and converted at least 50,000 hectares of forest, including wildlife sanctuaries and protected areas, to rubber plantations.

According to the U.S. Department of Labor's 2022 list of goods produced with forced or child labor, child labor in the rubber or rubber derivatives production sectors occurs in several countries.

There is a lack of data on labour standards and working conditions in the natural rubber supply chain, especially on the upper tiers of the supply chain, where the highest labour risks are found.

Figure 11. Social impacts found in the natural rubber production sector. Source: AidEnvironment based on GPSNR's 2020 Study on Human Rights and Labour Rights' Risk Mapping in the Global Natural Rubber Value Chains, SPOTT's 2021 report on Sustainability in the natural rubber supply chain: Getting the basics right, and Fair Labor Association's 2021 report on Natural Rubber Supply Chain Mapping in Viet Nam: A Multi-Stakeholder Approach in the Sporting Goods Industry.

Socioenvironmental impacts

Because of the pervasiveness of these issues, there are several legislative and regulatory initiatives being implemented by governments around the world, including in the EU and in individual EU Member States, that require companies to implement human rights due diligence and public reporting on the human rights impacts of their businesses and supply chain operations. These often include sanction measures according to which the failure to exercise adequate due diligence may lead to financial and operational penalties and operational challenges, including having goods excluded from entry in a country. Nonetheless, the socioenvironmental issues described have been and remain a reality within the sector. The Environmental Justice Atlas has reported on 25 socioenvironmental cases linked to rubber so far, of which 21 are related to land conflicts and are listed in Table 2 below.

Country	Conflicts reported	Description
Bangladesh	1	• Modhupur Sal forest and the Protection of Forest Rights due to government intervention
Cambodia	7	• Hoang Anh Gia Lai rubber plantation on indigenous land in Ratanakiri • Tumring logging and rubber concessions in Kampong Thom province causing deforestation and land conflicts • Prey Lang forest movement against deforestation, mining and agro-industries, among which government granted Economic Land Concessions attributed to rubber and cassava agro-industry companies • Try Pheap Co. Logging Operations in 23 provinces, leading to deforestation and land conflicts • Land conflict between ethnic Bunong villagers and Socfin KCD subsidiary, which started clearing the forest and fields close to the village. • Government allocation of land to Vietnamese investors to develop rubber plantations in the North-Eastern province Ratanakiri, causing deforestation and land conflicts with local indigenous communities • Illegal logging in Snuol Wildlife Sanctuary by granting new Economic Land Concessions for rubber and cassava plantations
Cameroon	3	• Rubber tree plantation and latex factory near Dja Reserve, by Sudcam Hévéa S.A., clears forest for industrial agriculture and is involved in land conflicts with the local population • Socio-ecological problems and land conflicts linked to SOCAPALM plantations • Rubber plantation of Hévécam in the Kribi Region causing expropriation of lands, destruction of the rainforest, and water pollution
Gabon	1	• Palm oil and rubber plantation deforestation and land conflicts linked to two agro-industrial companies - Olam International and SIAT Gabon
Indonesia	2	• Land conflict between Bumi Flora company and East Aceh residents • Plantation companies grab Orang Rimba indigenous land on Sumatra
Liberia	3	• Malaysian company Sime Darby Plantation land conflict • Mamba Bassa tribes evicted and dispossessed of their lands by Firestone/Bridgestone Rubber Plantations • Land conflicts and labour issues linked to SIFCA Rubber and Oil Palm Plantations
Nigeria	1	• Deforestation and land conflict in the Iguobazuwa Forest by Michelin rubber plantations
Sierra Leone	1	• Deforestation in Freetown linked to expansion of areas of land for commercial agriculture, by projects such as "Sierra Leone Agro-Processing Competitiveness Project", funded by the World Bank.
Sri Lanka	2	• Land grabbing in Nilgala Forestf (often in forest reservoirs and protected areas) for different purposes, such as plantations, tourism, and mines. • Land belonging to the village Soragune "Kuda Katharagama Devalaya" was sold to the private company Lalan Rubbers Ltd for the cultivation of rubber plantations, leading to deforestation and land conflicts

Table 2. Reported socioenvironmental cases linked to rubber. Source: AidEnvironment based on the Global Atlas of Environmental Justice. Accessed on 29/04/2024 from https://ejatlas.org/commodity/rubber

Challenges and opportunities

For the implementation and fulfillment of sustainable sourcing commitments, among which deforestation-free supply chains, it is essential to **guarantee that there is traceability** throughout the supply chain. This is an indispensable feature because, if not present, it is not possible to confirm if the natural rubber used is de facto produced sustainably. In this sense, having a traceable supply of rubber allows for more visibility and promotes the transparency that is necessary in order to act upon the issues that permeate the supply chains. However, compared to oil palm for instance, rubber production and use has not benefitted from the same level of scrutiny and lacks official and publicly available data, which has contributed to the difficulties manifested on achieving traceability of rubber supply chains, and to many companies failing to implement it. For instance, in SPOTT's 2021 assessment on public disclosure regarding organization, policies, and practices of companies that were involved in natural rubber supply chains, only eight out of 14 companies (57%) publicly committed to trace natural rubber to at least industrial plantation level. The same assessment from 2024 shows that while most companies assessed have zero-deforestation policies covering their whole supply chains (71.4 percent), less than one fifth of them (17.9 percent) discloses information about how they monitor supplier deforestation. This is further detailed in relation to disclosure of sourcing areas, where only seven companies out of 28 report on the countries they source natural rubber from and only one discloses the sourcing jurisdictions of natural rubber smallholders.

Considering the **requirements set by the EUDR**, in what comes to traceability to the plot of land, companies will be required to actively work towards increasing the transparency of their supply chains. This implies both the systematic mapping of their supply chains and the implementation of the necessary due diligence actions, including the mitigation of existing risks in the production and/or processing of natural rubber related not only to deforestation and forest degradation but also IPLCs rights and labour rights, for instance. Besides legislative initiatives like the EUDR, downstream buyer companies, investors, and multistakeholder organisations such as the Global Platform for Sustainable Natural Rubber have called for increased transparency in the natural rubber sector, promoting and supporting initiatives that have this goal at their core. For companies involved in the natural rubber industry, greater traceability and transparency has several recognized benefits, such as reduction of reputational risks faced, confirmation of commitments towards sustainability, trust-building among stakeholders, and competitive advantage gains. Knowing the origins of the supply and disclosing supplier locations has been deemed to have benefits in terms of pricing, secure supply chains, and opportunities for investment in sustainable practices at farm and landscape level that can bring forth desired outcomes, such as protection and/or restorations of ecosystems and species.

Rubber Case Studies

Indonesian rubber case studies

AidEnvironment has identified several Indonesian rubber cases that are potentially noncompliant with the EUDR. The cases include rubber plantations linked to **Kirana Megatara (Triputra) and Socfin** (see next pages).

Availability of public data sources in Indonesia to remotely assess compliance with the EUDR

Opportunities: In Indonesia, there is publicly available data on where rubber is planted from several sources, including Condro *et al*., 2020 and Harris *et al.* ("Spatial Database of Planted Trees - Version 1.0) (available through Global Forest Watch). Moreover, there is available rubber plantation concession data (industrial forest plantation– APL or Hak Guna Usaha/HGU), as well as an Indonesian forest layer (Kementerian Lingkungan Hidup dan Kehutanan - Ministry of Environment and Forestry).

Challenges: While deforestation monitoring and rubber traceability linked to large-scale rubber concessions is feasible, this is less evident for small-scale production of '*jungle rubber'.* In the latter, different crops (e.g., fruit trees, timber, rubber) are planted together, potentially resulting in an attribution issue on which commodity is responsible for deforestation. Moreover, the distinction between several trees through remote sensing, such as rubber trees or pulpwood plantations (mostly acacia), can be challenging. Also, Indonesia's forest zoning system (forest area versus non-forest area) may not reflect the actual land cover and may also not align with the EUDR requirements for a ban on clearing forests (also involves legal clearing). Therefore, AidEnvironment cross-checked the Indonesian forest layer with the EU Forest Observatory global map of forest cover 2020, acknowledged under the EUDR. Finally, a challenge is that Indonesian customs have stopped sharing export data with shipment data providers such as Seair since September 2021.

Figure 12. Example of satellite images of rubber plantation (left) versus oil palm plantation (right)

Case study 1: Kirana Megatara (Triputra) (1/3)

Kirana Megatara is the rubber and palm oil plantation business segment of the Triputra Group. Kirana Megatara Group reports to be the largest producer of crumb rubber in Indonesia with more than 500,000 tons production capacity annually. Other than rubber, its predominant commodity, the company is also active in palm oil, rice, corn and tapioca.

AidEnvironment found a total of **415 hectares** of clearing of native vegetation in the Indonesian concessions of rubber plantation subsidiaries of Kirana Megatara: 230 ha in concessions of PT Putra Katingan Pratama; 100 ha in concessions of PT Anugerah Alam Persada; and 85 ha in concessions of PT Kilau Getah Kemuning, all between the EUDR cut-off date (31 December 2020) and 31 December 2023.

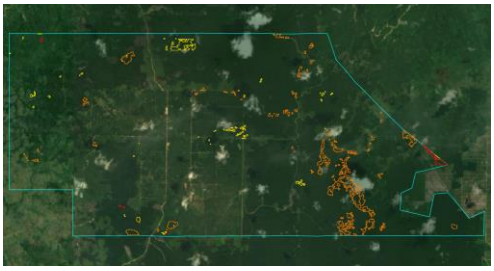
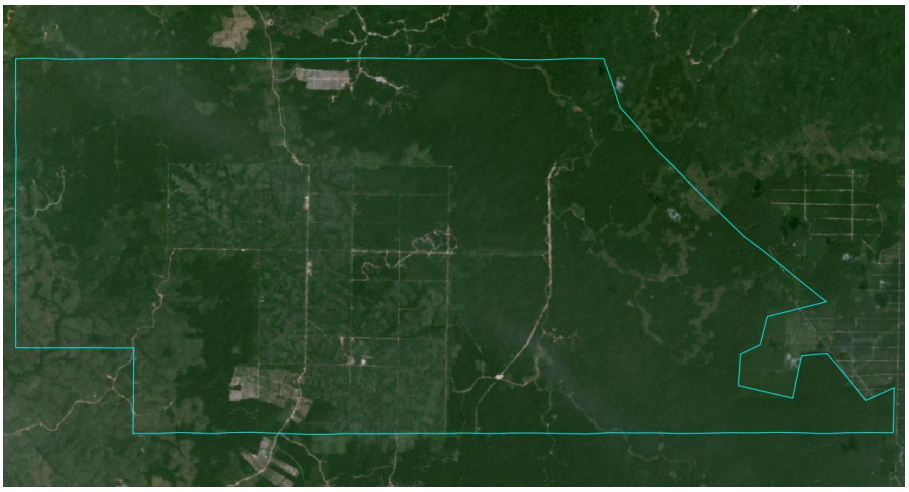


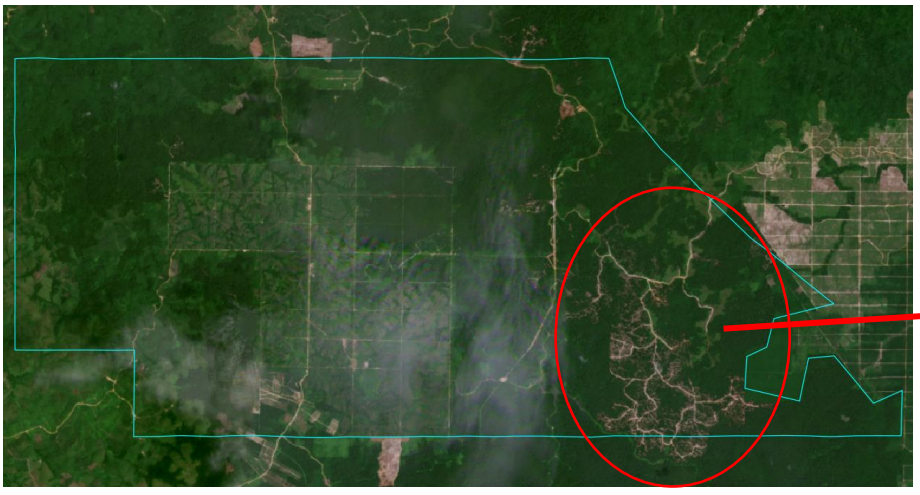
Figure 13. Kirana Megatara's PT Putra Katingan Pratama concession in Central Kalimantan (Katingan). Source: AidEnvironment. Imagery ©2023 Planet Labs Inc.

Coordinates of the concession: -1.3851, 113.1955

January 2021



January 2024



January 2024

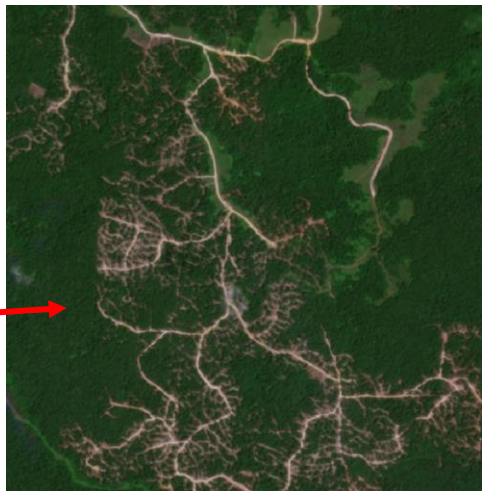


Figure 14. PT Putra Katingan Pratama concession, before and after clearing. The picture on the right shows a zoom of the cleared areas in January 2024. Source: AidEnvironment. Imagery ©2024 Planet Labs Inc.

Of the 230 hectares of cleared area in the concession of Kirana Megatara's plantation subsidiary **PT Putra Katingan Pratama** in Central Kalimantan (see images above), 43 ha were cleared in 2021, 12 ha in 2022, and 174 ha in 2023. According to Condro *et al*, 2020, the cleared area in the concession covers rubber vegetation. All the deforestation occurred inside the EU Observatory Forest map. Also, the Indonesian forest zoning system (KLHK layer) indicates there is forest inside the concession.

Case study 1: Kirana Megatara (Triputra) (2/3)

Figure 15. Clearing of 100 hectares in Kirana Megatara's PT Anugerah Alam Persada Sawit concession in the Hainan State Farms in East Kalimantan (East Kutai). Coordinates: 1.3275, 117.8385. Source: AidEnvironment. Imagery ©2024 Planet Labs Inc.

Inside the concession of Kirana Megatara's plantation subsidiary **PT Anugerah Alam Persada Sawit**, AidEnvironment detected 100 hectares of native vegetation loss between 31 December 2020 and 31 December 2023. According to Condro *et al*, 2020, the cleared area in the concession covers rubber. All the deforestation occurred inside the EU Observatory Forest map. Also, the Indonesian forest zoning system (KLHK layer) indicates there is forest inside the concession.

Case study 1: Kirana Megatara (Triputra) (3/3)

Finally, a total of 85 of area classified as forest was cleared in Kirana Megatara's plantation subsidiary **PT Kilau Getah Kemuning** in North Kalimantan (Bulungan) between 31 December 2020 and 31 December 2023.

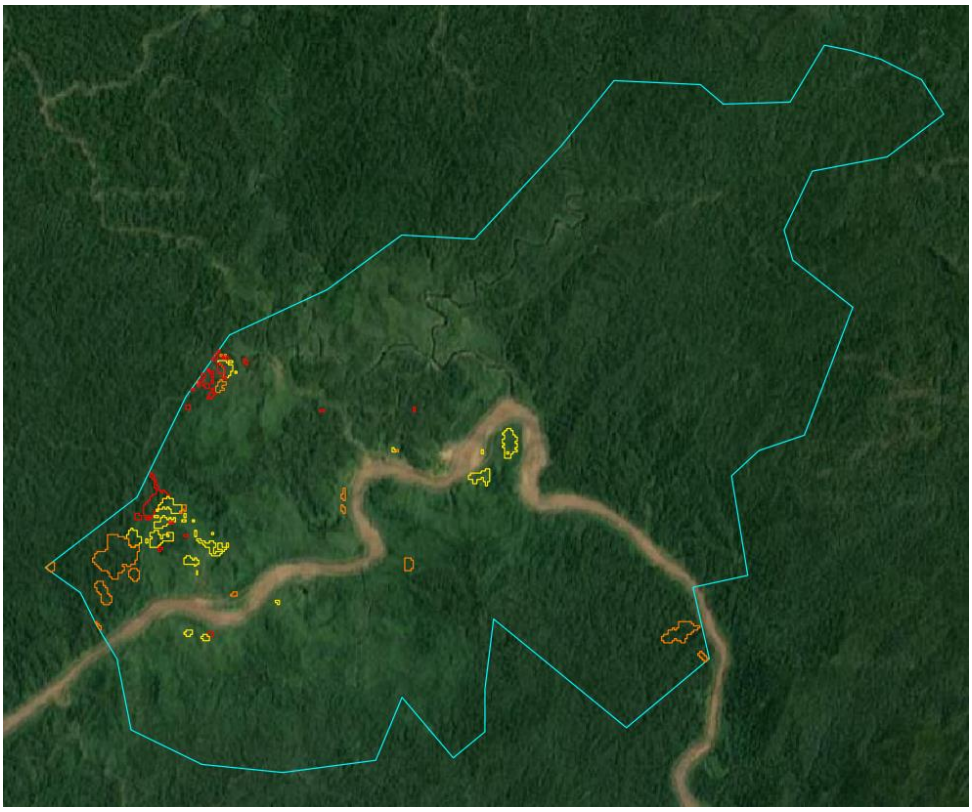


Figure 16. Clearing of 85 hectares in the concession of Kirana Megatara's rubber plantation company PT Kilau Getah Kemuning : 32 ha in 2021 (yellow), 13 ha in 2022 (red) and 40 ha in 2023 (orange).

Coordinates: 2.8244, 116.6826.

Source: AidEnvironment. Imagery ©2024 Planet Labs Inc.

Trading links to Europe

While Kirana Megatara ships the majority of its natural rubber products (processed by Kirana's crumb processors subsidiaries Musi, Permata, Prima, Sapta, and Windu) to Japan, United States, and China, according to Jan 2019 - Sept 2021 Indonesian export data, also EU27 countries have received 122,249 MT of natural rubber from the company group in this period, with top-3 recipients being Luxembourg, Belgium, and Romania. Its top-5 buyers in Europe in this period were Goodyear, Pirelli, Michelin, Polsaros, and Nexen. Moreover, plantation company PT Putra Katingan Pratama, with deforestation of 230 hectares between December 2020 and December 2023, exported 934 MT of natural rubber predominately to China and India (only 18 MT) between 2019 and September 2021 (last date of available Indonesian export data). According to its company website, subsidiary PT Putra Katingan Pratama is processing latex into Ribbed Smoked Sheets (RSS), which is indeed the rubber form exported to China.

In the 2022 Nature Benchmark, Kirana Megatara performs poorly, scoring only 7 out of 100 points indicators linked to social inclusion and community impact measurement. The company does not disclose time-bound targets to achieve conversion-free supply chain.

Case study 2: Socfin (1/2)

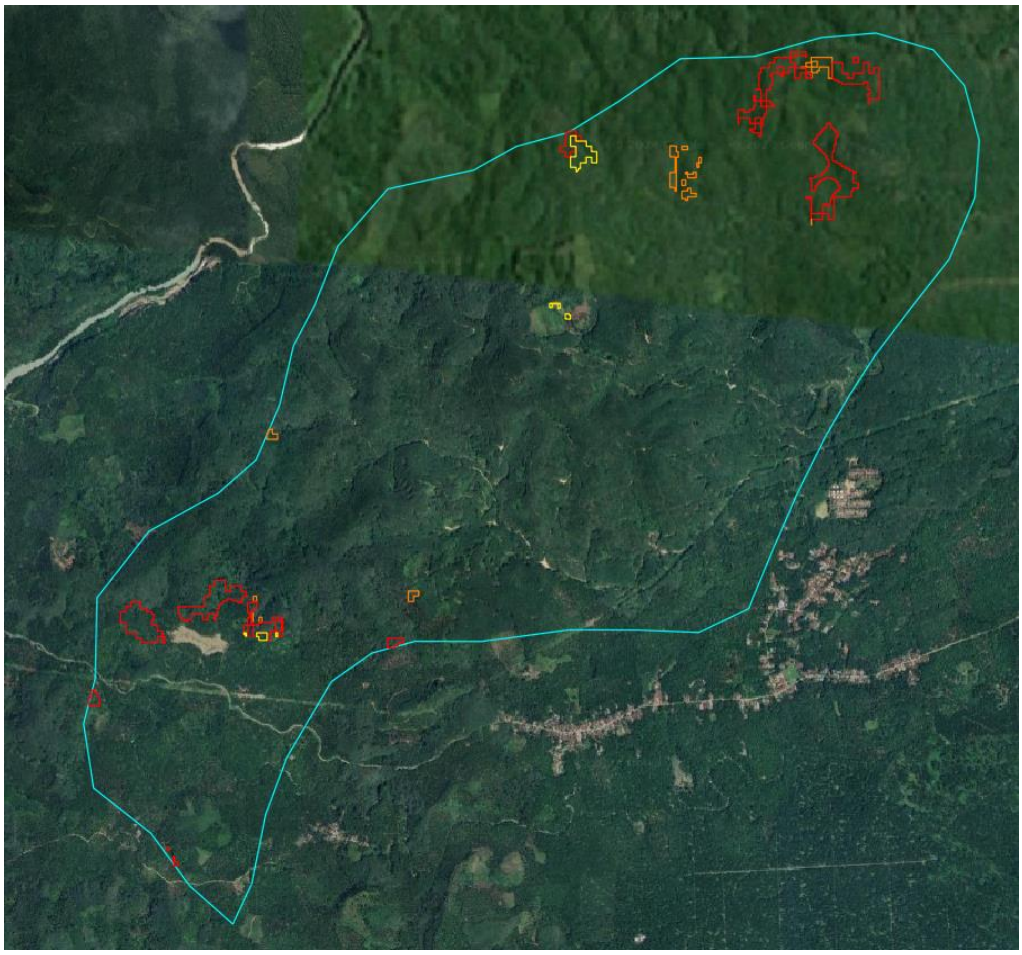


Figure 17. PT Socfin Indonesia – Aek Pamienke Estate in North Sumatra (North Labuhan Batu). Source: AidEnvironment.

In yellow represented approx. 2 ha cleared in 2021, in red 18 ha cleared in 2022, and in orange 2 ha cleared in 2023.

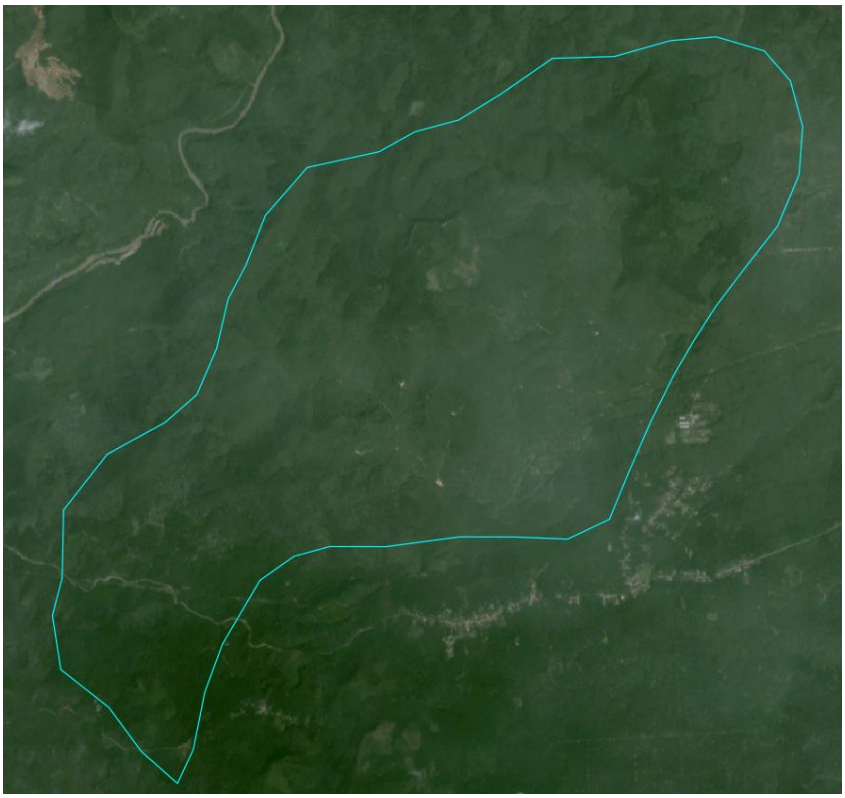
Coordinates of the farm: 2.3029, 99.7033

Socfin is a Luxembourg-based holding company involved in oil palm and rubber production in Asia and Africa. The company has about 383,000 ha of concessions in ten countries. Socfin Group, which consists of major financial holdings Socfin, Socfinaf, and Socfinasia, is 39 percent held by the French group Bolloré and 54 percent held by the Belgian businessman Hubert Fabri. The group says it is committed to promoting biodiversity and eliminating deforestation.

According to Socfin's 2022 Sustainability Report, PT Socfin Indonesia (Socfindo) is part of the Socfin Group and is a joint venture between the Socfin Group (90% of shares) and the Government of Indonesia (10% of shares). Socfin Indonesia is engaged in the cultivation of palm oil and rubber. In Indonesia, Socfin's rubber operates in the North Sumatra Province.

Case study 2: Socfin (2/2)

December 2020



April 2022

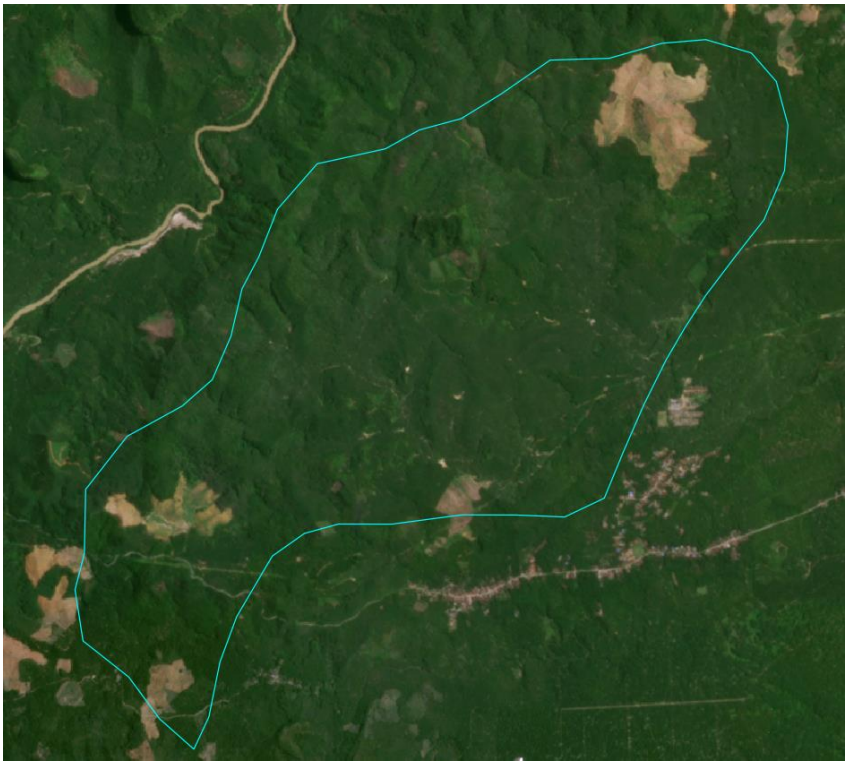


Figure 18. Before and after clearing images in PT Socfin Indonesia's Aek Pamienke Estate in North Sumatra (North Labuhan Batu). Source: AidEnvironment. Imagery ©2022 Planet Labs Inc.

Between the EUDR cut-off date and 31 December 2023, AidEnvironment detected **22 hectares** of cleared area in Socfin's Aek Pamienke Estate in North Sumatra (North Labuhan Batu).

However, while the 22 hectares of cleared parts fall inside the area classified as forest by the EU Observatory Forest map, the concession does not have any forest according to the Indonesian forest vegetation layer (KLHK). Therefore, this could represent either a flaw in the EU observatory forest map, or a flaw in the Indonesian land cover zoning system.

Rubber is cultivated in this concession area according to Harris *et al.* ("Spatial Database of Planted Trees - Version 1.0) (available through Global Forest Watch).

Trading links to Europe

Socfin Indonesia has exported 8,911 MT of natural rubber products to the EU27 between Jan 2019 - Sept 2021, the majority to Italy, Greece, and Spain. The top-5 buyers of Socfin Indonesia's natural rubber products in this period were Ravago, Pegasus Polymers, Alcan Rubber UK, Weber und Schaer, and Teodoro Gonzales. Ravago (Italy) is a plastic manufacturing company.

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