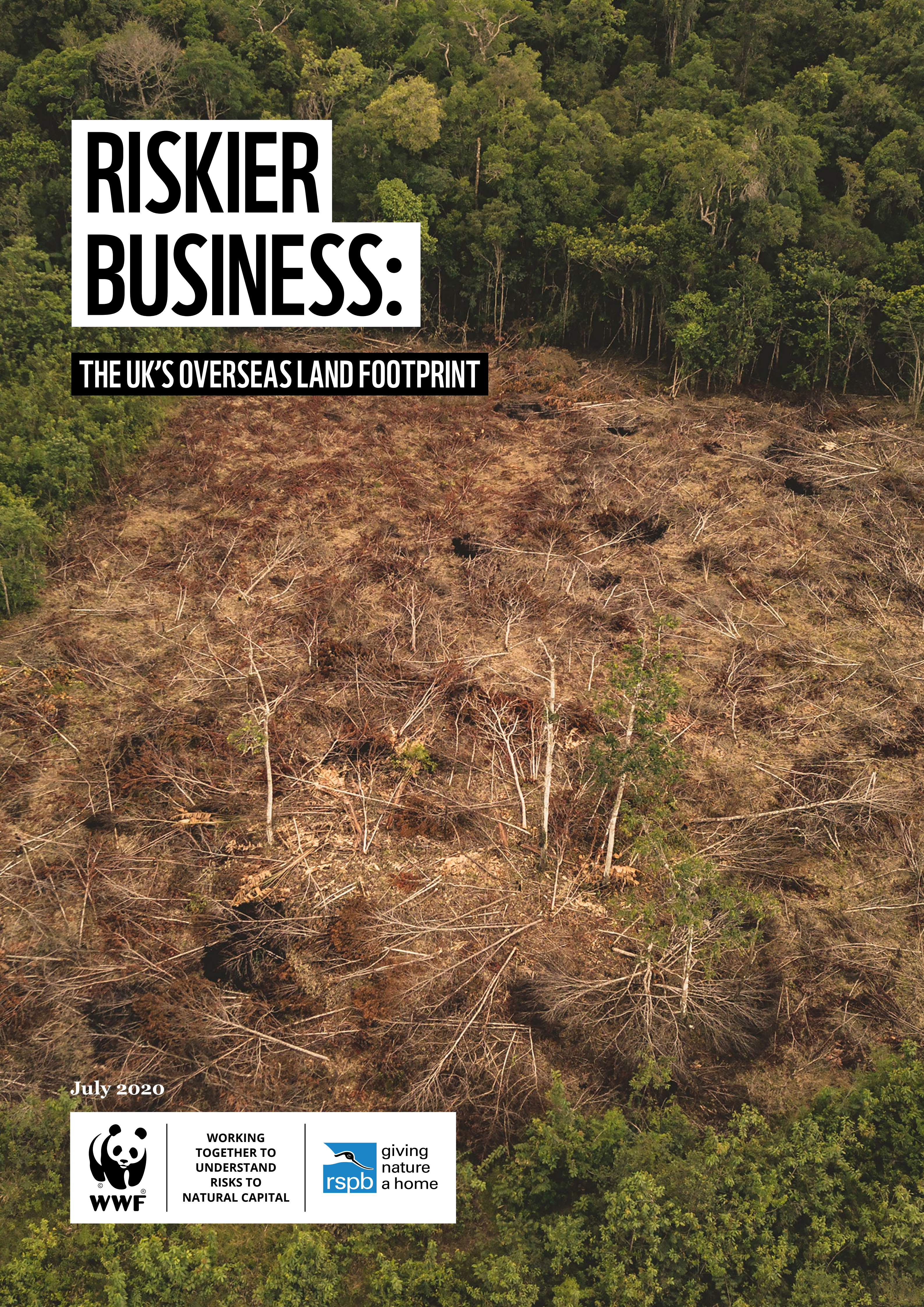
RISKIER BUSINESS:

THE UK'S OVERSEAS LAND FOOTPRINT



July 2020

WWF

WORKING TOGETHER TO UNDERSTAND RISKS TO NATURAL CAPITAL

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This report updates and extends our 2017 assessment, *Risky Business*[i], which focused on the impacts resulting from the UK's trade in the same seven agricultural and forest commodities: beef & leather, cocoa, palm oil, pulp & paper, rubber, soy, and timber. We present new analyses including estimates of the greenhouse gas emissions and the biodiversity impacts associated with the production of these commodities in producer countries. Our main analysis includes data up until 2018, which was the most recent available at the time of our analysis. As such, our assessment does not consider the large increase of deforestation and conversion rates in a few major producer countries (such as Brazil) that have occurred during the last year.

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i WWF and RSPB report Risky Business: Understanding the UK's overseas footprint for deforestation-risk commodities (2017) wwf.org.uk/riskybusiness

SUMMARY

The UK's overseas land footprint, a key element of the UK's total environmental footprint overseas, has increased by 15% on average compared to our 2011-15 analysis. Between 2016 and 2018, an area equivalent to 88% of the total UK land area was required to supply the UK's demand for just seven agricultural and forest commodities – beef & leather, cocoa, palm oil, pulp & paper, rubber, soy, and timber. This rise is in response to increasing demands for agricultural and forestry products, including those led by shifts in UK policy (notably, the greater demand for fuel wood as a source of renewable energy).

+15%
INCREASE IN THE UK'S OVERSEAS LAND FOOTPRINT COMPARED TO OUR 2011-15 ANALYSIS

Growing demand for forest and agricultural commodities drives greenhouse gas emissions and can have negative impacts on biodiversity overseas, but current UK legislation does not require these impacts to be monitored or mitigated. Greenhouse gas emissions arising from imported commodities are included in UK environmental accounts, but not in the UK carbon budget or climate strategy – so there are no requirements to mitigate them.

Globally, we are facing biodiversity and climate emergencies, being brought about by the destruction of nature and the greenhouse gas emissions generated by human activities. More than 50% of deforestation and land conversion is the result of commercial agriculture and forestry to produce the commodities[ii] we consumers take for granted and indeed increasingly demand.

These problems have been understood for some time. In fact, progressive companies and governments have made time-bound commitments to halt deforestation since 2010 (including through actions such as certification, market incentives and support for sustainable agriculture)[iii,iv,v]. But despite this, rates of deforestation and land conversion remain high and so do the associated negative impacts on local people and nature.

The Covid-19 pandemic has put our complex relationship with nature in the spotlight – including the role that converting and degrading ecosystems plays in increasing the risk of emergence of zoonotic[vi] diseases, and the fragility of our global supply chains (especially our food supply chains). Stopping the destruction of nature and protecting and restoring natural ecosystems is vital in securing wildlife habitats, addressing climate change and reducing the overall risk and frequency of future pandemics. It's also critical for securing resilient agricultural supply chains – for example, maintaining the provision of essential ecosystem services such as carbon sequestration and clean water.

ii Curtis, P.G., et al., (2018). Classifying drivers of global forest loss. DOI: 10.1126/science.aau3445
iii The Consumer Goods Forum. https://www.theconsumergoodsforum.com/initiatives/environmental-sustainability/about/our-commitments+and+achievements
iv The New York Declaration on Forests. https://forestdeclaration.org/about
v The Amsterdam Declarations. https://ad-partnership.org/about/
vi Diseases that are transmitted from animals to humans.

KEY FINDINGS

The UK's overseas land footprint continues to expand: between 2016 and 2018, an average annual area of 21.3 million hectares (Mha) was required to supply the UK's demand for the seven commodities assessed. This is an increase of 15% compared to our 2011-15 analysis. The new figure is equivalent to 88% of the UK's total land area.

The greenhouse gas emissions associated with the conversion of natural ecosystems and changes in land cover for the production of just four commodities[vii] (cocoa, palm oil, rubber and soy) amounted to an average of around 28 million tonnes of CO_2 equivalent ($MtCO_2e$) a year between 2011 and 2018. For a sense of scale, this is 7-8% of the UK's entire overseas carbon footprint in 2016[viii]. It is worth stressing that these overseas land-use change emissions are accounted for by the UK government, but they are not included in the UK national carbon budget or climate strategy, so there is no requirement to mitigate them.

FIGURE ES1:
THE UK'S ANNUAL LAND FOOTPRINT AREA OVERSEAS IN MILLION HECTARES (MHA) FOR THE SEVEN FOREST AND AGRICULTURAL COMMODITIES ASSESSED, FOR THE PERIODS BETWEEN 2011 AND 2015, AND 2016 AND 2018

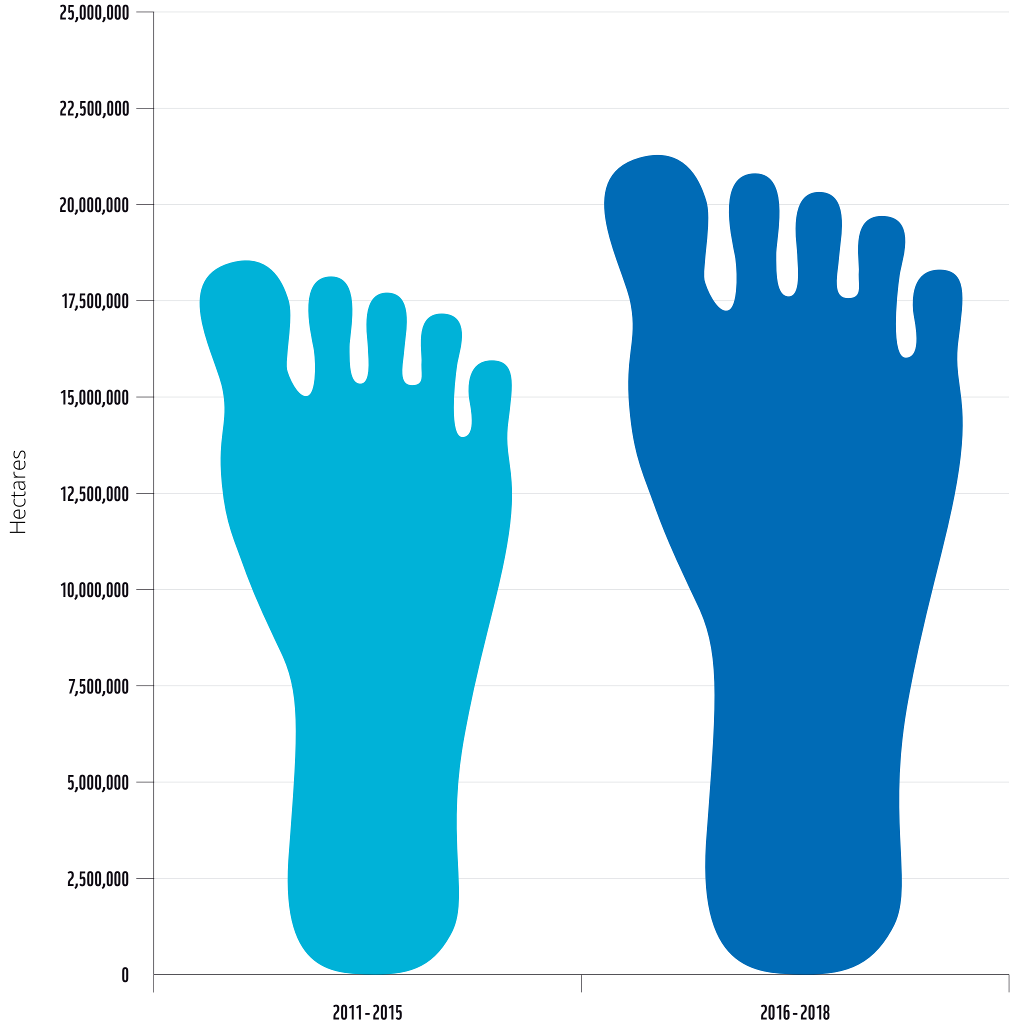
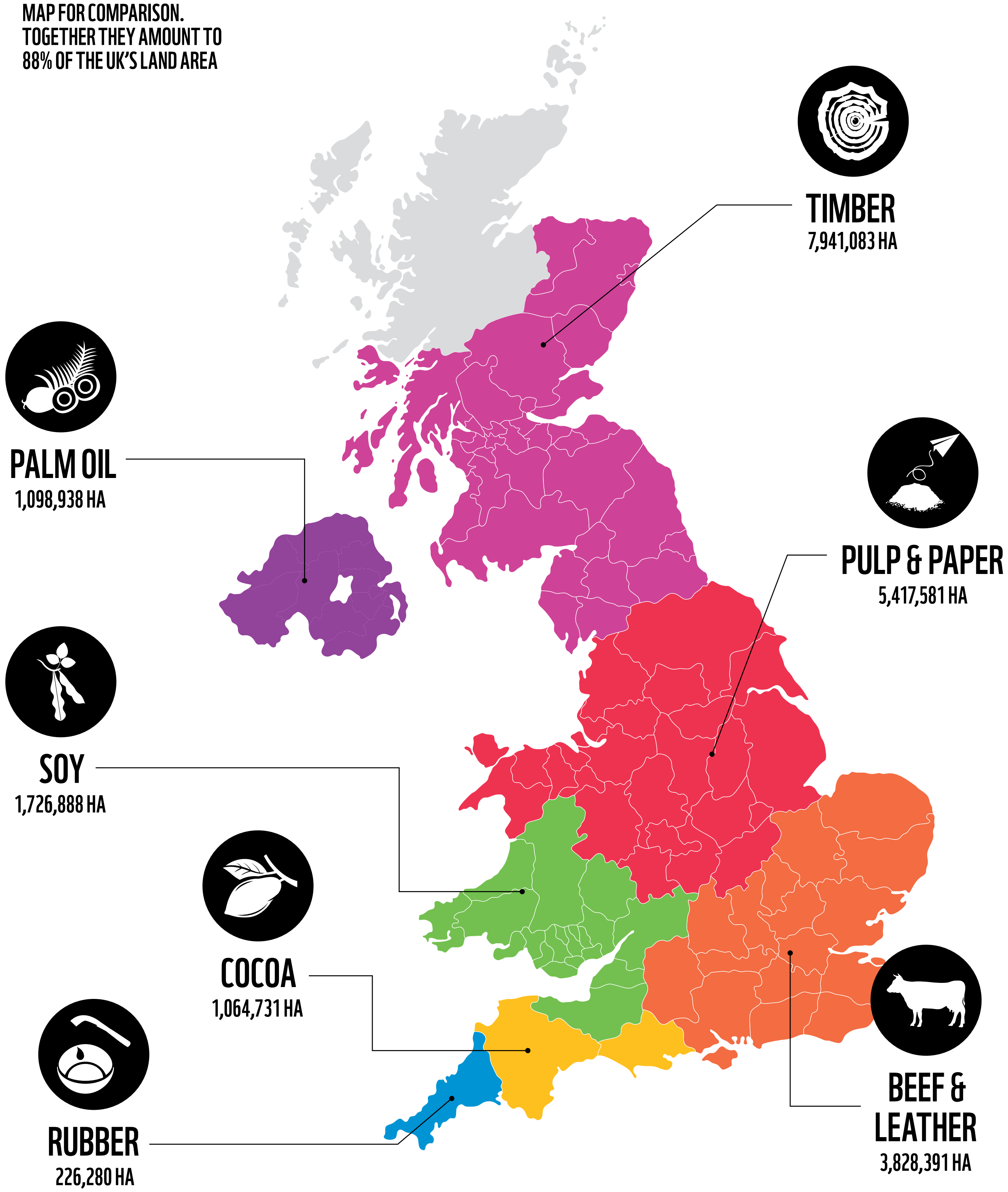


FIGURE ES2:
THE UK'S LAND FOOTPRINT OVERSEAS IN HECTARES (HA) FOR EACH OF THE SEVEN COMMODITIES SUPERIMPOSED ON THE UK MAP FOR COMPARISON. TOGETHER THEY AMOUNT TO 88% OF THE UK'S LAND AREA



vii Assessment could only be done for these commodities given the lack of comparable global data for calculating the GHG emissions for forest products and livestock.

viii WWF's 2020 report Carbon Footprint — Exploring the UK's Contribution to Climate Change found the total GHG emissions embodied in UK imports was 364 $MtCO_2e$ of a total UK carbon footprint of 801 $MtCO_2e$ in 2016; that analysis did not include emissions from land-use change (WWF, 2020). https://www.wwf.org.uk/updates/uks-carbon-footprint

In landscapes in high risk countries that grow products exported to the UK, we counted how many species could be exposed to threats associated with commodity production and expansion. We found that UK demand for and trade in these commodities could be affecting more than 2,800 species already threatened with extinction (including orangutan populations in Sumatra and wild cat populations in South America, such as the northern tiger cat).

By far the largest of all the land footprints are those associated with both the timber commodities and those of pulp & paper imported to the UK between 2016 and 2018 (7.9 and 5.4 Mha, respectively). For timber, even though more than 80% of this land footprint is located in lower risk countries, the sheer scale concerned means that the land footprint in high and very high risk locations[ix] (e.g. Russia) still represents a huge area of land. As for the lower risk countries, some, including the US, remain a concern in terms of deforestation and habitat destruction.

TIMBER IMPORTS HAVE DOUBLED SINCE OUR PREVIOUS STUDY, MOSTLY DUE TO A 110% INCREASE IN THE IMPORTS OF FUEL WOOD, AS A RESULT OF INCREASED DEMAND FOR BIOENERGY PRODUCTION

28%

OF THE UK'S TOTAL LAND FOOTPRINT OVERSEAS IS LOCATED IN COUNTRIES ASSIGNED A VERY HIGH OR HIGH RISK SCORE

We ranked the countries from which the UK imports directly according to their risk, using a composite of four factors: extent of tree cover loss, rate of deforestation, rule of law, and labour standards. Of the UK's total land footprint overseas (21.3 Mha), 28% (or around 6 Mha – three times the size of Wales) is located in those countries which our assessment assigned a very high or high risk score. This means there is still a high risk that the commodity supply chains operating within these countries continue to be associated with deforestation, conversion of natural ecosystems and/or human rights abuses.

BETWEEN 63% AND 89% OF THE UK'S LAND FOOTPRINT OVERSEAS FOR COCOA, PALM OIL, RUBBER AND SOY IS LOCATED IN COUNTRIES CONSIDERED TO HAVE HIGH AND VERY HIGH RISK

The UK's share of the global land footprint is sizeable for cocoa (9% of global cocoa land footprint), palm oil (5%) and pulp & paper (5%). This is especially notable considering the UK accounts for slightly less than 1% of the global population and around 2% of global gross domestic product (GDP).

ix We assigned a risk score to each UK sourcing country, based on their deforestation/conversion rates (Global Forest Watch and FAO), labour rights (International Trade Union Confederation) and rule of law indices (World Bank). Scores varied from 0 to 12, with ≥11 very high risk and 9-10 high risk.

Orangutan baby (*Pongo pygmaeus*). Semengoh Nature Reserve, Sarawak, Borneo, Malaysia.

GLOBAL SNAPSHOT

From 2016-18, the UK had an annual estimated overseas land footprint of 21.3 million hectares for just seven imported commodities – 28% of which (~6 Mha) was located in high and very high risk countries. The top 11 high and very high risk countries supplying commodities to the UK are shown on this map.

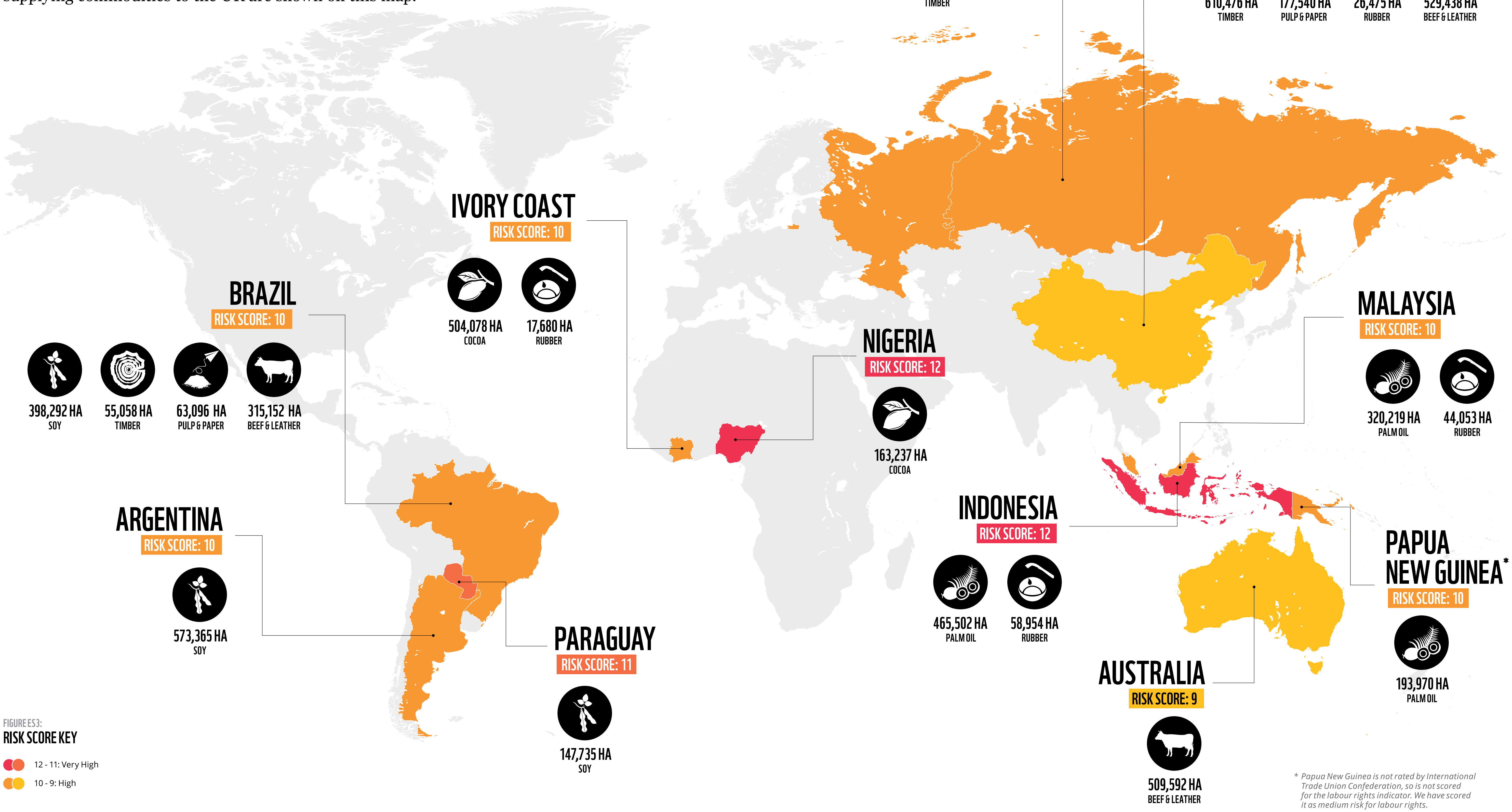


FIGURE ES3:
RISK SCORE KEY

12 - 11: Very High

10 - 9: High

Papua New Guinea is not rated by International Trade Union Confederation, so is not scored for the labour rights indicator. We have scored it as medium risk for labour rights.

THE UK MUST HELP TO STRENGTHEN THE RESILIENCE OF ITS GLOBAL SUPPLY CHAINS AND ENSURE THEY DO NOT CONTRIBUTE TO GREENHOUSE GAS EMISSIONS AND THE DESTRUCTION OF NATURE, OR CAUSE HARM TO PEOPLE OVERSEAS

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Young and mature oil palms in front of natural jungle in the state of Sabah, Borneo. WWF is supporting oil palm growers to adopt more sustainable agricultural practices and localinitiatives with replanting to create wildlife corridors linking existing forests which will allow species to move more freely.

ACHIEVING GREENER SUPPLY CHAINS

The UK, including the devolved governments, has shown willingness to take steps towards addressing its impacts overseas. This includes public recognition of the need to reduce its global footprint (for example through its 25 Year Environment Plan, the Global Resources Initiative (GRI) taskforce, the Well-being of Future Generations (Wales) Act, and the Scottish Environmental Strategy). In addition, it has undertaken work that aims to provide incentives for market demand for certified sustainable commodities and has been promoting private sector action (for example through the UK Roundtables on Sourcing Sustainable Palm Oil and Soya).

5-9%

THE UK'S SHARE OF GLOBAL LAND FOOTPRINT FOR COCOA, PALM OIL AND PULP & PAPER

We have also seen an increase in the number of commitments from the private sector to be deforestation- and conversion-free, and in action towards further transparency and sustainability in supply chains. Nevertheless, despite some encouraging progress within certain commodity supply chains (e.g. palm oil) there are still substantial risks embedded within the UK's supply chains that need to be addressed – and a large 'implementation gap' remains between pledges on deforestation and conversion-free supply chains and tangible progress on the ground.

Despite these worrying trends, the UK has the opportunity to demonstrate global leadership towards driving sustainability across commodity supply chains around the world. This can be achieved, especially for cocoa, palm oil, and pulp & paper supply chains, for which the UK's share of the global land footprint is most significant (5-9%).

Our data demonstrates that the UK is heavily dependent on international supply chains to satisfy its demand for food and fibre. In addition to managing demand, this dependence could, in theory, be marginally reduced for some commodities (i.e. beef & leather, pulp & paper, and timber) by increasing production domestically. However, for climatic, biological and other reasons it is not possible to grow most of them in the UK. Therefore, the UK must help to strengthen the resilience of its global supply chains and ensure they do not contribute to greenhouse gas emissions and the destruction of nature, or cause harm to people overseas.

Global traders and financial institutions have major links with impacts on producer landscapes, so they could play a key role in bringing about changes to improve sustainability. But there are currently no incentives for doing so.

International trade that respects the environment and human rights can play a positive role in enhancing equitable global prosperity. As the UK negotiates new trade agreements, it is important to ensure that these deliver on UK commitments to support the transition to resilient, reliable and sustainable commodity supply chains that benefit people and nature.

We urge the UK, including devolved governments, businesses and financial institutions, to take bold actions to bring about the rapid transition towards greener, more sustainable and resilient supply chains.

RECOMMENDATIONS

WE CALL ON GOVERNMENT TO URGENTLY:

- Secure high environmental and social standards and safeguards in all future trade agreements that are in alignment with the UK's commitments on climate, nature and people.
- Develop a post Covid-19 recovery package that ensures more sustainable and resilient supply chains.
- Establish a mandatory due diligence obligation on businesses and financial institutions that requires them to identify, mitigate and report on risks and impacts in their supply chains or investment portfolios[v].
- Implement the GRI taskforce recommendations – in particular, set a mandatory due diligence obligation, develop a sustainable action plan for commodity supply chains, set a legally binding target to halt deforestation, and develop a measuring, monitoring and reporting framework to support implementation.
- By the end of 2020, set a time-bound, legally binding target to halve the UK's overall environmental footprint by 2030, including a sub-target to halt deforestation and conversion embedded within UK commodity supply chains as early as possible and no later than 2023.
- Push for strong action targets, in partnership with key producer and consumer countries, such as China, to protect species and habitats as part of the Post-2020 Global Biodiversity Framework under the Convention on Biological Diversity. And, as president of the next conference of parties (COP26) of the UN Framework Convention on Climate Change, scale up support for and implementation of nature-based solutions.
- Lead the way in implementing multilateral/bilateral plans to improve sustainability in at-risk[vi] landscapes and transform supply chains, including support through Official Development Assistance and international climate change finance.

WE CALL ON COMPANIES TO:

- Set robust policies and time-bound commitments to halt deforestation and ecosystem conversion from supply chains aligned with the Accountability Framework initiative, and implement these as soon as possible (e.g. acting on voluntary due diligence principles).
- Report publicly on progress towards implementation of policies and commitments.
- Engage with suppliers and support implementation of policies and commitments across the entire supply chain.
- Advocate for further action among peers and wider stakeholders (e.g. government and civil society) for policies to achieve deforestation/conversion-free supply chains (e.g. supporting calls for robust environmental and social standards in trade agreements).

v The new legislative piece, the Environmental Bill, offers the right opportunity for such an obligation.

vi Producer landscapes experiencing high rates of deforestation and land conversion as well as human rights issues.

WE CALL ON FINANCIAL INSTITUTIONS TO:

- Set policies as well as pre-screening and monitoring systems to ensure that no lending or investments are associated with illegal environmental or social practices, or with the destruction of nature.
- Report publicly on risks and impacts and on the progress in mitigating them; and request clients to do so.
- Understand opportunities to enable the transition to sustainable commodity production (e.g. finance sustainable agriculture practices, nature-based solutions, and support projects to improve sustainability in at-risk landscapes).

WE CALL ON CITIZENS TO:

- Purchase products that meet a credible certified standard whenever possible.
- Write to your local MP, MSP, MS or MLA to support policies and legislation for greener supply chains and further transparency and scrutiny over trade deals.
- Demand greater transparency and action from your supermarket and favourite brands to ensure that the products you enjoy are not associated with deforestation, conversion or labour rights abuses.
- Eat more sustainably (e.g. consider introducing more plants into your diet, eating less meat, wasting less food and, when possible, choosing locally sourced options).

CONTENTS

TERMINOLOGY

In this report, we use the following key terms (refer to Methods for further details):

BIODIVERSITY Refers to the Convention on Biological Diversity's definition of biodiversity: 'The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems.' Our analysis of impacts on biodiversity relates to the species level of diversity.

COMMODITY Refers to various forms in which a commodity can be imported. This includes raw material, processed commodity, or commodity embedded in manufactured products and livestock (meat, dairy and eggs). For example, as 'soy' we mean soybeans, soymeal, soy oil, and soy fed to animals to produce imported meat, dairy and eggs. Similarly, as 'palm oil' we refer to products from oil palm including palm oil *per se*, solid residue of palm oil extraction (e.g. palm kernel expeller) and palm oil embedded in imported manufactured products (e.g. soap, chocolate). Refer to the 'Commodities' section below for further details.

CONVERSION Refers to the conversion of natural ecosystems to other land use or the permanent change in the original vegetation structure. When used after 'deforestation' it refers to the conversion of other ecosystems not classified as forests, e.g. woody savannahs. Note that our methodology only allows the assessment of conversion of ecosystems with a minimum of 10% tree coverage, thus, grasslands with less than 10% of tree cover are not included in our analyses.

DEFORESTATION Refers to the definition of deforestation from the United Nations Food and Agriculture Organization (FAO) (2015): 'The conversion of forest to other land use or the permanent reduction of the tree canopy cover below the minimum 10% threshold.' Note that this definition allows the assessment of changes in vegetation cover of other formations (e.g. woodlands, savannahs), if these have at least 10% of tree coverage[1].

FOOTPRINT For crops, refers to the estimated land area (in hectares) required outside the UK to grow the crop needed to provide the quantity (by weight) of commodities imported (based on average crop yield for the source country); for timber, and pulp & paper, refers to the area of forest required to grow the trees needed to extract the quantity (by weight) of commodities imported; for beef & leather, refers to the area of grazing pastures for beef cattle required to raise the herd needed to provide the quantity (by weight) of commodity imported.

GREENHOUSE GAS (GHG) EMISSIONS In our main analysis, i.e. the country-level UK's land footprint analysis, we refer to GHG emissions as those emissions of greenhouse gases resulting from changes in land use, including deforestation, conversion of other ecosystems, and changes from one crop to another. These GHG emissions are expressed as carbon dioxide equivalent (CO_2e). Note that we take into account average national figures to calculate emissions and cannot trace deforestation directly. Therefore, our GHG emissions estimates are an indication of the risk associated with commodities traded to the UK. Due to lack of data for forest products and livestock we only present these estimates for four commodities: cocoa, palm oil, rubber and soy.

RISKY COUNTRIES Refers to those countries to which our risk index assessment assigned a very high or high risk score. The risk index considers tree cover loss from Global Forest Watch for 2016-18, percentage of natural forest loss from the FAO (2010-15), and indicators of labour rights (International Trade Union Confederation – ITUC, 2018) and rule of law (World Bank, 2018).

SOCIO-ENVIRONMENTAL RISK We refer to indicators used in our risk index score.

COMMODITIES

BEEF & LEATHER

We focus on beef and bovine leather given their strong links with deforestation and land conversion.
By beef & leather, we refer to beef (fresh or frozen) and processed bovine meat used in processed food (e.g. corned beef); and bovine leather as raw hides and leather used in manufactured products (e.g. shoes, vehicle seats, apparel).

COCOA

***Theobroma cacao* is a tropical tree from South America. It requires climatic conditions within 20 degrees latitude of the Equator to grow.**
By cocoa, we refer to cocoa beans, and processed cocoa used in manufactured products (e.g. chocolate, cocoa powder).

PALM OIL

The oil palm, *Elaeis guineensis*, is native to west and south-west Africa and now planted widely in tropical lowlands. It is the most productive oil crop per hectare and is extremely versatile, being used in the manufacturing of over 50% of packaged products in supermarkets.
By palm oil we refer to oil fraction (refined and crude oil), solid by-products from oil extraction (palm kernel and palm kernel cake), and refined oil used as ingredients in manufactured products (e.g. soap, margarine, cosmetics).

PULP & PAPER

Wood pulp is a fibre extracted from wood and is mainly used to produce paper.
By pulp & paper we refer to paperboard, carton boxes, regular printing paper, newsprint, toilet paper, etc.

RUBBER

The primary source of natural rubber is the rubber tree, *Hevea brasiliensis*, which grows in humid, tropical lowlands.
By rubber we refer to natural latex either raw or used in the manufacture of products (e.g. tyres, latex gloves, vehicle accessories).

SOY

Soy (or soybean, or soya), *Glycine max*, is a leguminous species native to east Asia, cultivated for its edible bean. It is now grown widely in Asia and the Americas.
By soy we refer to soybeans, soy oil, solid by-products from oil extraction (e.g. soymeal), processed soy used as ingredients in manufactured products (e.g. tofu, soymilk) and soy embedded in imported livestock product (e.g. poultry, eggs).

TIMBER

Timber is a general name for forest products, wood being the main product. Wood is used widely from lumber to sawnwood and pulp & paper.
By timber, we refer to wood and solid wood products (including timber for construction and fuelwood for bioenergy), as well as wood used in finished products (e.g. furniture). We exclude pulp & paper given they are assessed separately.

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IN THIS REPORT

The *Risky Business* report, published in 2017[2], highlighted key socio-environmental risks associated with the UK trade of the following seven forest and agricultural commodities: beef & leather, cocoa, palm oil, pulp & paper, rubber, soy and timber. In this report, we reassess the UK's trade of the same commodities and the associated risks, from 2011 to 2018.

We continue to focus on the supply chains of the same seven commodities given their major association with deforestation, conversion and habitat degradation globally[3]. We build on the previous analysis and look at the entire period from 2011 to 2018. In addition, we provide estimates of GHG emissions equivalent due to direct land-use change from the production of these commodities, as well as risks to biodiversity in producer countries.

In addition to our global analysis, we show three case studies for three commodities (soy, palm oil and cocoa) in specific producer landscapes (Mato Grosso in Brazil, West Kalimantan in Indonesia, and Ivory Coast). These three commodities were chosen given both the high risk of deforestation and conversion in their supply chains and the large volumes imported to the UK. The producer landscapes were chosen given their importance in trade (share of imports) to the UK, the high socio-environmental risks they face linked to commodity production, and their importance in terms of biodiversity and climate change mitigation potential.

KEY FINDINGS

6 MHA

3 TIMES THE SIZE OF WALES IS LOCATED IN COUNTRIES UNDER HIGH RISK

21.3 MHA

AVERAGE ANNUAL AREA REQUIRED TO SUPPLY THE UK'S DEMAND FOR SEVEN AGRICULTURAL & FOREST COMMODITIES BETWEEN 2016 AND 2018

- **The UK's overseas land footprint, a key element of the UK's environmental footprint overseas, continues to expand.** Between 2016 and 2018, an average annual area of 21.3 million hectares (Mha) was required to supply the UK's demand for seven agricultural and forest commodities. This is equivalent to 88% of the total UK land area – a 15% increase compared to our 2011-15 analysis (Fig. ES1, Figs. 1a-b).
- **Of the total UK overseas land footprint, 28% (around 6 Mha – three times the size of Wales) is located in countries assigned a very high or high risk score** in our risk assessment[i].
- **The largest contributions to the UK's overseas land footprint are from imports of timber and pulp & paper** (7.9 Mha and 5.4 Mha, respectively, see Table 1 and Figs. 1a-b). Timber imports have doubled since our previous study, mostly due to a 110% increase in the imports of fuelwood, as a result of increased demand for bioenergy production.
- **Between 63% and 89% of the UK's overseas land footprint for cocoa, palm oil, rubber and soy was located in countries experiencing high deforestation and ecosystem conversion rates, poor track records on labour rights and/or a weak rule of law** – countries with high and very high risk scores. These include countries such as Brazil, China, Indonesia, Ivory Coast, Nigeria and Russia (Table 2 , Fig. 1c).
- **The UK's share of the global land footprint (i.e. the land area required around the world to produce/harvest these commodities) is largest for cocoa (9% of the global cocoa land footprint), palm oil (5%) and pulp & paper (5%)** (Table 1).
- **The GHG emissions associated with the conversion of natural ecosystems and changes in land cover for the production of just four commodities[ii] (cocoa, palm oil, rubber and soy) amounted to an average of around 28 million tonnes of CO_2 equivalent** ($MtCO_2e$) a year between 2011 and 2018. For a sense of scale, this is 7-8% of the UK's entire overseas carbon footprint in 2016[4].
- UK demand for and trade in these agricultural and forest commodities could be **exerting pressure on more than 2,800 species already threatened with extinction in high and very high risk producer countries.** Over 75% of these species have declining populations.

i We assigned a risk score to each sourcing country, based on its deforestation/conversion rates, labour rights and rule of law indices. Scores varied from 0 to 12, being ≥11 very high risk, 9-10 high risk. Refer to the risk index section in Methods for further details.

ii Assessment could only be done for these commodities given the lack of comparable global data for calculating the GHG emissions for forest products and livestock.

Commodity	**Average annual UK overseas land footprint for 2016-18 (Mha)**	**UK's percentage of global land footprint in 2017* (%)**	**Percentage of UK overseas land footprint in very high and high risk‡ countries (%)**	**Average annual GHG emissions** for 2016-18 (Mt CO_2e per year)**
Beef & leather	3.8	0.2%	35%	-
Cocoa	1.0	9.3%	63%	1.2
Palm oil	1.0	5.2%	89%	6.7
Pulp & paper	5.4	4.7%	4%	-
Rubber	0.2	1.8%	65%	0.4
Soy	1.7	1.3%	65%	18.8
Timber	7.9	1.0%	18%	-
Total	**21.0**	**-**	**28%†**	**27.2§**

TABLE 1:
THE UK'S OVERSEAS LAND FOOTPRINT AND ASSOCIATED GHG EMISSIONS

Notes: * *Source of global land footprint area: FAO (2017), except for beef & leather: FAO (2013)[iii]; UK land footprint data refers to 2017. ‡Refers to the percentage of total UK land footprint area for each commodity, column 2, that is located in countries with very high and high risk index scores. Refer to Table 2 for details on each country.*

** *GHG emissions are not provided for timber, pulp & paper or beef & leather due to lack of data.*

† *Percentage of the total UK overseas land footprint total in column 2, that is located in countries with very high and high risk index scores, i.e. ~6 Mha (see Table 2 for details).*

§ *Note that this figure refers to the average annual emissions for the period between 2016 and 2018, and differs from the average for the period between 2011 and 2018 (28 $MtCO_2e$), presented in the summary.*

iii Due to lack of more recent data we use the global cattle land footprint for 2013, which reduces the accuracy of our estimate for the UK's share of the global footprint for beef & leather.

THE UK'S IMPORTS OF AND LAND FOOTPRINT ASSOCIATED WITH SEVEN COMMODITIES

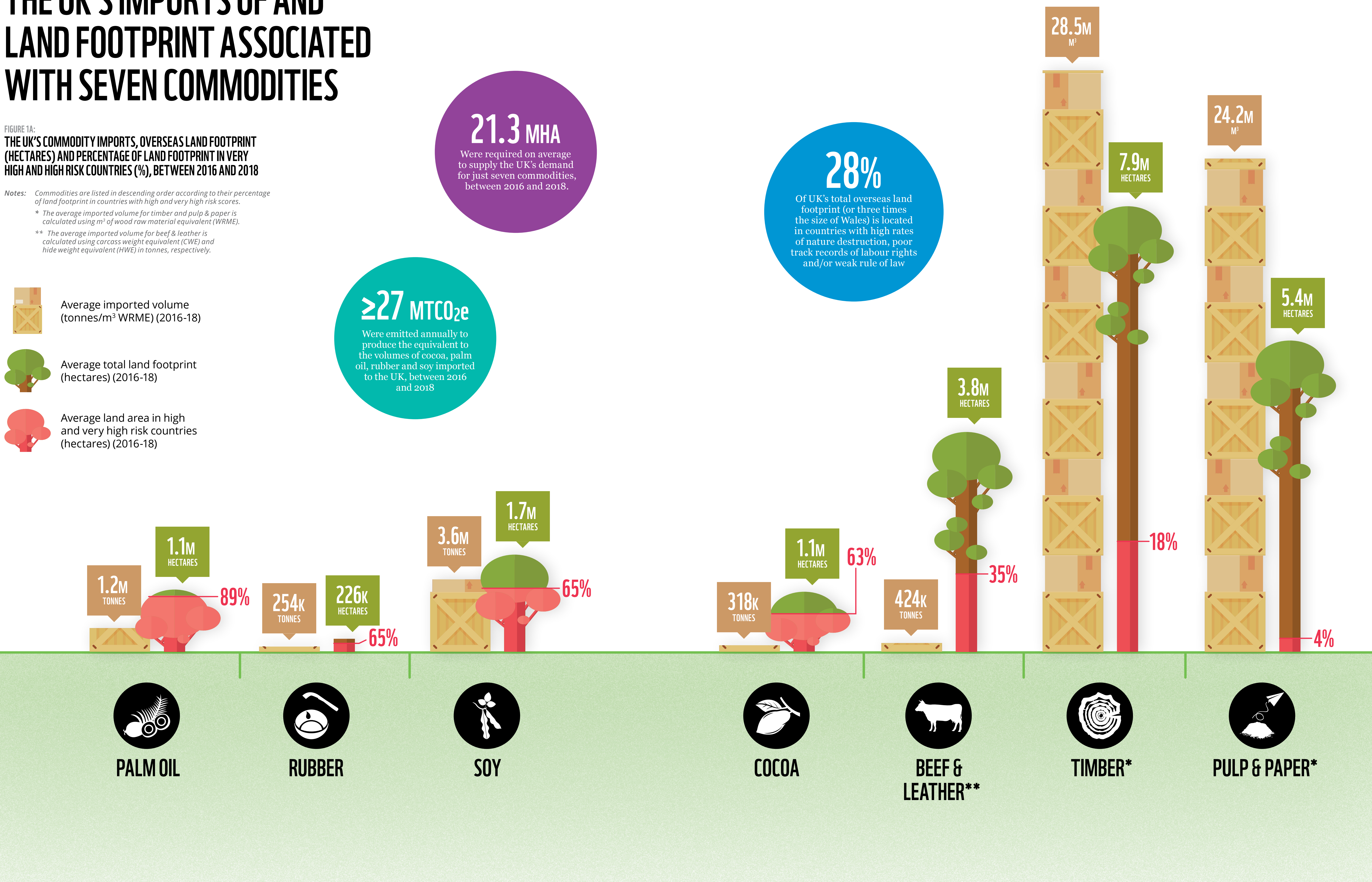
FIGURE 1A:

THE UK'S COMMODITY IMPORTS, OVERSEAS LAND FOOTPRINT (HECTARES) AND PERCENTAGE OF LAND FOOTPRINT IN VERY HIGH AND HIGH RISK COUNTRIES (%), BETWEEN 2016 AND 2018

Notes: *Commodities are listed in descending order according to their percentage of land footprint in countries with high and very high risk scores.*

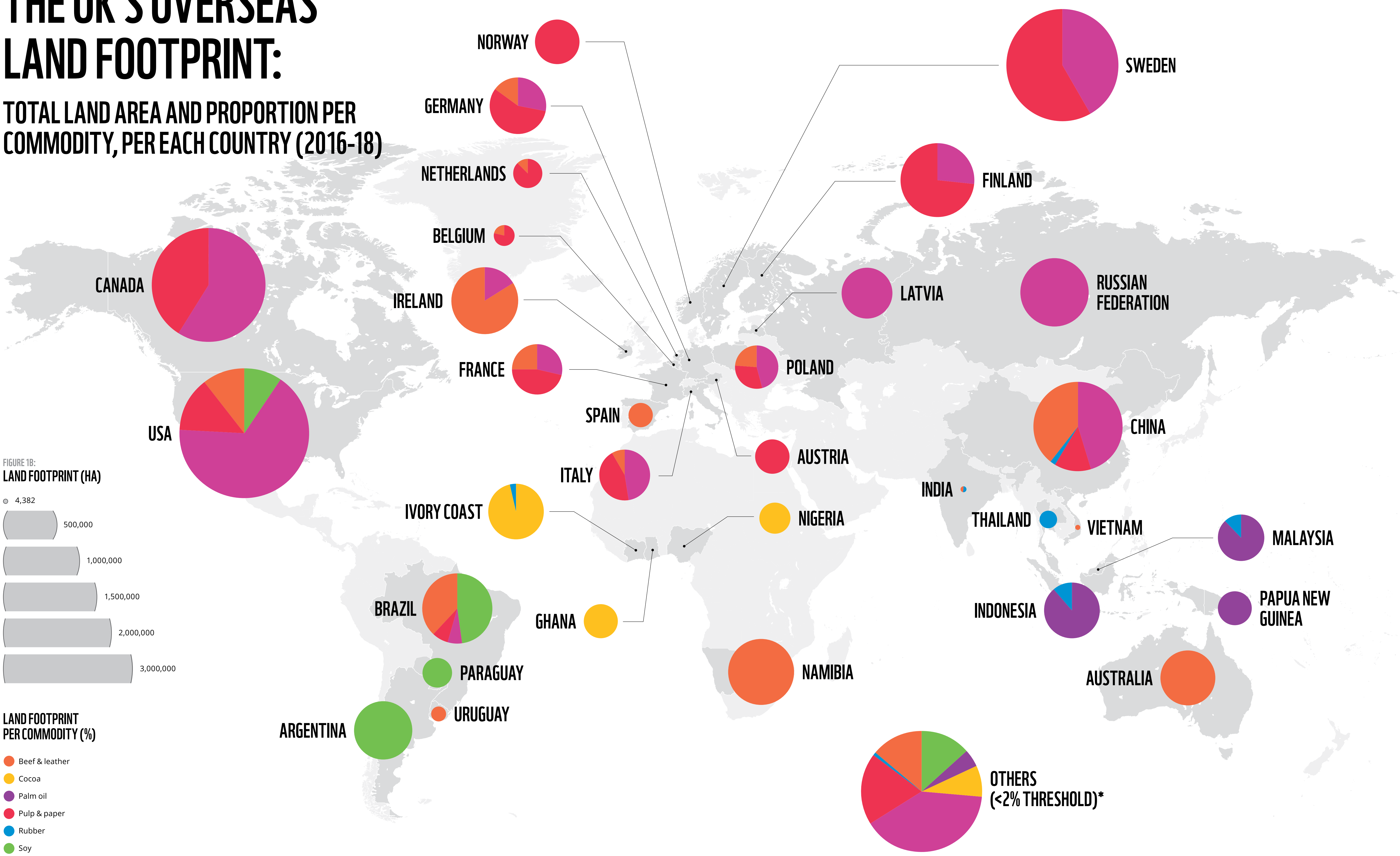
* *The average imported volume for timber and pulp & paper is calculated using m³ of wood raw material equivalent (WRME).*

** *The average imported volume for beef & leather is calculated using carcass weight equivalent (CWE) and hide weight equivalent (HWE) in tonnes, respectively.*



THE UK'S OVERSEAS LAND FOOTPRINT:

TOTAL LAND AREA AND PROPORTION PER COMMODITY, PER EACH COUNTRY (2016-18)



* *Refers to land footprint in countries responsible for less than 2% of the UK's imports*

INDIVIDUAL COUNTRY RISK SCORES

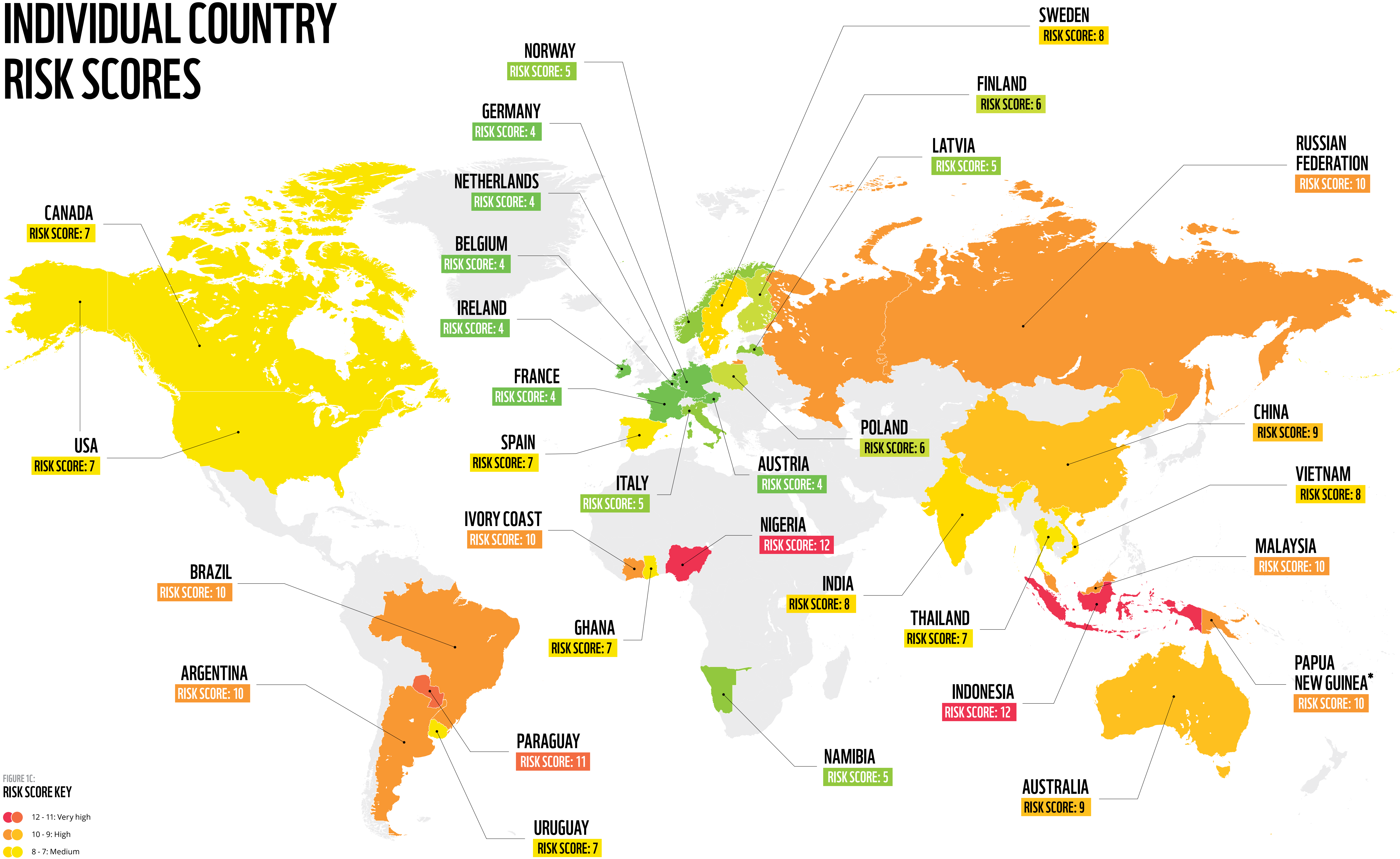


FIGURE 1C:
RISK SCORE KEY

- 12 - 11: Very high
- 10 - 9: High
- 8 - 7: Medium
- 6 - 5: Medium low
- 4: Low

* Papua New Guinea is not rated by ITUC, so is not scored for the labour rights indicator. We have scored it as medium risk for labour rights.

Country	Risk score (11-12 = very high; 9-10 = high)	Average annual UK overseas land footprint for 2016-18 (Mha)	Percentage of total UK overseas land footprint in risky† countries (%)	Commodities sourced from each country
Indonesia	12	0.5	8.8%	Palm oil, rubber
Nigeria	12	0.2	2.7%	Cocoa
Paraguay	11	0.1	2.5%	Soy
Argentina	10	0.6	9.6%	Soy
Brazil	10	0.8	13.9%	Soy, timber, pulp & paper, beef & leather
Ivory Coast	10	0.5	8.8%	Cocoa, rubber
Malaysia	10	0.4	6.1%	Palm oil, rubber
Papua New Guinea*	10	0.2	3.3%	Palm oil
Russian Federation	10	0.8	13.2%	Timber
Australia	9	0.5	8.5%	Beef & leather
China	9	1.3	22.5%	Timber, pulp & paper, rubber, beef & leather
Total	-	**5.9**	-	-

TABLE 2:

THE TOP 11 HIGH RISK COUNTRIES[IV] WHERE THE UK HAS A LAND FOOTPRINT

Notes: * *Papua New Guinea is not rated by the International Trade Union Confederation (ITUC), so is not scored for the labour rights indicator. We have scored it as medium risk for labour rights. Refer to Methods for further detail.*

† *Refers to total land area (~6 Mha) in countries assigned with very high and high risk scores by our analysis, i.e. total in column 3.*

iv Refers to our assessment of socio-environmental issues, i.e. those with highest risk have shown highest deforestation and land conversion, and worse labour rights and rule of law indices.

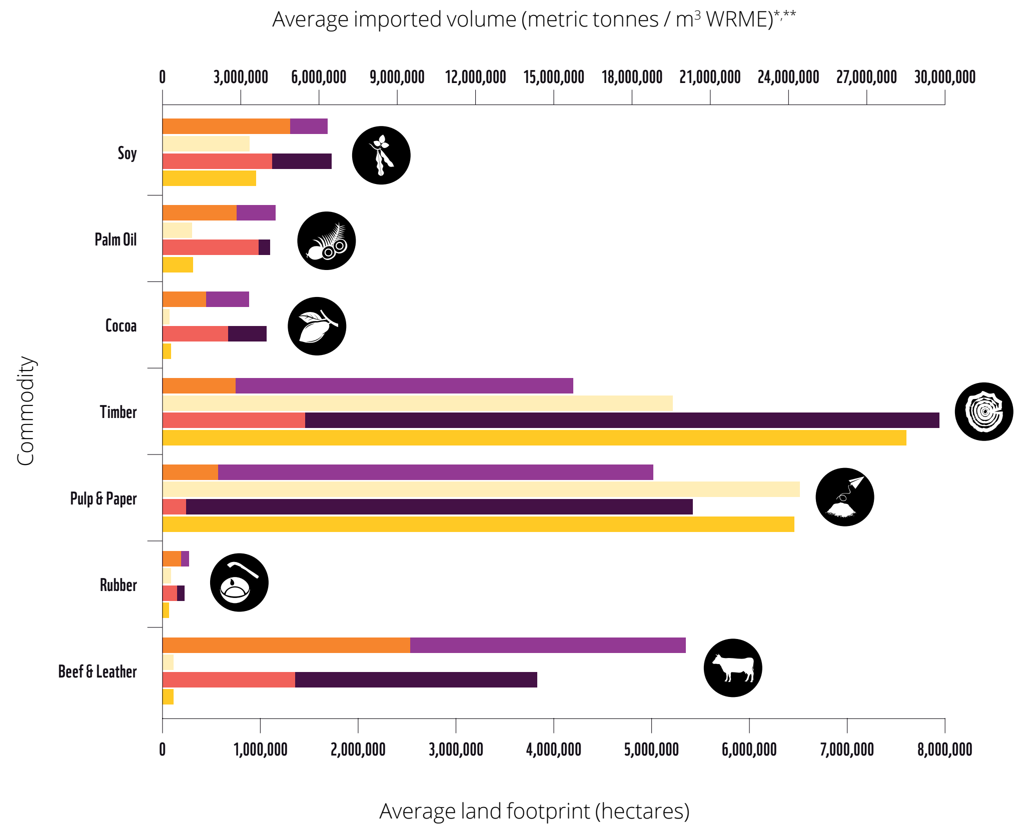
FIGURE 1D:

LAND FOOTPRINT IN HIGH AND VERY HIGH RISK CATEGORIES 2011-15 & 2016-18

Note: * *Units for timber and pulp & paper are expressed in m³ (WRME), and in tonnes of carcass weight equivalent (CWE) and hide weight equivalent (HWE), for beef and leather, respectively.*

** *The average imported volume for leather between 2011-15 was calculated using the average imported volume between 2016-18 as a proxy.*

- Average annual land footprint 2011-15
- Average land footprint in high and very high risk countries 2011-15
- Average imported volume 2011-15
- Average annual land footprint 2016-18
- Average land footprint in high and very high risk countries 2016-18
- Average imported volume 2016-18



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A large fire burns in the Cerrado in Brazil, one of the world's oldest and most diverse tropical ecosystems and one of the most endangered on the planet. One million hectares of forest is lost in the Cerrado each year to make way for soy plantations for food, animal feed and biofuels.

WE URGE THE UK GOVERNMENT, INCLUDING THE DEVOLVED GOVERNMENTS, BUSINESSES AND FINANCIAL INSTITUTIONS, TO TAKE BOLD ACTIONS TO BRING ABOUT THE RAPID TRANSITION TOWARDS GREENER, MORE SUSTAINABLE AND RESILIENT SUPPLY CHAINS

Sandstone formation at Chapada das Mesas in the region of Matopiba, Brazil. The Cerrado is being destroyed by unsustainable soy plantations which means many species, including giant anteaters, as well as indigenous communities, are at risk of becoming extinct. The destruction of the Cerrado will continue if we don't start growing all soy sustainably.

RECOMMENDATIONS

GOVERNMENT

Given the complex governance structure across countries within the UK, some policies are under the competence of devolved administrations rather than the central government. In such cases, we specify in our recommendation whether the content should apply to devolved administrations.

KEY

GOOD PROGRESS
PARTIAL PROGRESS/NOT STARTED
LITTLE OR NO PROGRESS
NEW

Recommendation in the 2017 *Risky Business* report	Impact/progress	New recommendation(s) from *Riskier Business*
Recognise the UK's impact on natural capital overseas within the 25 Year Environment Plan, and work with business to design an appropriate policy framework to manage such impacts.	Chapter on reducing the UK footprint overseas was included in the 25 Year Environment Plan in 2018. Global Resources Initiative (GRI) taskforce was established in July 2019 and published recommendations to the UK government in March 2020. Under the Well-being of Future Generations Act in Wales, the Welsh government has recognised the need to reduce impact on the global environment and climate change. Progress is reported annually against a set of national indicators, including the ecological footprint of Wales[5]. In 2020 the Scottish government published 'visions and outcomes' for its Environment Strategy, which includes an outcome for a sustainable international footprint[6].	**By the end of 2020, government should establish an ambitious and time bound, legally binding target to halve the UK's overall environmental impacts overseas[v] – global footprint – by 2030,** with an initial sub-target focussing on eliminating deforestation and land conversion from UK commodity supply chains as early as possible and no later than 2023. Such a target should be applicable to the entire UK, including devolved administrations. **Government should establish a mandatory due diligence obligation on all businesses,** including the financial sector, to identify, mitigate and publicly report on the social and environmental impacts and risks within their supply chains or portfolios[vi]. Such obligation should be applicable to the entire UK, including devolved administrations. **The UK government should adopt the GRI taskforce recommendations** and implement them as soon as possible, in particular, to set a mandatory due diligence obligation, develop a sustainable action plan for commodity supply chains, set a legally binding target to halt deforestation, and develop a measuring, monitoring and reporting framework to support implementation.

v This refers to wider environmental impacts beyond deforestation and conversion, e.g. water pollution.
vi The new legislative piece, Environment Bill offers the right opportunity for such obligation. All four countries of the UK should adopt similar legislation.

Recommendation in the 2017 *Risky Business* report	Impact/progress	New recommendation(s) from *Riskier Business*
Ensure that key policy measures are analysed for deforestation risk – e.g. renewable energy incentives, UK Industrial Strategy, Department for International Development (DFID) Economic Development Strategy.	There has been some progress on increasing Official Development Assistance (ODA) funding from the UK for critical landscapes, and for addressing deforestation and climate risks in developing countries. This includes: • DFID/Department for Environment Food and Rural Affairs (DEFRA): Biodiverse Landscapes Fund (£100 million) • Forest Governance Markets and Climate (£30 million) • Just Rural Transition (£9.6 million) • International Climate Fund (ICF) (£11.6bn) However, overall, there has not been much public policy cohesion, e.g. renewable energy, net zero policies do not consider impacts overseas. The Scottish government has again delayed the Good Food Nation Bill, which would have provided the framework for policy coherence, to ensure that more people are encouraged to eat more locally produced, sustainable and healthy food that supports our aims on climate change[7].	**Within the UK government and devolved administrations, ensure coherence across policies** to secure an overall positive impact on nature and people both within and outside the UK. This includes: • Secure alignment among domestic policies, and between domestic and international policies. For example, **UK climate policy should consider not only domestic carbon emissions but also the implications of offshoring production** in order to ensure that the UK truly ends its contribution to climate change, and does not exacerbate GHG emissions, habitat loss and other negative impacts overseas. • Policies supporting development overseas should be taking into account their role in supporting transition to sustainable production. **The UK should deliver a significant uplift in the share of ICF and other climate mitigation finance allocated for protecting and restoring natural ecosystems** in key at-risk landscapes.
Conduct sustainability impact assessments and incorporate the highest environmental and social safeguards into any new trade agreements, to ensure that new UK trade relationships do not contribute to a new wave of deforestation or negative social impacts.	No progress on this yet as no new trade agreement has been ratified by the UK government since the last report.	**The UK government should conduct sustainability impact assessments and incorporate the highest environmental and social safeguards into any new trade agreements,** to ensure that new UK trade relationships do not contribute to a new wave of deforestation, land conversion or negative social impacts, nor support agricultural practices that otherwise cause significant harm to biodiversity and ecosystems, and instead stimulate the market for sustainably produced commodities (e.g. high safeguards should be secured in any deal with the Mercosur, the US, Ivory Coast, Indonesia and Malaysia, and the EU).
		The UK government and devolved administrations should commit to non-regression and lead on strong socio-environmental standards in the revised policies after the Brexit transition period, by setting and effectively enforcing strong standards and a firm regulatory approach, especially regarding agriculture, environment, energy, transport and trade policies.

Recommendation in the 2017 *Risky Business* report	**Impact/progress**	**New recommendation(s) from *Riskier Business***
		The UK government should invest in research to develop new technologies to support companies' progress towards further transparency and accountability, building on the principles and guidelines of the Accountability Framework initiative, e.g. innovative ways to monitor progress in implementing deforestation-/conversion-free commitments.
		The UK government and devolved administrations' economic recovery package after Covid-19 should support environmental action aiming at reducing the UK's negative impacts on nature and people both domestically and overseas, as a way of addressing underlying environmental issues that contribute to the emergence of new diseases (e.g. deforestation, biodiversity loss).

PRIORITISING ACTION

When setting new policies and regulation, the UK government should focus initially on those commodities and their derived products that pose the greatest socio-environmental risks to producer landscapes where the UK has a land footprint. The seven commodities in this study should be considered first by such policies, given the evidence that their production is usually strongly associated with deforestation, conversion of other natural ecosystems, land degradation and human rights abuses. The government's policies and regulation should apply to all commodities and fresh produce coming from abroad no later than 2025, and to products from other high risk sectors (e.g. mining), and consider wider environmental risks other than deforestation and conversion, such as water pollution, soil erosion and changes in hydrology.

When action is taken on producer landscapes, those landscapes with high deforestation/conversion risks due to UK trade as well as those landscapes where the UK has the biggest potential to act immediately should be prioritised.

Working with Amsterdam Declarations signatories/other consumer countries

Recommendation in the 2017 *Risky Business* report	**Impact/progress**	**New recommendation(s) from *Riskier Business***
Maintain and extend the national statement on palm oil, and initiate similar time-bound targets and reporting commitments on other commodities with viable measures of sustainability, particularly soy, timber, pulp & paper, and cocoa.	Despite the commitment to achieve 100% certified sustainable palm oil by 2015, the UK had achieved only 77%[vii], on palm oil that is certified by the Roundtable on Sustainable Palm Oil (RSPO), in 2018[8]. Work remains to be done to reach the 100% sustainable palm oil target. The Welsh government, within its Economic Contract, encourages and assists companies to move away from the use of non-ethical palm oil[9].	**The UK government should continue to work on the implementation of the national statement on palm oil** to achieve the 100% sustainable palm oil target as soon as possible, and no later than 2021, and ensure support for compliance and progress reporting. **The UK government should initiate similar time-bound targets and reporting commitments on other commodities,** particularly soy, cocoa, timber, and pulp & paper. **These should have clear implementation plans,** aligned with the plan for implementing the global footprint target.

vii Note that the UK Roundtable on Sourcing Sustainable Palm Oil provides a detailed analysis of the volume of certified palm oil in the UK market. However, it focuses only on the imports of crude and refined palm oil, excluding palm kernel oil, solid by-products from oil extraction and palm oil embedded in imported manufactured products. Therefore, the overall percentage of certified volume is much lower: ~28% of total imported palm oil.

Working with Amsterdam Declarations signatories/other consumer countries

Recommendation in the 2017 *Risky Business* report	**Impact/progress**	**New recommendation(s) from *Riskier Business***
Encourage companies to adopt high environmental and social standards in multi-stakeholder certification schemes, and convene roundtables to drive progress where such approaches have gained little or no uptake, notably for beef & leather, soy and rubber.	The UK Roundtable on Sourcing Sustainable Palm Oil[viii] has contributed to an increase in the participation of key traders, food manufacturers and retailers in the roundtable's actions/discussions. The UK Roundtable on Sourcing Sustainable Soya was created in 2018[10] and has supported progress on increasing soy volumes consumed in the UK that are deforestation-/conversion-free certified by the Round Table on Responsible Soy (RTRS)[ix]: from 15% to 27%[11]. Work remains to increase the market uptake of responsible soy. No meaningful progress has been noted on the topic for other high risk commodities.	**The UK government should set up a target for corporate action plans** on certified sustainable commodities to be met in alignment with the global footprint target and new due diligence legislation. **The UK government should maintain and strengthen existing roundtables** (RSPO and RTRS) and seek alignment and collaboration with other country platforms to assist companies to meet requirements, including providing a transparent and robust reporting framework. **The UK government should convene roundtables for other high risk commodities** such as cocoa, timber, and beef & leather.
Create market incentives for operators proactively managing their deforestation risk, through adopting and implementing sustainable public procurement policies across these high risk commodities, building on the example of the Timber Procurement Policy (TPP) and the requirement in the Government Buying Standards for certified sustainable palm oil.	According to the Government Buying Standards (GBS), the procurement of sustainable palm oil has been mandatory since 2015. However, little information on the uptake of this policy by government departments[12] is available due to a lack of transparency in recent years (for instance mandatory reporting on Greening Government Commitments[x] has been dropped since 2016).	**The GBS should require all acquired forest-risk commodities (in addition to palm oil and paper) to be certified as sustainably produced,** or assured in case certification standards are limited, prioritising soy, cocoa and beef & leather. **GBS and TPP should be mandatory for all public bodies,** including schools, NHS, prisons, etc. **Reporting and monitoring frameworks for assessing compliance against public procurement policies should be strengthened** (e.g. annual public reporting on progress should be mandatory for all government departments and wider public bodies).
Recognise that while some UK companies are undertaking voluntary action to address the risks, policy action will be required to accelerate progress across all UK imports.	The UK government is legislating a new Environment Act, considering implementing a due diligence obligation on supply chains. The GRI has provided a series of recommendations to the government on enabling policies to accelerate action.	Refer to the recommendations on the global footprint target, due diligence legislation and implementation of GRI taskforce recommendations.

viii Refers to the UK Roundtable on Sourcing Sustainable Palm Oil, under the UK Sustainable Palm Oil Initiative promoted by the UK government. This differs from the Roundtable on Sustainable Palm Oil (RSPO) which is a global standard on certified sustainable palm oil.

ix Refers to sustainably and equitably produced soy as certified by the global Round Table on Responsible Soy.

x Reporting requirements for compliance on Greening Government Commitments were dropped in 2016. www.wwf.org.uk/sites/default/files/2018-06/Buying_Right_Implementation_UK_Timber_Procurement_Policy_2017.pdf

UK international influence and leadership to support producer countries

Recommendation in the 2017 *Risky Business* report	**Impact/progress**	**New recommendation(s) from *Riskier Business***
Use UK influence and development assistance to support producer countries in ensuring sustainable production and trade of forest-risk commodities. Measures could include promoting integrated land-use planning, and supporting sustainable intensification while preventing land conversion. Investments can include finance, technical assistance and access to new technologies (e.g. satellite monitoring, new crop varieties). Champion the implementation of the Action Agenda of the New York Declaration on Forests, to realise the shared ambition to halve natural forest loss globally by 2020, and strive to end it by 2030. Work with key intermediary countries, e.g. China for rubber and timber.	The UK fund for landscapes, ODA spent, and contribution to ICF mentioned above are encouraging progress in terms of increased support to the global transition towards halting deforestation and promoting sustainable development.	The UK government should, in collaboration with producer and other consumer countries, **develop clear and time-bound action plans** to tackle deforestation and wider environmental and social impacts overseas associated with commodity production and trade. These plans should: • consider the best use of ODA, including ICF, Green Climate Fund, and other international finance • in addition to halting deforestation, support conservation and nature restoration projects in at-risk producer landscapes • be announced by the UN Framework Convention on Climate Change (UNFCCC) COP26 at the latest **The UK government, in collaboration with other consumer and producer countries, should secure commitments from the private sector, and match with commitments of public finance,** to secure investments into high risk deforestation/conversion producer landscapes to facilitate their transition towards sustainable production.
Ensure effective implementation and enforcement of the EU Timber Regulation (EUTR), to prevent illegally harvested timber and wood products entering the UK. Continue to invest in lowering the deforestation risk in key sourcing countries, working with UK companies sourcing from there. This should build on successful support for Forest Law Enforcement, Governance and Trade (FLEGT) in Ivory Coast, Indonesia and Vietnam, while exploring other options to support countries with high deforestation and significant trade with the UK, notably Argentina, Brazil and Paraguay.	The government has effectively progressed implementation of the EUTR, achieving one of the best outcomes amongst EU member states. Unfortunately, the UK still can't guarantee for sure that illegal timber is not placed on the market[13]. Continued efforts for compliance with EUTR, collaboration with the EU members and a review of the scope are needed, as currently 59%, more than half, of timber products by value are not covered[14].	**Continue to work to implement the EUTR,** soon UKTR, including stronger enforcement, providing compliance support to operators, and collaboration with the EU member states to ensure alignment. **Expand the scope of the products covered by the EUTR (UKTR)** to include all wood products placed on the UK market. **Secure and strengthen FLEGT voluntary partnership agreements (VPAs), and explore implementation of new partnerships with other timber producer countries.** Support to countries where agriculture is a major deforestation driver should be considered in the context of the new plans in high risk landscapes. See recommendations above.
		The UK government should work with other consumer countries to push for strong action targets in the Convention on Biological Diversity (CBD) Post-2020 Global Biodiversity Framework, for the protection of natural ecosystems and species, addressing the negative impacts of supply chains, and encouraging sustainable consumption and production. These targets should be supported by time-bound implementation plans.

COMPANIES

Participating in multi-stakeholder initiatives

Recommendation in the 2017 *Risky Business* report	Impact/progress	New recommendation(s) from *Riskier Business*
Manage the risks associated with their corporate footprint. Make a clear commitment, with time-bound targets for change, to eliminate illegal and unsustainable sources of these commodities. Accelerate implementation of commitments to eradicate deforestation from supply chains, using existing data sources to analyse and disclose deforestation risks – drawing on country risk assessments, transparency and corruption indices, and new data sources (e.g. SPOTT for palm oil, timber, pulp & paper; TRASE for soy). Report publicly in simple and open terms on progress on an annual basis, using clear metrics or existing tools such as CDP forest footprint disclosure. Help customers understand choices and pricing, to create a more equitable global market, reduce wasteful consumption, and promote investment in sustainable production.	Despite good efforts from leading companies across these high risk supply chains, including commitments to address deforestation and industry-led initiatives (e.g. Palm Oil Transparency Coalition, Cerrado Funding Coalition, Soy Transparency Coalition), we have not seen significant progress on the ground at the scale needed[15,16]. Voluntary corporate commitments to end deforestation by 2020 have failed, and many targets have been weakened and, in some cases, even removed[16].	**Make an ambitious, time-bound and robust group level (global) commitment to eliminate deforestation and conversion from commodity supply chains as quickly as possible, consistent with the deforestation target,** following the principles of the Accountability Framework initiative[17] (or revise in case commitment is already in place), to help speed up a global industry-wide shift towards sourcing from verified deforestation- and conversion-free landscapes. **Implement your deforestation and conversion-free commitments,** such as by ensuring all sourced volumes are certified by credible certification systems (or assured when standards are limited), and by adopting volunteer due diligence systems to monitor risks and progress. **Monitor, verify by a third party and publicly report** on progress on a regular basis (at least annually). **Support, contribute to and invest in multi-stakeholder actions on the ground** to bolster the transition of at-risk landscapes towards deforestation- and conversion-free production systems.

Participating in multi-stakeholder initiatives

Recommendation in the 2017 *Risky Business* report	Impact/progress	New recommendation(s) from *Riskier Business*
Support the development of transparent, multi-stakeholder governance to reduce deforestation and social risks in key sourcing countries, including higher environmental and social standards in multi-stakeholder certification schemes. Invest in initiatives to develop sustainable supply chains, including through support to smallholder producers and jurisdictional approaches. Collaborate with other companies to drive impact at scale through increased market demand for sustainable production, e.g. policy advocacy, preferential sourcing approaches.	The UK Roundtable on Sourcing Sustainable Palm Oil[18] has contributed to a large increase in the volume of certified palm oil that is imported to the UK. Further progress is needed to implement commitments. Membership of the UK Roundtable on Sourcing Sustainable Soya has widened since its creation: eight of the major UK retailers (83% of retail market share) have created or strengthened their sustainable soy sourcing policies[10]. Further progress is needed to implement commitments. The Cerrado Manifesto was launched in 2017 and supported by over 100 companies[19]. The Cerrado Funding Coalition was launched in 2020 to incentivise production on existing agricultural land and halt conversion of the Cerrado. The number of corporate sustainable sourcing policies is higher for public-facing companies[20] compared to traders and producers – this has impacted the success in implementing zero-deforestation commitments across entire supply chains.	**Actively participate in multi-stakeholder initiatives in your industry,** related to high risk commodities in your supply chain to accelerate industry-wide progress (e.g. government initiatives, roundtables). **Engage in broader cross-sector multi-stakeholder initiatives and platforms to foster greater action globally** on preventing deforestation and conversion of natural ecosystems (e.g. New York Declaration on Forests). **Collaborate with industry peers, government and other stakeholders to address key social and environmental challenges linked to high risk commodities.** Such activities might include supporting the creation of collective or aligned goals, standards, coordinated implementation processes, monitoring systems, or other measures to increase effectiveness, scaling up of initiatives, and minimising leakage of negative impacts to other regions/commodities.
		Support and advocate for policies aimed at accelerating progress in removing deforestation, conversion and wider environmental and social impacts from commodity supply chains (e.g. mandatory due diligence obligation on companies and the financial sector, secure high environmental and social standards in trade deals).

FINANCIAL INSTITUTIONS

There has been growing recognition of the role of international finance in deforestation, conversion of natural ecosystems and land degradation[21]. The UK is one of the largest western financiers to multinationals trading in palm oil, pulp, timber and rubber. Estimates of financing to companies producing deforestation-risk commodities are upwards of £6.5 billion from 2013-2019, which has been corroborated by several sources[xi]. For instance, UK financial institutions have been shown to provide significant support to beef suppliers from the Amazon, such as Marfrig, JBS and Minerva, that have been linked to deforestation[22,23]. UK financial institutions may therefore be indirectly enabling deforestation and conversion, by providing financial services to or investing in companies that do not have assurance that they can trace all their products to ethical, certified legal or sustainably produced products.

The lack of transparency in supply chains and lack of regulatory strength in many production locations has been shown to have legal, reputational, moral and in many cases financial risk implications for trading companies. Production activities have been linked to illegal deforestation, human rights abuses and land-grabbing allegations that have at times been financially material to companies and their financiers. Greenhouse gas emissions, water over-extraction, and the use of polluting chemicals that damage biodiversity may also be high in these supply chains, compromising the future productivity of the production system itself. For this reason, it is imperative for such risks to be understood both by companies and by the financial actors that support them.

Some financial institutions have already begun to strengthen their lending policies, and explore opportunities for sustainable production and elimination of deforestation in supply chains. The Banking Environment Initiative[24], a collaboration of 12 international banks representing 50% of global trade finance, created the Soft Commodities Compact[24] in 2014 with the Consumer Goods Forum. The aim was to transform soft commodity supply chains (particularly palm oil, timber products, soy and beef) and achieve zero net deforestation by 2020. Although targets were not achieved, many member banks now require certification for targeted deforestation-risk commodities, or for clients to achieve certification within certain timeframes.

In 2019, the UK government's GRI taskforce[25] published a report outlining a pathway for regulators, business and finance to secure deforestation-free supply chains, and providing recommendations to deliver change at scale. This included recognition of the role of both private and public finance in enabling this transition. It also recommended setting legally binding due diligence measures for lending and investments to remove deforestation in supply chains by 2030. Strengthening lending policies, supporting supply chain traceability initiatives and due diligence measures for companies to assess deforestation and wider environmental and social risks will be key if such targets are to be achieved.

£6.5bn

ESTIMATES OF FINANCING TO COMPANIES PRODUCING DEFORESTATION-RISK COMMODITIES BETWEEN 2013 AND 2019

xi A report issued by Global Witness, *Money to Burn* (2019), estimated that UK financiers provided upwards of US$2 billion to Brazilian beef companies such as Marfrig, Minerva and JBS, which are not fully able to guarantee deforestation-free supply chains (The Guardian, 2019). Amazon Watch, Complicity in Destruction II (2019) estimate that UK banks provided upwards of US$6 billion in loans and underwriting to traders such as Cargill, Bunge, Louis Dreyfus and Archer Daniels Midland between 2013-2018, indicating that UK financiers are relevant players in these supply chains. Forests & Finance Initiative, a joint project between Rainforest Action Network, TuK INDONESIA and Profundo, accessed May 2020, also draws links to UK financial institutions in the financing of >US$5 billion worth to deforestation-risk commodities (2014-2019).

Recommendation to financial institutions

Financial institutions should consider the following recommendations if they are to support the transition to deforestation/conversion- free supply chains:

Understand and mitigate your risks and impacts: The allocation of all capital, in investments, lending or insurance, should be done with consideration of the risks posed by climate change and biodiversity loss, which affect companies trading in or processing deforestation-risk commodities. Financial institutions should also strive to reduce their risks and impacts on human rights and livelihoods of people associated with the same supply chains.

This could be done by:

- Committing to and/or strengthening existing policies towards eliminating deforestation, conversion of natural ecosystems and human rights abuses from financial loans and investments.
- Implementing pre-screening processes for lending and investments to ensure that client companies have policies and protocols for protection of high biodiversity, high carbon ecosystems.
- Actively supporting the establishment of a due diligence obligation for businesses and financial institutions, and engaging clients who are sourcing high risk commodities.
- Strengthening publicly available monitoring and reporting on environmental and climate impacts and risks, and encouraging clients to do the same.

Understand the opportunities in the sustainable transition: Financial institutions should recognise the investment opportunity in new assets, technologies and business models which will be needed in the transition to a sustainable system. Public and client sentiment is already beginning to change in recognition of the risks of climate change to financial portfolios and national policies are increasingly strengthening in favour of due diligence and mandatory reporting to ensure sustainable supply chains, particularly in the EU[xii,26]. Sustainable production and agroforestry practices are an essential component of food security and mitigating climate risk, and can provide a wide range of benefits throughout the value chain. Financing companies that encourage such restorative and sustainable practices, and that are better able to track the sources of their products to the farm level, is also more likely to have lower downside risk.

FINANCIAL INSTITUTIONS SHOULD RECOGNISE THE INVESTMENT OPPORTUNITY IN NEW ASSETS, TECHNOLOGIES AND BUSINESS MODELS WHICH WILL BE NEEDED IN THE TRANSITION TO A SUSTAINABLE SYSTEM

xii An example is the *French Devoir de Vigilance* in 2017; the OECD Due Diligence for Responsible Business Guidance in 2018; and the proposed EU due diligence legislation arriving in 2021 and rising demand for sustainable and green investments (GSIR, 2018).

CITIZENS

Recommendation in the 2017 *Risky Business* report	**Impact/progress**	**New recommendation(s) from *Riskier Business***
Reduce the number of products that you buy that have environmentally damaging ingredients, and prevent waste by only buying what you need. Look for products that are certified to credible environmental and social standards (e.g. Forest Stewardship Council (FSC) for wood products, RSPO for palm oil). Ask companies what they are doing to manage their deforestation footprint. Buy from brands and companies that have committed to addressing deforestation and governance risks, and who openly report on progress. Eat healthily while reducing your consumption footprint, using advice in the WWF Livewell report.	In general, the public has become more aware of the impacts of their demand on biodiversity and climate. A few examples are: • 'Fridays for climate', the worldwide school strikes • 10,000 signatures for MPs in support of a target in the Environment Bill to stop deforestation • increased awareness and demand for transparency and information on the origin of products Progress on promoting sustainable diets either in current legislative/policy proposals, e.g.: Scotland's Good Food Bill promoting sustainable diets.	**Look for products that are certified** by credible environmental and social standards (e.g. FSC for paper and wood products, RSPO for palm oil, UTZ for cocoa). **Ask companies what they are doing to manage the risks** and impacts in their supply chains. **Buy from brands and companies that have publicly committed to addressing deforestation, conversion and other environmental and social risks,** and that openly report on progress to meet their targets. **Inform yourself and write to your MP, MSP, MS or MLA** to support policies and legislation aimed at halting deforestation and other environmental and social impacts in supply chains (e.g. due diligence obligation in the Environment Act, widening the scope of the UKTR). **Eat more sustainably** (e.g. more plants and less (and better) meat, and a greater variety of food)[27].

INTRODUCTION

WE ARE FACING GLOBAL BIODIVERSITY AND CLIMATE EMERGENCIES

Forests and other natural ecosystems are home to countless species and support us all with critical ecosystem services, such as sequestering carbon from the atmosphere, providing water and regulating temperature[28]. Moreover, about 2 billion people depend, directly or indirectly, on forests to fulfil their needs for food, fibre and shelter[29]. **The loss of forests and other critical natural ecosystems would result in significant environmental, climatic, economic and social impacts, not only affecting those who depend upon forests directly, but the human population as a whole[30].**

Commodities such as cocoa, palm oil, soy and timber are deeply embedded within the supply chains of manufactured products that we purchase on a daily basis, and their production is closely associated with deforestation[3], forest degradation[31] and other environmental and social impacts in producer countries[32,33,34,35]. **Over 50% of deforestation and land conversion** is caused by commercial agriculture and forestry[36], in order to produce commodities that are either consumed directly, used in the manufacturing of a myriad of products we buy every day, or to feed livestock which form part of our diets.

The global demand for such commodities continues to increase and, unless we can decouple future agriculture and forestry from deforestation, conversion and degradation of natural ecosystems, this demand will result in increasing loss of nature, and therefore, loss of valuable ecosystem services. Agriculture, forestry and other land activities contribute to nearly a quarter of global man-made GHG emissions[37], greatly hindering our ability to mitigate climate change. However, if forests and other critical natural ecosystems are properly preserved and degraded areas restored or enhanced, they could contribute significantly to limiting global warming to 1.5 degrees Celsius[37,38].

The impacts associated with the production of commodities are often ignored, especially when they occur thousands of miles away from consumers. When there is little transparency, there is little accountability for such impacts across global supply chains.

There have been increasing commitments to remove deforestation from commodity supply chains. A decade ago, the Consumer Goods Forum – which brings together over 400 stakeholders amongst the largest companies in the world – adopted a resolution to achieve zero net deforestation across all commodity supply chains by 2020[39]. In 2014, the New York Declaration on Forests (NYDF) was endorsed by actors from the private sector, governments and civil society, who committed to halving deforestation from agricultural supply chains by 2020 and eliminating it by 2030[40]. Building upon this and in the context of the Paris Agreement[41], major consumer country governments, including the UK, signed the Amsterdam Declarations (AD) in 2015, which signalled their continued commitments to preserve forests and other critical ecosystems through responsible supply chains[42]. A large wave of commitments has been seen in the private sector and many leading businesses have progressed in improving sustainability in their supply chains[16]. However, a large majority of companies are lagging behind. Meanwhile, the finance sector – a key player in driving change – appears to be ignoring the problem[16].

24.2 MHA
OF TREE COVER LOST WORLDWIDE IN 2019

Despite such pledges, there has been relatively little progress towards turning deforestation-free supply chain commitments into a reality. In fact, deforestation rates and rates of conversion of other natural ecosystems remain high[43]. The world lost a colossal 24.2 Mha of tree cover in 2019, of which around 3.8 Mha occurred within humid tropical primary forests (a 3% increase compared to 2018)[44] — meaning that an area of primary forest equal to the size of a football pitch was lost every six seconds[45]. For instance, Brazil, which is home to the largest share of the Amazon rainforest, accounted for a third of this forest loss (~1.4 Mha)[45], as it experienced the highest deforestation in a decade[46]. That same year, the world experienced the second warmest year ever recorded[47] which presents yet another threat to the world's remaining forests. Forests and other terrestrial ecosystems are sensitive to changes in temperature, and therefore climate change may lead to further changes in species composition and loss of ecosystem services[48].

We have seen signs that we are now reaching a tipping point for action to reverse the biodiversity loss and climate crises. Events such as the unprecedented Amazon wildfires in 2019, as well as the Australian bushfires earlier this year, highlight the urgency of the problem. The latest science suggests that the Amazon forest's capacity to store carbon is reducing (i.e. parts of the forest are emitting more CO_2 than they can absorb)[49]. This is likely due to a combination of large-scale deforestation, conversion and land degradation among other drivers such as higher temperatures and drought due to climate change, leading to changes in forest functioning[50]. African forests have sequestered less CO_2 since 2015, due to high tree mortality driven by high temperatures and higher frequency of droughts, as a result of climate change[50]. Both examples in the Amazon and Africa highlight the alarming rate at which the world's ecosystems and their ability to mitigate against the effects of climate change are being diminished by human activities.

The agricultural expansion over natural ecosystems has also been increasingly associated with the spread of zoonoses and other infectious diseases[51,52,53]. Such a trend is likely to be exacerbated by the effects of climate change[54]. Land-use change is a key driver for disease emergence. In an undisturbed natural ecosystem, the resident wildlife are natural hosts of various pathogens with little chance for spillover into people and other species. Conversion and degradation of natural ecosystems, often associated with intensification of human activities, lead to disruption of ecosystem integrity and the composition of habitats, change in wildlife/pathogen communities and increased potential for human-animal-pathogen contact and spillover that may lead to the spread of new diseases to humans[51,55]. Examples of recent disease outbreaks that may have links with agricultural expansion include Lyme disease[51], malaria[56], Severe Acute Respiratory Syndrome (SARS) and Ebola[52]. Tropical regions, which currently witness some of the highest rates of deforestation and land degradation and harbour the highest levels of terrestrial biodiversity on Earth, have experienced the most dramatic reductions in average wildlife population sizes since 1970 (56%-89%)[57]. It is doubly concerning that such destruction of nature and loss of associated biodiversity can lead to the emergence of new infectious diseases and may also hinder our ability to combat such emerging diseases, due to the loss of both existing and yet to be discovered medicinal plants[58].

56-89%
REDUCTIONS IN AVERAGE WILDLIFE POPULATION SIZES IN TROPICAL REGIONS SINCE 1970

We need robust action now in order to halt deforestation, land conversion and land degradation. Only then, and with additional efforts to restore degraded land and preserve intact natural ecosystems, will we be able to succeed in reversing the biodiversity loss crisis and mitigating against the effects of climate change. Moreover, we need to transform commodity production systems to secure sustainable development, so the benefits for people, nature and climate are secured in the long term.

WHY DO WE NEED FURTHER ACTION IN THE UK?

The UK currently consumes about 1.2 billion tonnes of raw material every year[59], of which over half of the food[60] and four-fifths (81%) of the fibre[61] is imported from overseas. This overwhelming dependence on forest and agricultural commodities from abroad brings with it a greater risk, as the UK could be helping to fuel the deforestation and habitat conversion as well as other environmental and social impacts embedded within the supply chains of its imported goods[62,63].

Recent global events have helped highlight the fragility of the UK's food system, mainly due to the country's heavy reliance on international supply chains. For instance, the Covid-19 pandemic and the ensuing swathe of travel restrictions, border closures and labour shortages led to severe disruption of the flow of goods entering the UK[64,65]. Furthermore, future changes to the UK's portfolio of international suppliers following its departure from the EU — which currently accounts for ~30% of the UK's food imports[66] – may further exacerbate future food shortages if not carefully assessed[67,68], especially if combined with the effects of recent climate change and biodiversity loss in producer countries[68].

RECENT GLOBAL EVENTS HAVE HELPED HIGHLIGHT THE FRAGILITY OF THE UK'S FOOD SYSTEM, MAINLY DUE TO THE COUNTRY'S HEAVY RELIANCE ON INTERNATIONAL SUPPLY CHAINS

Beyond securing its own benefits, the UK, as a signatory of the NYDF, Paris Agreement and the Sustainable Development Goals (SDGs) and an endorser of the AD, has the duty to ensure that the supply chains of its imported products are not contributing to negative environmental and social impacts in producer countries nor to exacerbating climate change.

We welcome initial efforts in the public sphere to progress this agenda. In 2018, the UK government explicitly recognised these risks and responsibilities to reduce its global footprint in its 25 Year Environment Plan[69]. These have also been recognised by the devolved governments across the UK, such as through the Welsh Well-being of Future Generations (Wales) Act[70], the Scottish Environment Strategy[71], and Northern Ireland's proposed new Environment Strategy[72]. More recently, in 2019, the GRI taskforce published a set of measures to be taken by the UK government to address its impact overseas[73], asking for immediate transformative actions to be put in place.

Current UK legislation does not require impacts in supply chains of imported products to be monitored or mitigated. For instance, GHG emissions arising from imports are included in UK environmental accounts, but not in the UK carbon budget or the national climate strategy – so there are no requirements to mitigate them. As the UK establishes new policies and legislation frameworks, **it is important to ensure that high environmental and social standards are applicable to both domestic and imported products;** and that there are strict requirements and systems in place to account for and report on progress towards mitigating risks and impacts overseas.

Large agribusiness and commodity traders rely on financial institutions to provide them with key financial services and capital (e.g. lending, capital markets, advisory, trade finance and risk management services). UK banks are known to be lead financiers of major global traders and agribusinesses operating in producer countries that are likely to be associated with impacts such as deforestation[74]. Despite this, little has been done to assess risks and mitigate any impacts of UK finance in producer landscapes.

We need new legal and policy frameworks in which all actors (governments, businesses, financial institutions and civil society) share the responsibility of halting deforestation, habitat conversion and human rights abuses in global supply chains at pace and, ultimately, work collectively towards transforming commodity production systems and supply chains. Current proposed solutions both on the demand side (e.g. due diligence obligation on businesses and mandatory reporting) and production side (e.g. improved sustainable production and governance) have to be considered as part of a wider common plan to achieve such goals at the global scale.

Of particular importance for the UK are the upcoming trade agreements which will be key to ensuring high environmental and social standards for the production and trade of imported goods. On the international stage, we are approaching key moments of potential uplift where global leaders will take decisions to address how we collectively tackle the climate and biodiversity crises and ensure sustainable development for all, including at the conferences of the UNFCCC (COP26) and the CBD (COP15). **Hence, the UK has the opportunity to play a leading role in securing strong global action to tackle both the biodiversity loss and climate crises through domestic and international measures.**

WE NEED NEW LEGAL AND POLICY FRAMEWORKS IN WHICH ALL ACTORS (GOVERNMENTS, BUSINESSES, FINANCIAL INSTITUTIONS AND CIVIL SOCIETY) SHARE THE RESPONSIBILITY

GLOBAL ASSESSMENT: RISKS ASSOCIATED WITH THE UK'S COMMODITY TRADE

THE UK'S OVERSEAS LAND FOOTPRINT

Our analysis shows that, **between 2016 and 2018, 21.3 Mha were required on average each year to supply the UK's demand for seven agricultural and forest commodities (beef & leather, cocoa, palm oil, pulp & paper, rubber, soy, timber). This corresponds to 88% of the UK's land area – an increase of roughly 15% since our previous 2011-15 analysis.**

For the following commodities, the majority of the imports to the UK (63-89%) originate from very high or high risk countries: palm oil, soy, rubber and cocoa (Table 1). This suggests that, for those commodities, there is a very high chance that the UK trade is contributing to deforestation, destruction of natural ecosystems and negative social impacts in producer countries.

Timber, pulp & paper and beef & leather have the highest land footprints overseas, as well as the highest land footprints in risky countries, in terms of absolute area (Fig. 1a). Nevertheless, in relative terms, their land footprint in risky countries is lower (4-35%; see Table 1).

Overall, the total UK land footprint located in very high and high risk countries between 2016 and 2018 amounted to nearly 6 Mha. The highest risks were located in Indonesia, Nigeria and Paraguay (which received risk scores of ≥11; see Table 2). Meanwhile, countries such as China, Russia and Brazil were amongst those countries assigned a high risk score (≥9<11; see Table 2).

IMPACTS ON CLIMATE AND BIODIVERSITY DUE TO UK SUPPLY CHAINS

This report estimates the impacts on GHG emissions and on biodiversity from land-use change associated with the conversion of natural ecosystems and changes in land cover due to commodity production in producer countries exporting to the UK. These producer countries are of global importance in terms of their carbon stocks and biodiversity, so these impacts have global implications.

GREENHOUSE GAS EMISSIONS FROM COMMODITY PRODUCTION

We estimate that **an average of 28 Mt CO_2e could have been emitted every year, between 2011 and 2018, due to the production of the cocoa, palm oil, rubber and soy imported to the UK. This is comparable to 7-8% of the UK's total CO_2 equivalent emissions from imports in 2016 (364 Mt CO_2e)**[4]. Between 2016 and 2018, this average was around 27 Mt CO_2e per year.

There are striking differences between the GHG emissions associated with the production of each commodity. For instance, between 2016 and 2018, the GHG emissions associated with the production of soy were much higher than those of palm oil and cocoa combined (18.8, 6.7 and 0.4 Mt CO_2e per year, respectively; see Table 1). However, the fact that the land footprint for soy was larger than for other crops only partially explains the difference in GHG emissions. A main contributing factor for such differences was that deforestation data for the major palm oil and cocoa producers was not publicly available during the time of our analysis. Despite this, rates of deforestation and conversion in major palm oil and cocoa producer countries have been high in recent years. So much so that Malaysia and Ivory Coast lost 495,000 and 301,000 hectares of tree cover per year on average, respectively, between 2016 and 2018[44]. Commodity-driven deforestation was responsible for approximately 90% of tree cover loss in Malaysia between 2016 and 2018[44]. Although this may also include other non-forest land uses, palm oil is by far the main agricultural crop in the country[xiii] and is therefore likely the main agricultural driver of deforestation. Similarly, cocoa is one of the most important drivers of deforestation and conversion in Ivory Coast[xiv,xv]. Therefore, it is reasonable to assume that our estimated GHG emissions associated with the production of palm oil and cocoa would have been much higher if the data from these locations had been available.

Emissions from consumption (i.e. due to the production and trade of imported products) contribute to climate change and are significant in the UK due to the country's heavy reliance on imported products[4]. Despite this, these emissions, although accounted for, are not included in the UK national carbon budget nor considered in the UK Climate strategy, so there are no requirements to mitigate them.

>2,800

GLOBALLY THREATENED SPECIES COULD BE UNDER PRESSURE FROM UK TRADE IN COMMODITIES

IMPACTS ON BIODIVERSITY

Our analysis based upon the International Union for Conservation of Nature (IUCN) Red List[75], suggests that **UK trade in key agricultural and forest commodities could be exerting pressure on over 2,800 globally threatened species in high risk producer countries exporting to the UK.**

In the 11 countries classified as very high and high risk in this report (Table 2), there are 2,858 species (of which 1,059 are amphibians, birds or mammals) listed as globally threatened (in the Vulnerable, Endangered or Critically Endangered IUCN Red List categories[76]; see Box 1 for a description of each) which live in habitats that are threatened by activities related to commodity production, such as livestock farming and logging (Table 3). Over 75% of these species (and over 90% of the amphibians, birds and mammals) have declining populations. Our risk assessment (see Methods section on 'Assigning a risk score to producer countries') reveals that in these countries, there is a substantial risk that high levels of deforestation and ecosystem conversion are linked with the production of commodities traded to the UK. Subsequently, there is a strong possibility that UK commodity demand is contributing to increased extinction risk for these species.

xiii According to Faostat (www.fao.org/faostat), Malaysia is the second biggest global producer of palm oil after Indonesia (with 19.5 Mt produced in 2018). In 2018, palm oil production exceeded by 7 to 13 times that of other key agricultural crops in the country: rice, rubber, coffee, cocoa, bananas and other fruits and vegetables.

xiv Other drivers for which limited data is available may include mining, logging, fire damage and large-scale agricultural expansion for crops other than cocoa. See Satelligence (2019), www.satelligence.com/news/2019/5/17/cocoa-not-main-cause-of-deforestation-in-ghana

xv We decided to focus on cocoa because its production is closely associated with deforestation in West Africa and according to Global Forest Watch, the predominant cause of tree cover loss in the region was due to 'shifting agriculture' (i.e. temporary loss or permanent deforestation due to small- and medium-scale agriculture).

Country	Country risk score (11-12 = very high; 9-10 = high)	No. of globally threatened species	Percentage (%) of globally threatened species with declining populations
Argentina	10	115	84%
Australia	9	348	46%
Brazil	10	464	81%
China	9	498	75%
Indonesia	12	739	81%
Ivory Coast	10	113	66%
Malaysia	10	716	81%
Nigeria	12	209	71%
Papua New Guinea	10	161	61%
Paraguay	11	53	79%
Russian Federation	10	116	78%
Total		**2,858§**	**76% (average)**

TABLE 3:
NUMBERS OF GLOBALLY THREATENED SPECIES* AND PROPORTION OF THOSE WITH DECLINING POPULATIONS IN RISKY COUNTRIES†

Notes: * Includes animal, plant and fungi species classified as Vulnerable, Endangered or Critically Endangered by the IUCN Red List, listed as living in at-risk habitats threatened by commodity production-related activities.

† Refers to countries that are assigned very high (11-12) and high (9-10) risk scores in our risk assessment.

§ This total takes into account that some species occur in several of the countries, so is not a direct sum of the column above.

Source: IUCN Red List 2020

Of the 11 countries assessed, the figures for Indonesia are extremely concerning given that the UK has a significant land footprint there (over 524,000 ha), and it has both the highest risk score in our assessment and the greatest numbers of globally threatened species with declining populations. Also, of particular concern are the figures for Brazil, where the UK's footprint is even bigger than in Indonesia (over 831,000 ha) and is linked to the production of multiple commodities where the impacted landscapes are highly biodiverse.

However, due to the limited granularity of the Red List data, it is difficult to draw conclusive, causal links between commodity production due to UK trade and impacts on biodiversity in a particular landscape. Nonetheless, the opposite is also true: we cannot say for certain that the UK's demand for and trade in agricultural and forest commodities is not contributing to the demise of threatened species, especially given that the UK sources large volumes of commodities from these 11 countries.

As a signatory to the CBD and as a key supporter of efforts to increase the sustainability of agricultural commodity supply chains, the UK must ensure that its consumption and trade of commodities is not contributing, directly or indirectly, to the destruction or degradation of habitats. If the UK wishes to be a global environmental leader, it must lead by example and work with other consumer countries to ensure the conservation and restoration of valuable ecosystems in these producer countries.

BOX 1:
IUCN RED LIST CATEGORIES

According to the IUCN Red List categories, Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) species are globally threatened with extinction in the wild. Species are placed into these categories following assessments according to a specific set of established criteria, which include elements such as population size, rates of decline, and area of geographic distribution. These 'threatened' categories are on a scale of risk, with CR species facing the highest risk, followed by EN and VU species. The IUCN aims to have each species on the Red List reassessed at least once every 10 years, and ideally every five years if resources permit (for further details, please refer to the full IUCN Red List Categories and Criteria[76]).

FINDINGS PER COMMODITY

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Example of raw soy product which was harvested from a sustainable farm, Cerrado.

SOY

After rapid expansion in the past decade, soy production is expected to grow less quickly over the course of the next decade, falling from 4.4% to 1.2% per annum, a trend that has been linked to the projected reduction in Chinese demand[77]. Nevertheless, the production of soy will likely continue to represent significant risks to both the natural environment and local human populations.

The land required overseas to meet the UK's annual demand for soy between 2016 and 2018 was on average 1.7 Mha, or an area approaching the size of Wales. This figure was similar to our previous study, based on 2011-15 data.

Despite the UK relying a little less on soy from South American countries (6% decrease), 65% of the soy land footprint is still located in Argentina, Brazil and Paraguay, all of which are high risk countries.

More than half (56%) of the UK's soy imports between 2016 and 2018 were in the form of soymeal – a prime ingredient of animal feed and increasingly associated with high protein diets.

From our data, at least 75% of all imported soy is either embedded in imported meat, eggs and dairy or is used for animal feed.

To date, the Americas dominate the production of soy, with Brazil expected to surpass the US as the world's largest producer of soy in the coming years[77]. Meanwhile, in terms of consumption, China and Indonesia currently import the largest quantities of soy globally[78]. The Netherlands also imports large volumes of soy, around half of which is then re-exported across the EU, as well as to the UK and Morocco[78].

From 2016 to 2018, the UK imported on average 3.6 million tonnes of soy per year of which almost all (~90%) was used to manufacture products in the country – mostly food and animal feed. The volume of soy imported to the UK has increased by approximately 7% since our previous analysis. As of 2019, just over a quarter (~27%) of the soy consumed in the UK was certified by a deforestation and conversion-free soya standard[11]. No other information is currently available to ensure that the other three-quarters is free from deforestation and conversion.

The world's land footprint for soy is about 131 Mha[79] or roughly one-third of the size of the European Union. The UK's imports account for about 1% of this land footprint. Between 2016 and 2018, the land required to produce the volume of soy imported was on average 1.7 Mha, or an area nearly the size of Wales. This land footprint has remained relatively stable since our previous study (2011-15), possibly due to slightly higher crop yields in producing countries in the most recent years[79].

The GHG emissions from land-use change to produce the volume of soy imported to the UK were an estimated 18.8 Mt CO_2e per year between 2016 and 2018 – equal to around 35% of the emissions produced by the UK construction industry in 2016[4].

Most of the soy imported to the UK (at least 65%) still comes from Argentina[3], Brazil[80], and Paraguay (Fig. 2a), though this has declined by 6% since our past study (2011-15). Our risk analysis assigned high and very high risk scores to these countries for the period 2016-18 (Table 2), due to high deforestation and conversion rates and poor social indicators. There has been a slight reduction in the risk scores for these countries compared to the previous period of the analysis, mostly due to improvements on social indicators for all three countries. A relative slowdown in deforestation and conversion happened in Argentina and Paraguay, which is possibly related to either crop intensification or the fact that most of the natural vegetation in areas suitable for cropland has already been converted[81]. Meanwhile, in Brazil, deforestation and land conversion rates remain as high. Unfortunately, only a small percentage of the soy produced in South America was certified as sustainably produced (e.g. Brazil = 2.8% (3.2 million tonnes), Argentina = 2.1% (569,800 tonnes), and Paraguay

= 0.9% (81,400 tonnes))[xvi], suggesting a considerable risk that the soy traded to the UK is not free from deforestation, land conversion or human rights abuses.

Soymeal was by far the most common form of soy imported to the UK (56% of total volume) followed by soybeans (21%, see Fig. 2b). Soymeal is rich in protein and, thus, is almost entirely used in the manufacturing of animal feed that constitutes either part of or the entire diet of livestock raised in the UK (see the subsequent section 'Hungry for meat: links between soy fed to animals and impacts on critical ecosystems' for further details). For soy embedded in livestock, the most common imports are soy embedded in poultry (of which chicken constitutes 88%), closely followed by soy embedded in pork.

FIGURE 2A:

ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY UK'S SOY DEMAND, BY COUNTRY (2011-18)

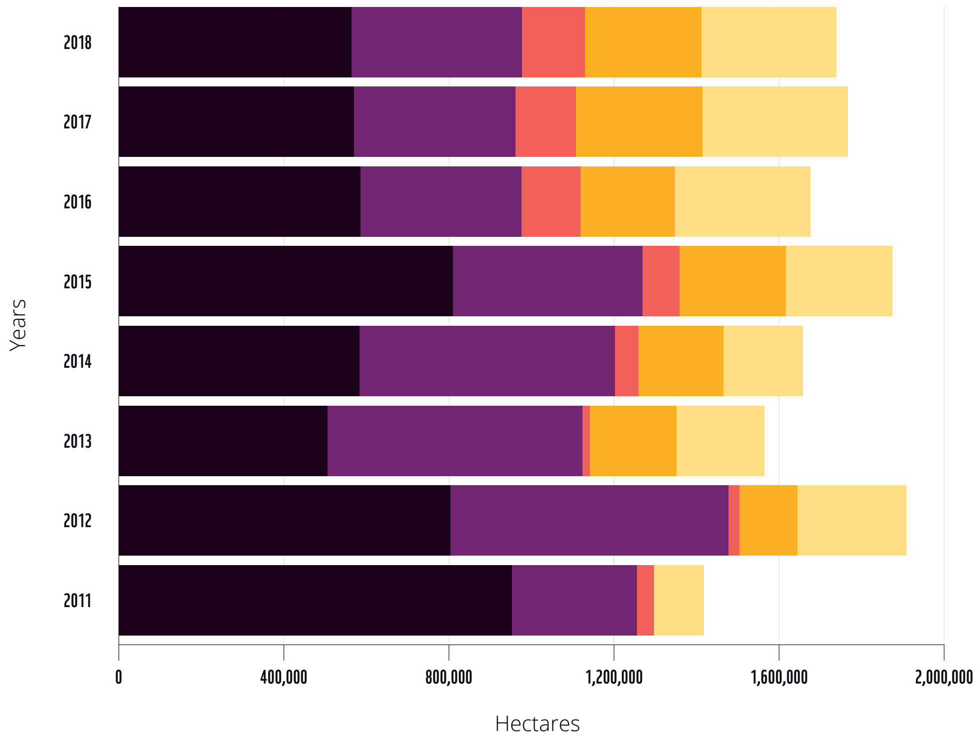
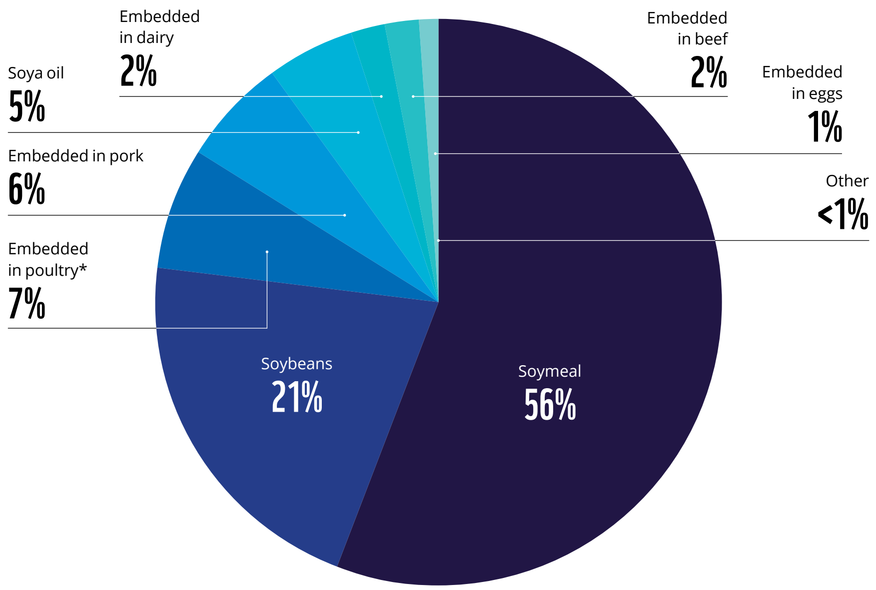


FIGURE 2B:

ESTIMATED PROPORTION OF SOY IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)

* *Chicken comprises around 88% of total imported poultry.*



xvi The percentages were calculated using volumes of RTRS certified soy from the European Soy Monitor Report www.idhsustainabletrade.com/uploaded/2019/04/European-Soy-Monitor.pdf (commissioned by IDH, The Sustainable Trade Initiative and IUCN NL) and trade data collected by Trase (https://trase.earth/explore).

FURTHER ACTIONS ARE NEEDED TO ENSURE THAT THE MEAT ON OUR PLATES IS NOT CONTRIBUTING TO THE DESTRUCTION OF VITAL ECOSYSTEMS

HUNGRY FOR MEAT: LINKS BETWEEN SOY FED TO ANIMALS AND THE IMPACTS ON CRITICAL ECOSYSTEMS

Soymeal is the main product left after the extraction of oil from the soybean. It is the number one protein source used in the manufacture of animal feed due to its high content of protein, high digestibility and relatively low cost[82,83].

On average, soymeal is the most common form of soy imported by European countries[84] and the same is true for the UK. The increasing global demand for soymeal is associated with an increase in animal protein-based diets, especially in fast-growing markets, such as in Southeast Asia[85]. In the UK, there has been a slight reduction in the consumption of red meat, but this has been counterbalanced by an increase in poultry consumption in recent years[86]. Overall, the UK's meat consumption (79.9kg per person per year) remains higher than the world average (43kg per year)[87].

In the UK, soymeal is mostly used to feed poultry (15-26% of feed content), followed by pork (5-18%)[88] and cattle (0-18%). A large proportion of the cattle reared within the UK are grass fed, which explains the lowest use of soy for cattle, although some industrial-scale producers prefer to use animal feed in intensive beef systems[89].

Most soymeal imported to the UK between 2016 and 2018 was produced in Argentina, Paraguay and Brazil, all risky countries. Soybean production in South America is causing or has caused large-scale destruction of forests, savannahs and grasslands – most notably across the Cerrado, Gran Chaco[90] and Pampas biomes[91,92], (See Map 1), all of which are home to high biodiversity and provide crucial ecosystem services. The UK's large reliance on soy imports from these countries suggests there is a high risk that the UK is contributing to negative environmental and social impacts in these regions. For instance, in Argentina large parts of the Chaco were converted to agriculture between 2007 and 2017[93], many of which are areas producing soy and that exported directly to the UK market in 2017[94] (see Map 2).

With the prospect of increasing global demand for soy in the coming years[77], further actions are needed to ensure that the meat on our plates is not contributing to the destruction of these vital ecosystems, to preserve what remains and to restore degraded areas. Increasing the market demand for certified sustainable soy and improving traceability in supply chains are a good start. Government incentives and regulation (e.g. due diligence obligation) are important to make that happen across the entire food sector. Strong support to producer countries to improve sustainability is needed. Measures aimed at reducing our meat consumption, such as shifting towards plant- and/or insect-based proteins, may also help reduce the pressures on these ecosystems[90].

56%

SOYMEAL WAS BY FAR THE MOST COMMON FORM OF SOY IMPORTED TO THE UK

MAP 1:

LOCATION AND EXTENT OF THE AMAZON, CERRADO, CHACO AND PAMPAS BIOMES IN SOUTH AMERICA

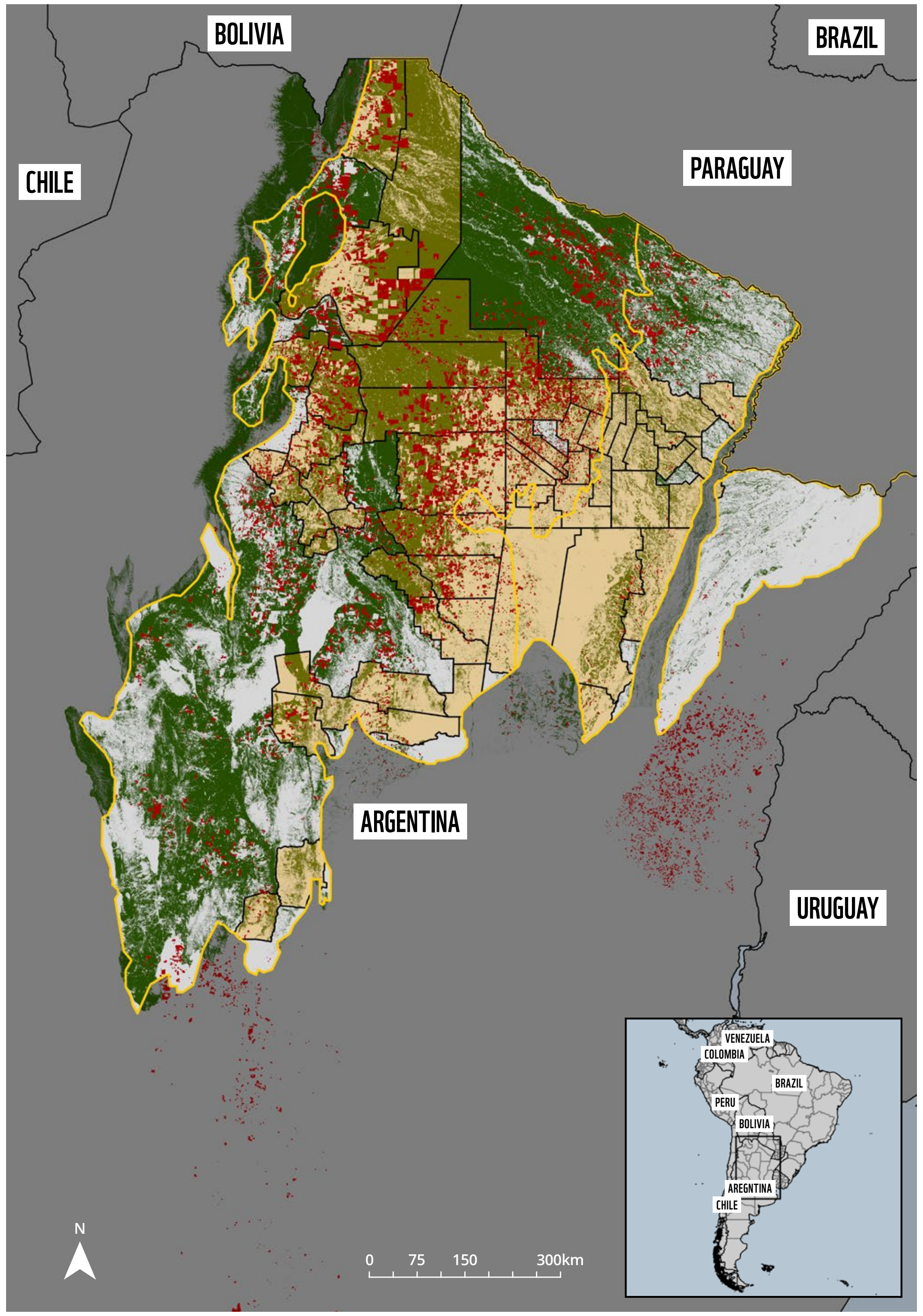
Biome

- Amazon
- Cerrado
- Chaco
- Pampas

MAP 2:

DEFORESTATION AND CONVERSION IN THE ARGENTINIAN CHACO BETWEEN 2007 AND 2017; AND THE ARGENTINIAN DEPARTMENTS EXPORTING THE LARGEST VOLUMES OF SOY TO THE UK, IN 2017

- Gran Chaco
- Departments that export soy to the UK
- Current remnant natural vegetation
- Deforestation 2007-17



Sources: Map is a modified version from map produced by Fundación Vida Silvestre based on UMSEF information; natural vegetation loss between 2007-2017: UMSEF 2018; and soy trade from Argentina to the UK data for 2017: TRASE.

PALM OIL

The land required overseas to supply the UK's demand for palm oil between 2016 and 2018 was on average 1.1 Mha per year – roughly 5% of the world's palm oil land footprint in 2017. This was a decrease of 5% compared to our previous analysis for 2011-2015.

Of the palm oil imported to the UK between 2016 and 2018, 89% came from risky countries (Indonesia, Malaysia and Papua New Guinea).

The UK's palm oil land footprint located in high and very high risk countries increased by 37% compared to our previous analysis of 2011-15.

Despite progress in the certification of palm oil both globally and in the UK (around 19% of global production and 77%[xvii] of the UK's crude and refined palm oil imports are currently certified as sustainably produced by the RSPO), rates of deforestation and conversion due to palm oil production remain high. This suggests that efforts in the sector have not been translated into improving sustainability on the ground.

India, China, Pakistan and the EU are currently the major importers of palm oil globally, while Indonesia and Malaysia are the major producers[78]. The latter two countries are also major consumers of palm oil. The current annual global demand for vegetable oil, of which palm oil comprises 40.5%, is 204.9 million tonnes[95]. The global demand for palm oil is expected to increase to 264—447 million tonnes by 2050, due to growing demand for consumer goods and biofuels[96].

While the largest growth in production is expected to occur in Indonesia and Malaysia, it is also expected to increase in the frontier areas of Latin America and Africa (mainly Colombia and Nigeria, respectively)[95]. This is especially important given both the high forest cover and presence of other key highly biodiverse habitats (e.g. savannahs and grasslands) in these regions.

On average 1.2 million tonnes of palm oil was imported into the UK every year between 2016 and 2018, of which 82% was consumed within the UK – a 3% increase based on our previous analysis (2011-15). The remainder was exported. In 2018, around 323,688 tonnes, or 77% of the crude and refined palm oil entering the UK, was certified as sustainable by the RSPO[8]. However, this figure excludes palm kernel oil (PKO), RSPO credits, derivatives and finished goods and so only applies to 36% of the total palm oil that is imported to the UK.

WHEN ALL IMPORTS ARE TAKEN INTO ACCOUNT, ONLY 28% OF THE PALM OIL THAT IS CURRENTLY IMPORTED TO THE UK IS CERTIFIED AS SUSTAINABLY PRODUCED BY THE RSPO

We still do not have reliable data on the percentage of certified volumes for PKO, or the solid parts of processed palm (e.g. palm kernel expeller (PKE) and oil cake) and for palm oil embedded in imported manufactured products. Thus, when all imports are taken into account, only 28% of the palm oil that is currently imported to the UK is certified as sustainably produced by the RSPO. There are, however, concerns regarding this figure, as a significant proportion of the certified palm oil is covered by Mass Balance certification, meaning it is a mix of certified and non-certified palm oil (see Box 2 for further details). For example, according to our most recent Palm Oil Buyers Scorecard[15], more than a third of the palm oil volume disclosed by UK companies was certified as Mass Balance. It is likely that this percentage is even higher when the entire volume imported to the UK is taken into consideration.

xvii This figure is derived from Efeca's Annual Progress Report — UK Roundtable on Sourcing Sustainable Palm Oil (2019), which focuses only on the imports of crude and refined palm oil, excluding palm kernel oil, solid by-products from oil extraction and palm oil embedded in imported manufactured products. Therefore, the overall percentage of certified volume is much lower: ~28% of total imported palm oil.

BOX 2:
ROUNDTABLE ON SUSTAINABLE PALM OIL: TYPES OF CERTIFICATION[17]

The RSPO currently permits certified oil palm products to be traded through any of the following four supply chain models:

1. **Identity Preserved (IP)** – sustainable palm oil from a single identifiable certified source is kept separately from ordinary palm oil throughout the supply chain.
2. **Segregated** – sustainable palm oil from different certified sources is kept separate from ordinary palm oil throughout the supply chain.
3. **Mass Balance** – sustainable palm oil from certified sources is mixed with ordinary palm oil throughout the supply chain.
4. **RSPO Credits/Book & Claim** – the supply chain is not monitored for the presence of sustainable palm oil, but manufacturers and retailers buy credits[xviii] from RSPO certified growers, crushers and independent smallholders to cover the volume of palm oil they use.

37%
INCREASE IN THE UK'S PALM OIL LAND FOOTPRINT IN RISKY COUNTRIES, COMPARED TO OUR PREVIOUS STUDY

The world's land footprint for palm oil is about 21.4 Mha[79], or more than two and a half times the size of Ireland. The land required overseas to supply the UK's palm oil demand between 2016 and 2018 was on average 1.1 Mha per year – about 5% of the world's palm oil land footprint. Overall, the UK land footprint for the production of palm oil overseas has decreased slightly since our previous study (by about 5%). The estimated GHG emissions to produce the volume of palm oil imported to the UK were 6.7 Mt CO_2e per year, for the period of 2016-18 (Table 1) – equal to around 11% of the GHG emissions generated by the transmission and distribution of electricity across the UK in 2016[4].

About 89% of palm oil imports to the UK came from Indonesia, Malaysia and Papua New Guinea (Fig. 3a) – an increase of 8.5% from our previous study. These countries are high risk locations due to high deforestation rates[98,99,100] and poor track records of human rights (Table 2). The level of risk for Indonesia and Papua New Guinea increased compared with our previous study. Despite still being a high risk country, mostly due to high rates of deforestation, Malaysia has shown higher labour and rule of law indices in recent years and maintained a similar score. Such increase in overall risk has led to an increase of 37% of the UK's palm oil land footprint in risky countries, compared to our previous study.

Indonesia is experiencing slightly lower rates of deforestation and land conversion compared to 2011–15. However, rates are still very significant: 1.6 Mha of natural forests and other ecosystems were converted in Indonesia between 2016 and 2018[4]. The relative contribution of deforestation driven by large-scale oil palm plantations has, though, declined since the early 2000s, from ~50% to ~25%[101]. However, deforestation and land conversion due to small-scale agriculture/plantations (including to smallholder oil palm) has markedly increased. The decline in the role of large-scale oil palm plantations in driving deforestation may have been influenced by increased adoption of sustainability standards by large companies[101]. Nevertheless, sustainability standard levels amongst smallholders are much lower, despite the fact they are responsible for over a third of the country's palm oil production[102].

xviii An RSPO Credit is proof that one tonne of certified palm oil was produced by an RSPO certified company or independent producer, and has entered the global palm oil supply chain. By purchasing credits, buyers encourage the production of certified sustainable palm oil.

39%

OF THE UK'S IMPORTS OF PALM OIL, IN TERMS OF WEIGHT, ARE IN THE FORM OF PKE AND OIL CAKE

Since 2016, there has been a considerable increase in palm oil imports to the UK from Indonesia and a decrease from Malaysia (Fig. 3a). Indonesia has taken a higher proportion of the global market in recent years and is expected to continue to dominate due to its larger extent of unconverted land and lower labour costs compared to Malaysia[103].

The majority of the UK's imports of palm oil as well as other oil palm-derived products, in terms of weight, are in the form of PKE and oil cake (39%), followed by crude or refined palm oil (35%; see Fig. 3b). Palm oil fractions are mostly used in the food sector, or in the manufacture of personal care products; a smaller proportion is used for energy generation[104]. Whereas a smaller percentage of imported PKE, ~20%, is also used for energy generation, the largest portion (80%) is consumed by the UK's animal feed industry[104]. In fact, despite being less common than soymeal in feed manufacturing globally, PKE has a high nutritional content and is used to manufacture animal feed, especially in large palm oil producing countries like Malaysia[105]; it is mostly used to feed cattle, due to its high fibre content. Little information is available on the percentage of PKE used in the diets of different livestock in the UK.

SINCE 2016, THERE HAS BEEN A CONSIDERABLE INCREASE IN PALM OIL IMPORTS TO THE UK FROM INDONESIA AND A DECREASE FROM MALAYSIA

FIGURE 3A:
ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY THE UK'S PALM OIL DEMAND, BY COUNTRY (2011-18)

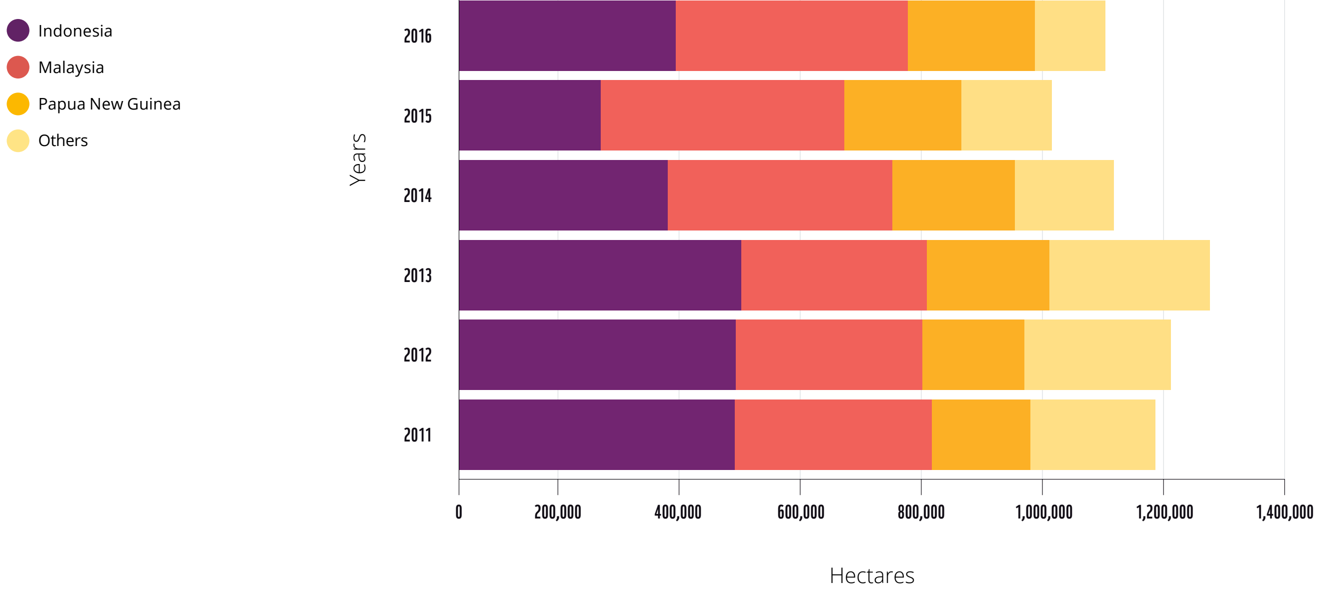
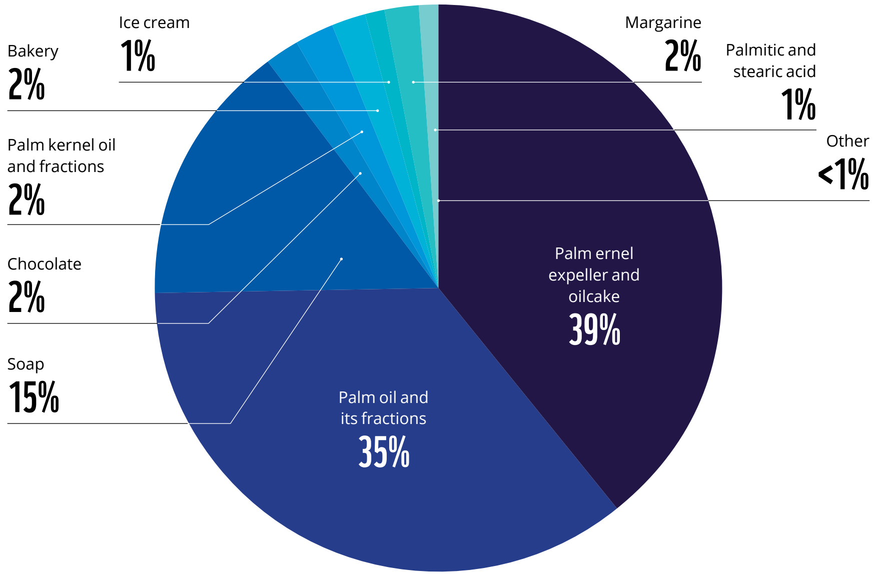


FIGURE 3B:
ESTIMATED PROPORTION OF PALM OIL IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)



COCOA

The world's cocoa land footprint is about 11.7 Mha[79], or an area approaching the size of England. The Netherlands, the United States and Germany are the major global importers of cocoa, while Ivory Coast and Ghana are the major global exporters[78]. Global demand for cocoa is expected to rise in the coming years, with a predicted market increase of 3.5% per annum between 2019 and 2025[106].

The average land required overseas to supply the UK's demand for cocoa has increased from 884,372 hectares to nearly 1.1 Mha – an increase of 20% since our previous assessment (2011-15). This amounts to around 9% of the global land footprint for cocoa.

Almost 80% of the UK's land footprint was located in West Africa: Ivory Coast (47%), Ghana (18%) and Nigeria (15%). Ivory Coast and Nigeria were assigned very high and high risk scores, respectively.

On average between 2016 and 2018, the UK imported 1 million tonnes of cocoa every year – of which about 81% was consumed in the country and the remainder was exported. The imported volumes have increased by 18% since our 2011-15 analysis. Less discernible, however, is the percentage of certified cocoa currently entering the UK, which is unknown (see Box 3 for further detail on the global/UK status).

The land required to produce the UK's cocoa imports was on average 1.1 Mha per year – equivalent to about 9% of the world's land footprint for cocoa in 2017. The estimated GHG emissions attributed to the UK's cocoa land footprint between 2016 and 2018 were around 1.2 Mt CO_2e per year[xix] – equal to around 2.6% of the emissions generated by the UK aviation industry in 2016[4].

Almost half of the UK's cocoa land footprint was located in Ivory Coast (47%), followed by Ghana (18%) and Nigeria (15%; Fig. 4a). Risk scores have increased for both Ivory Coast and Nigeria, as both countries have experienced a large increase in deforestation rates in recent years[107]. In Nigeria the labour rights indicator has also worsened.

Most of the cocoa imported to the UK was in the form of chocolate and other food preparations containing chocolate (39%) and cocoa beans (29%; Fig. 4b). The UK consumption of chocolate bars has remained fairly constant (just over 70,000 tonnes a year)[108]. Consumption of chocolate boxes rose by 6%, to 294,000 tonnes per year[108].

39%

OF THE COCOA IMPORTED TO THE UK WAS IN THE FORM OF CHOCOLATE AND OTHER FOOD PREPARATIONS CONTAINING CHOCOLATE

xix Very likely to be higher, since GHG emissions data for Ivory Coast – the main cocoa producer – are unavailable.

BOX 3:

SUSTAINABILITY STANDARDS IN THE COCOA INDUSTRY.

There are numerous certification schemes aimed at mandating minimum sustainability standards for cocoa producers. These include voluntary standards schemes (principally UTZ, Rainforest Alliance[xx], Fairtrade and organic) as well as the proprietary schemes of manufacturers and traders including Mars Wrigley, Mondelez, Barry Callebaut, Hershey and Nestlé.

The global area of certified cocoa[xxi] more than doubled between 2013 and 2017 (+115% in the period, and +19% between 2016 and 2017), reaching 25% of the global cocoa area (23% of the global cocoa area is UTZ certified)[109]. This suggests increasing efforts by cocoa traders and chocolate companies, but these have so far failed to drive meaningful change in the industry, as cocoa production continues to be linked to deforestation, child labour and farmer poverty.

It is in the UK that Fairtrade finds its largest global market: as of 2014, it was the largest consumer of Fairtrade cocoa products in the world[110]. Unfortunately, however, there is no information regarding the total volume or proportion of certified sustainable cocoa currently entering the UK, due to a lack of publicly available data from traders, manufacturers and retailers.

BOX 4:

INDUSTRY AND GOVERNMENTS JOIN FORCES TO END COCOA-RELATED DEFORESTATION.

In recognition of their collective responsibility, the governments of Ivory Coast and Ghana as well as 35 of the world's leading cocoa and chocolate companies (accounting for over 85% of global cocoa) joined together to form the Cocoa & Forests Initiative in 2017, in order to bring about an end to deforestation and restore degraded forests[111]. In March 2019, as part of the initiative, Ivory Coast, Ghana and 34 companies released action plans that spell out concrete steps to end cocoa-related deforestation, focusing on forest protection and restoration, sustainable cocoa production and farmers' livelihoods, and community engagement and social inclusion. The initiative is timely, especially as global demand for cocoa is expected to rise in the coming years[106].

xx UTZ and Rainforest Alliance have merged in 2018 and have published a new joint certification programme under the Rainforest Alliance brand in June 2020, with audits becoming mandatory in mid-2021. The current Rainforest Alliance and UTZ programmes will continue to run in parallel as the transition across to the new standard takes place. See https://www.rainforest-alliance.org/business/tag/2020-certification-program/

xxi Certified by one or more of the four main third-party certification schemes for cocoa: UTZ, Rainforest Alliance, Fairtrade and organic.

FIGURE 4A:
ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY THE UK'S COCOA DEMAND, BY COUNTRY (2011-18)

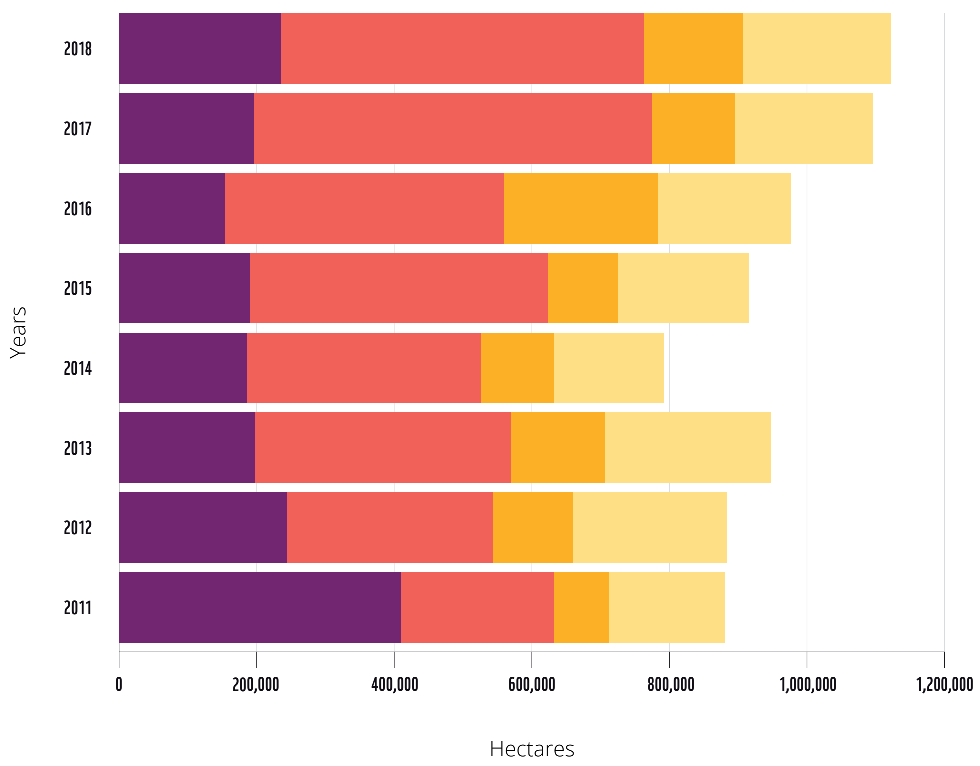
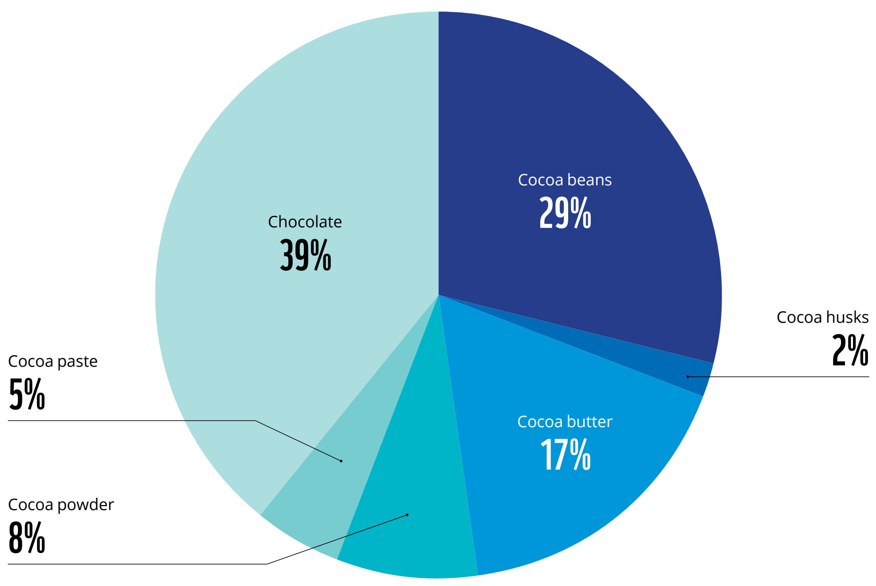


FIGURE 4B:
ESTIMATED PROPORTION OF COCOA IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)



TIMBER

Currently, the US and China are the major global consumers of timber products, excluding wood pellets (fuelwood)[112]. Together, the US, China and the UK are the major importers of softwood lumber timber[113], and Russia is the largest global exporter with 23% of the global market share[114]. The global demand for timber and timber-derived products is expected to triple between 2010 and 2050[115].

Globally, the land area required to supply the world's demand for timber is about 1.7 billion hectares[79] – equivalent to the size of Russia. The UK's timber footprint overseas, though only 1% of the world's timber footprint, is the largest in absolute area compared to those of all commodities studied in this report (Fig. 1a). The UK's timber land footprint has increased threefold since 2011 (Fig. 5a) – from 2.8 Mha to 8.4 Mha – an area greater than the size of Scotland. Between 2016 and 2018, this land footprint doubled compared with that of our previous study (2011-15).

On average, 28.5 million m^3 of wood raw material equivalent (WRME) were imported to the UK every year between 2016 and 2018, of which 94% was consumed domestically. The largest volumes of timber are imported from the US (23%) and Canada (21%) – both medium risk countries. The risk in timber supply chains has stabilised since our past study: 18% of the UK's timber land footprint is located in high risk countries, such as China, Russia and Brazil (Table 2).

The largest proportion of timber imported to the UK between 2016 and 2018 was as fuelwood (32%) followed by sawn wood (24%) and furniture (14%; Fig. 5b). Fuelwood is primarily used for energy generation and has increased considerably in three years, from an average of 22% of total imports to 32%. This increase is likely linked to policies to increase the share of renewable sources in the UK's energy mix[116].

The land required overseas to supply the UK's demand for timber and fuelwood has increased threefold since 2011 (from 2.8 Mha to 8.4 Mha) – an area greater than the size of Scotland.

Around one-fifth of the UK's overseas land footprint for timber – a total of 1.4 Mha and greater than the size of Yorkshire – was located in high risk countries, such as Brazil, Russia and China.

Around a third of the UK's timber imports between 2016 and 2018 were in the form of fuelwood – equivalent to 27.6 million trees[xxii].

Fuelwood is primarily used for energy generation, and demand has increased considerably – from an average of 22% of total imports to 32%. Such an increase is likely to be linked to policies aimed at increasing the share of renewable sources in the UK's energy mix. Though well-intended, these policies fail in sufficiently assessing the carbon impacts of biofuels.

AROUND 60% OF THIS FUELWOOD WAS PRODUCED IN THE US, WHICH ALTHOUGH ASSIGNED AS MEDIUM RISK BY OUR ASSESSMENT, RAISES CONCERNS GIVEN REPORTS OF UNSUSTAINABLE FOREST MANAGEMENT PRACTICES FOR TIMBER PRODUCTION

xxii Calculated using the average cubic metre volume (m^3) of an individual Sitka spruce (*Picea sitchensis*), a species of tree commonly used in UK construction. Note that this figure is illustrative only, as it is based on the average tree dimensions of a single tree species. The real number of trees might vary depending on the species used which varies per region.

BOX 5:

SUSTAINABILITY STANDARDS IN THE TIMBER AND PULP & PAPER INDUSTRIES

There are two main certification schemes that certify timber and pulp & paper: the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). By mid-2019, these initiatives had together certified 430 Mha of managed forests globally[117]. However, only 7% of these forests – an area roughly the size of Italy – were located in the tropics[117]. The UK is among those countries that have seen the most rapid growth in the market penetration of certified timber, with 3,278 chain of custody certificates[xxiii] issued by FSC and PEFC. However, due to a pervasive lack of publicly available data, we do not know the exact volume of certified timber currently entering the UK.

FIGURE 5A:

ESTIMATED LAND FOOTPRINT AREA REQUIRED OVERSEAS TO SUPPLY THE UK'S TIMBER DEMAND BY COUNTRY (2011-18)

- Brazil
- Canada
- China
- Finland
- France
- Germany
- Ireland
- Italy
- Latvia
- Poland
- Russian Federation
- Sweden
- USA
- Others

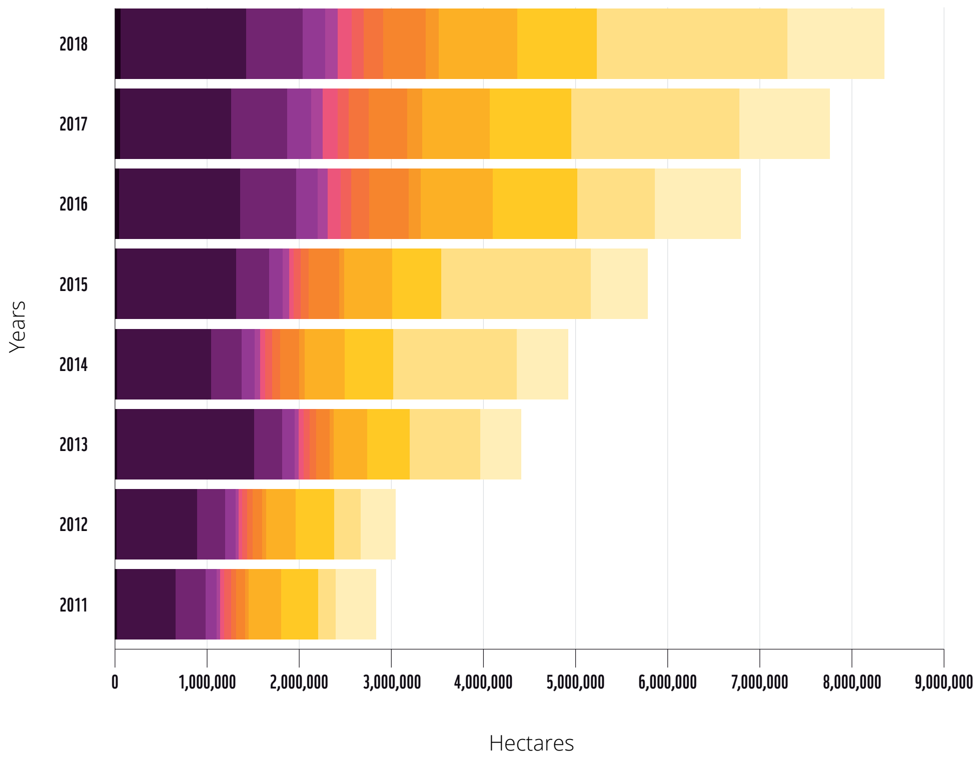
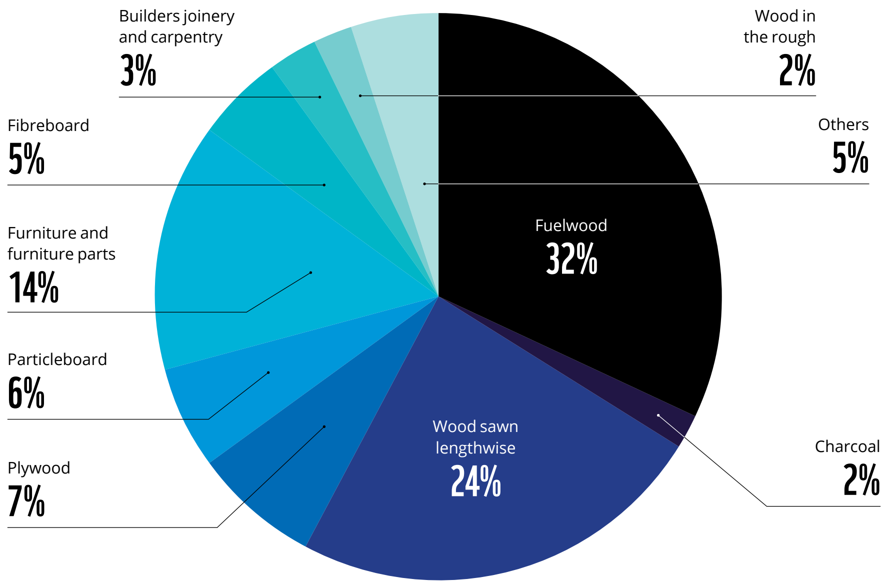


FIGURE 5B:

ESTIMATED PROPORTION OF TIMBER IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)



xxiii Chain of custody certification verifies that certified material has been identified and separated from non-certified and non-controlled material as it makes its way along the supply chain, from the forest to the market.

+152%

INCREASE IN AVERAGE IMPORT VOLUMES OF FUELWOOD FROM THE US COMPARED TO OUR 2011-15 STUDY

BURNING OUR WAY TO NET ZERO: FUELWOOD IMPORTS AND RISKS TO NATURE AND CLIMATE

Fuelwood imports, which account for over 30% of the UK's total timber imports, have doubled since 2015. Such a large increase is linked to policies designed to offset emissions from fossil fuels, which were adopted by the UK as part of the first Climate Change Act in 2008[118]. To date, the UK's dependency upon wood biomass for energy generation is equivalent to 25% of the country's total renewable energy sources[119]. The large fuelwood imports can be mostly attributed to the growth in the demand for wood pellets for bioenergy – most notably at Drax power station in Yorkshire[120]. In 2016 alone, Drax burnt around 13 million tonnes of wood pellets – a volume greater than the UK's average domestic wood production each year (~11 million tonnes)[121].

Of the total fuelwood imported to the UK, about 59%[xxiv] was produced in the United States. According to our analysis, between 2016 and 2018, an average of 4.4 million tonnes or 5.3 million m³ (WRME) of fuelwood were imported each year from the US; and average import volumes have increased by 152% since our 2011-15 study. Despite not being a risky country according to our risk analysis, there are growing concerns that the UK's increased demand for wood pellets is being met at the expense of old-growth forests across the US[120,122]. Importing wood from such long distances also raises concerns regarding carbon neutrality, given that over half the wood pellets burnt at Drax usually originate from the US[121].

Another matter of concern is that, between 2016 and 2018, around 505,000 thousand m³ (WRME) of fuelwood was imported from Russia – a country that lost about 36 Mha of tree cover between 2011 and 2018[44]. To date, only 3% of Russia's forested area is designated for the preservation of biodiversity[123], meanwhile, its environmental legislation is not well implemented on the ground, nor do its agricultural policies stimulate the conservation of remnant forests[124].

FUTURE UK POLICIES AND LEGISLATION ON RENEWABLE ENERGY AND OTHER SECTORS SHOULD BE CAREFULLY ASSESSED IN TERMS OF THEIR DEFORESTATION, CONVERSION AND OTHER NEGATIVE ENVIRONMENTAL AND SOCIAL IMPACTS OVERSEAS

The demand for fuelwood in the UK is expected to increase over the next decade, due to increasing demand for bioenergy[125], the revised target of the Climate Change Act on net zero emissions by 2050, and strengthened policies in various sectors (e.g. energy, heating and transport) to reduce GHG emissions from fossil fuels. Future UK policies and legislation on renewable energy and other sectors should be carefully assessed in terms of their deforestation, conversion and other negative environmental and social impacts overseas. Increased demand for wood should not be met at the expense of nature and people in producer countries nor result in higher emissions due to unsustainable forest management practices and long-distance transportation. Therefore, the government should ensure high environmental standards on all imported wood. Further, legislation to ensure legality needs to be strengthened as the UK leaves the EU and the EUTR is replaced by the UKTR.

As of 2019, the forested area within the UK stood at 3.2 Mha[126], of which 83% was managed for commercial purposes[127]. According to the Committee on Climate Change, the UK could increase its land area dedicated to the production of bioenergy crops[xxv] by 1.2 Mha, by 2050[128]. If acted upon, this strategy could help, to a certain extent, reduce demand for imported timber, partially reducing the UK's land footprint and associated risks overseas. However, any future strategy aimed at increasing the UK's domestic timber production should give due consideration to the potential impacts on local biodiversity and communities as well as food production.

xxiv Likely to be higher given we only included direct imports in this calculation, without provenance reassignment.

xxv The CCC analysis considers three types of bioenergy crops grown in the UK: miscanthus, short-rotation coppice (SRC) willow and short rotation forestry (SRF).

PULP & PAPER

The land required to supply the world's demand for pulp & paper is around 103 Mha[79] – equal to more than three times the size of India. Currently, the three main exporters of pulp & paper are the US, Canada and Brazil, while the biggest importers are China, Germany, India, the US and Indonesia[129]. In terms of paper and paperboard, Germany, the US, Finland, Sweden and Canada are the top exporters, while Germany, the US, China, Italy and the UK are the major importers[131].

Despite the ongoing decline in demand for graphic paper due to digitisation, global production is actually expected to grow over the course of the next decade, especially in Latin America, Europe and Asia[130]. Fuelling this predicted rise in the consumption of pulp & paper products is an increase in demand for both industrial and consumer packaging as well as tissue products[94].

The UK imported on average 24.2 million m³ (WRME) of pulp & paper every year between 2016 and 2018 – nearly a 1% decrease since our previous study (2011-15). Around 70% of all pulp & paper imports, 80% of which were paper and paperboard (Fig. 6b), were consumed in the UK. In fact, UK paper consumption is more than double the global average at 145 tonnes compared to 55 tonnes per person, per year[129].

The land required overseas to meet the UK's demand for pulp & paper between 2016 and 2018 was slightly higher (by 8%) than in our 2011-15 study, at an annual average of 5.4 Mha (Fig. 6a). This is around 5% of the total land area to supply global demand for pulp & paper in 2017.

There has been an increase of imports from medium- and low-risk European countries (e.g. Sweden, Germany and Finland), in conjunction with a decrease of imports from high risk locations (e.g. China and Brazil). Even though the land footprint in risky countries decreased from 11% to 4% it remains high in terms of absolute area at 179,000 hectares – equal to around half the size of Cornwall.

The slight decrease in imports and the increase in the overseas land area required to produce the imported volumes of pulp & paper, can possibly be explained by the increase in the share of imports from countries where the average net annual increment (NAI) (i.e. the net increase in the volume of wood in a forest per hectare, per year) is lower. This is the case for Sweden and Canada where, given the lower NAI, a higher land area is required to grow the same volume of wood than in a country with a higher NAI (refer to Annex D.2 for conversion factors used per country).

Globally, there has been a shift in recent decades away from using hardwood pulp sourced from natural forests towards 'fastwood' plantations, especially eucalyptus and acacia[131]. The creation of pulpwood plantations has sometimes been at the expense of natural forest and other natural habitats[132]. This can have a significant impact on biodiversity, and for this reason the main certification schemes, FSC and PEFC, essentially exclude plantations (for pulp and other end uses) established on areas converted from natural forest after November 1994 and 2010, respectively.

Between 2016 and 2018, the land required to supply the UK's demand for pulp & paper was on average 5.4 Mha per year – approaching three times the size of Wales. This represents an 8% increase compared to our previous analysis for 2011-15.

There has been a relative increase of imports from medium and low risk European countries (e.g. Sweden).

The percentage of the land area required to supply the UK's demand for pulp & paper located in high risk countries, such as Brazil and China, has reduced from 11% to 4%, but this still represents a significant area of land – equivalent to around 179,000 hectares, or half the size of Cornwall.

FIGURE 6A:
ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY THE UK'S PULP & PAPER DEMAND BY COUNTRY (2011-18)

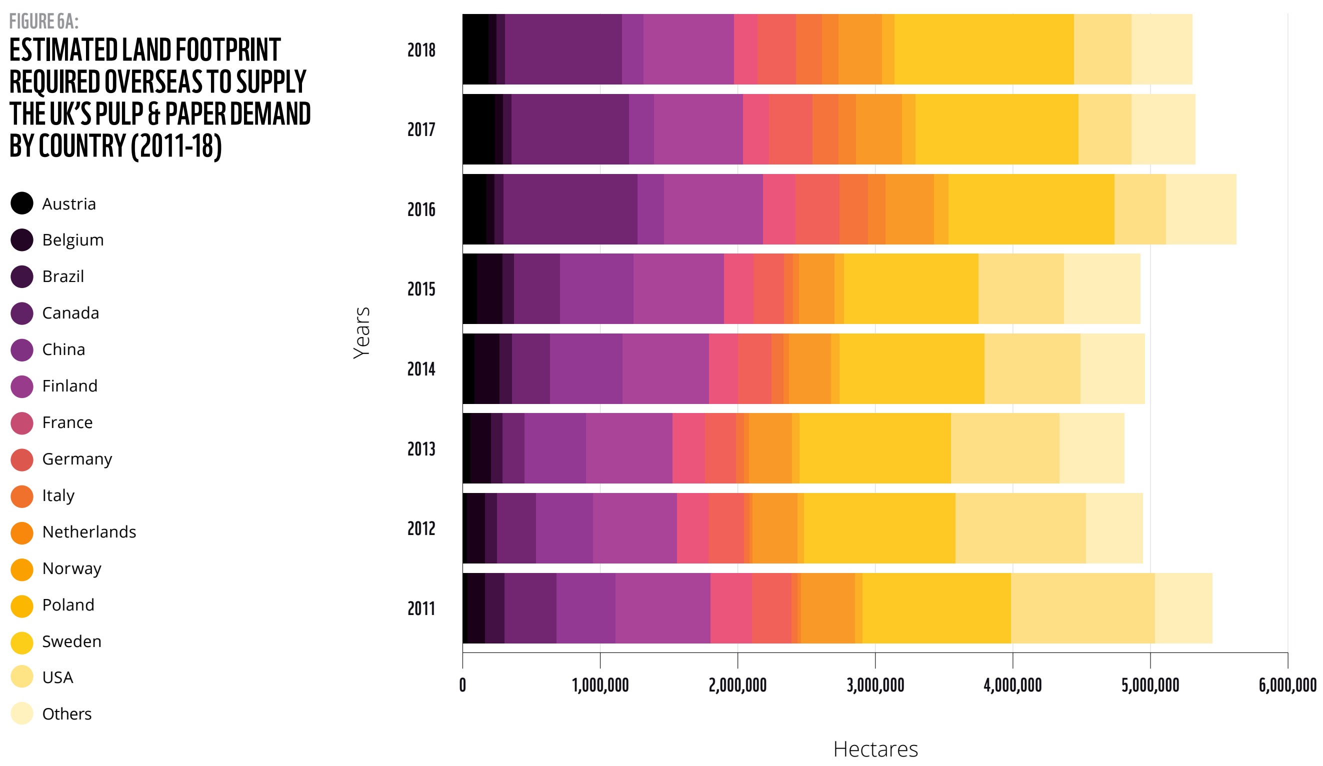
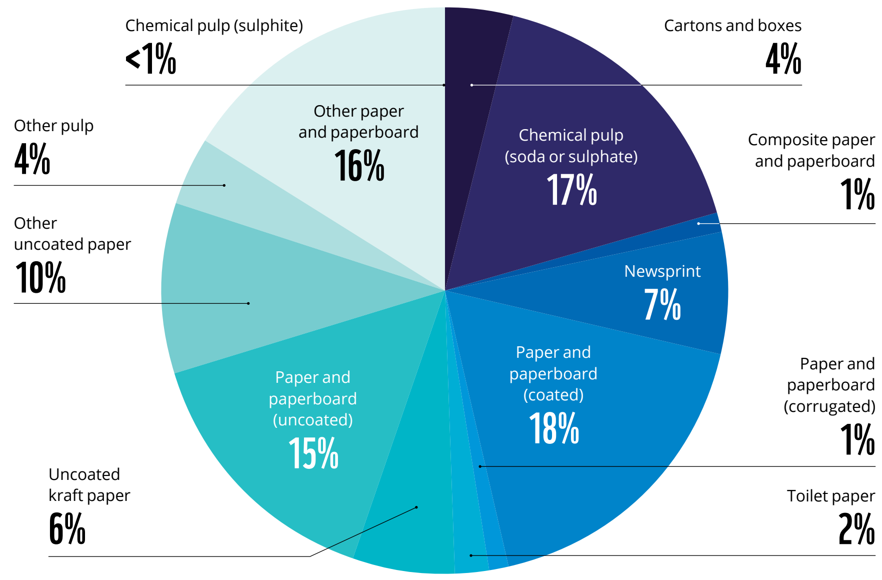


FIGURE 6B:
ESTIMATED PROPORTION OF PULP & PAPER IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)



NATURAL RUBBER

Between 2016 and 2018, the land required overseas to supply the UK's annual demand for natural rubber was 226,280 hectares – just under 2% of the world's land footprint for rubber in 2017.

The UK's natural rubber land footprint has decreased by around 17% since 2011-15, as a result of a 22% decrease in the volume of rubber imported.

The GHG emissions equivalent to the UK's rubber land footprint were 0.4 Mt CO_2e per year between 2016 and 2018. This figure, however, is underestimated due to a lack of GHG emissions data for major rubber producing countries, such as Thailand, Malaysia and China.

The global land footprint for rubber is about 12.4 Mha[79] or an area greater than the size of Scotland, Wales and Northern Ireland combined. The largest importers of natural rubber globally are China, Malaysia and the US, while the main exporters are Thailand, Indonesia and Ivory Coast[78]. Between 1990 and 2010, the global rubber land footprint expanded rapidly throughout Southeast Asia due to rising rubber prices and shifting government policies, particularly in non-traditional rubber producing countries such as Laos and Myanmar[132]. After a slight decline since 2018, global demand for rubber is expected to increase by 1.2% in 2020[133].

On average, the UK's land footprint for rubber was 226,280 hectares per year between 2016 and 2018 – just under 2% of the global land footprint for rubber. Since 2015, the UK's rubber land footprint has decreased by around 16% (Fig. 7a) due to a 22% fall in rubber import volumes (from 326,000 tonnes annually for 2011-15).

Around 65% of the UK's land footprint for rubber was located in high risk countries, such as Indonesia, Malaysia, China and Ivory Coast (Table 2). Risk has worsened in Ivory Coast, mainly due to a large increase in deforestation rates in recent years[44]; meanwhile, the opposite trend has been observed in Malaysia, due to relative improvement on social indicators.

The GHG emissions equivalent to the UK's land footprint for rubber in Indonesia as well as producer countries in the 'Others' category (below 2% import volume threshold) were estimated to be on average 0.4 Mt CO_2e per year between 2016 and 2018. However, due to lack of GHG emissions data for a few major rubber producer countries, such as Thailand, Malaysia and China, we were only able to estimate emissions equivalent to 37% of the total UK rubber land footprint overseas. Therefore, this figure is significantly underestimated.

Of the total imported volume of natural rubber, 42% was consumed in the UK, mainly in the form of new vehicle tyres (40% of imports, see Fig. 7b). As for the other 58% of imports little information is available on what happens once it has been exported. However, the majority of exports (39%) are composed of rubber waste from industry, such as compounded rubber[xxvi] and rubber from used vehicle tyres.

xxvi Chemically treated rubber.

FIGURE 7A:
ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY UK'S RUBBER DEMAND BY COUNTRY (2011-18)

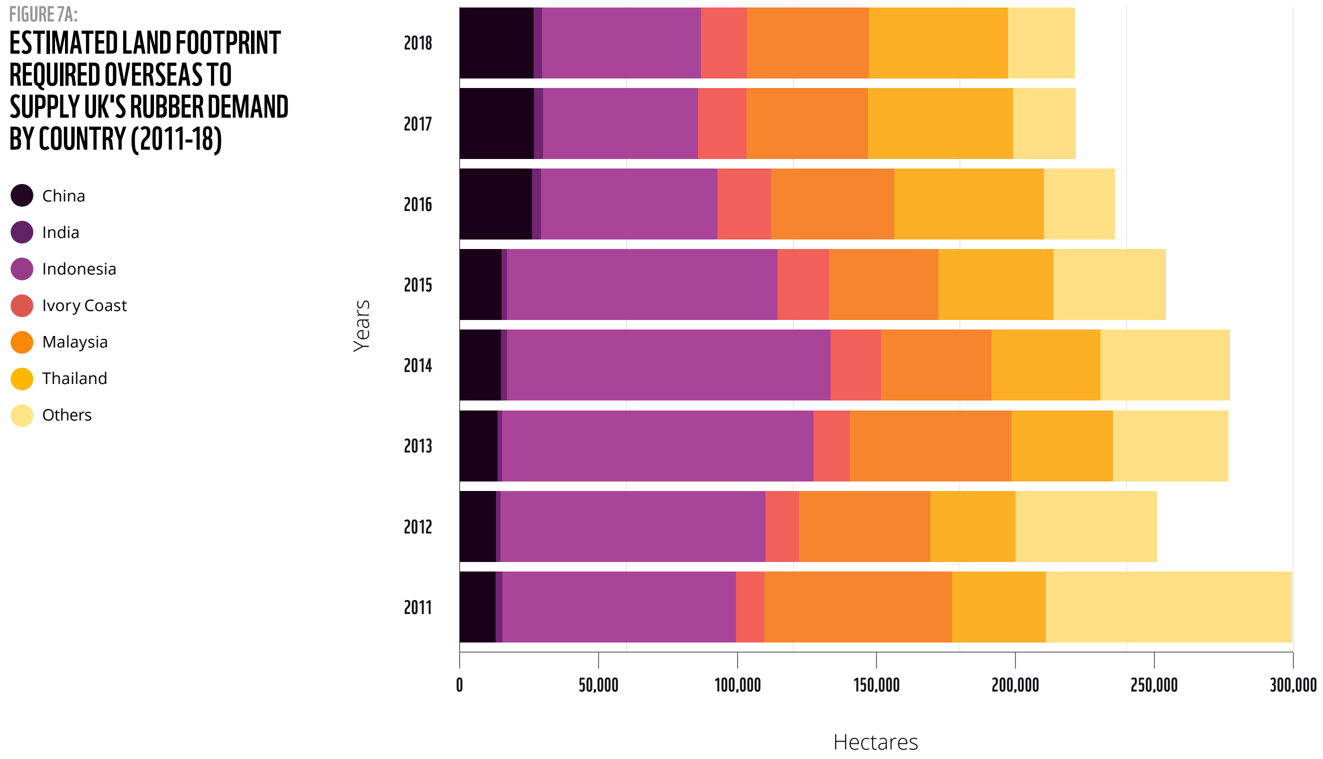
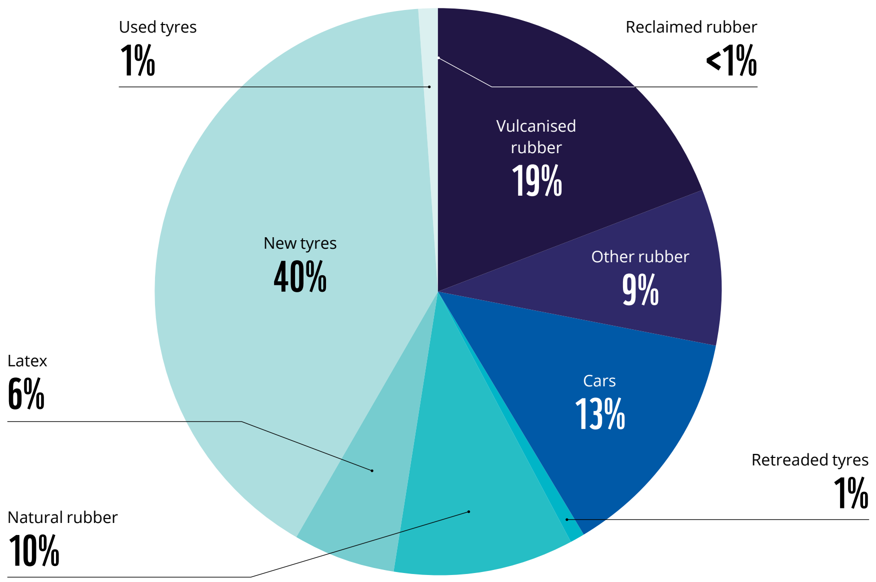


FIGURE 7B:
ESTIMATED PROPORTION OF RUBBER IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)



STEERING THE RUBBER INDUSTRY TOWARDS SUSTAINABILITY

In recent years, the production of natural rubber has come increasingly under scrutiny, as governments and businesses alike begin to recognise both the need for and benefits of transitioning towards a sustainable rubber industry. For example, in 2016, Michelin announced a 'zero net deforestation policy' that excludes deforestation of primary forest, high carbon stock forest and high conservation value forest from its supply chains, which indicates that the sector is perhaps becoming more open to addressing its socio-environmental impacts.

Following Michelin's announcement, several sustainability initiatives have been created in order to help turn the sector's ambition into a reality. For instance, in March 2019 the Global Platform for Sustainable Natural Rubber (GPSNR) was launched: an international, multi-stakeholder, voluntary membership organisation, which has a mission to lead improvements in the socioeconomic and environmental performance of the natural rubber value chain[134]. The Sustainable Natural Rubber Initiative (SNR-i), developed under the framework of the International Rubber Study Group (IRSG), serves as a set of voluntary guidelines and criteria for members that include indicators on productivity, quality, forest sustainability, water management and human/labour rights – 43 of SNR-i's registered international companies have completed the self-declaration stage[135]. Non-sector-specific certification schemes that apply to natural rubber include FSC and organic standards. However, FSC claims just 4% of global rubber production[136], and organic certified rubber is imported in diminutive quantities for specific niche uses (e.g. for use in mattresses).

THERE REMAINS A NEED TO RAISE AWARENESS AND CATALYSE A CREDIBLE APPROACH TO SUSTAINABILITY WITHIN THE SECTOR

Despite growing interest, the general lack of sustainability mechanisms with meaningful market share suggests that there remains a need to raise awareness and catalyse a credible approach to sustainability within the sector.

The tyre industry is key to securing progress on sustainable natural rubber supply chains, as tyres represent approximately 70%[137] of natural rubber use globally. GPSNR is a recent but promising initiative, which has demonstrated much-needed increasing collaboration between tyre companies and other key stakeholders. However, much remains to be done: some member companies do not have their own internal sustainable rubber policies. An effective grievance mechanism to call out companies that violate the principles, codes and policies of GPSNR is yet to be developed, and no companies from the world's largest rubber market, China, currently participate – nor do any UK-headquartered businesses[138,139]. Further collaboration is needed between tyre companies and across other key stakeholder groups, accompanied by bold action by all involved. Efforts to increase the currently very low consumer awareness of the impacts of natural rubber production would also enable more rapid transformation.

Developments are under way on alternative sources of natural rubber[140] that might present lower risks of deforestation and conversion than the Pará rubber tree (*Hevea brasiliensis*), which is grown in commercial plantations almost exclusively in Southeast Asia. Alternatives include guayule (*Parthenium argentatum*), which can be grown in arid regions such as the southwest US[141], and Russian dandelion (*Taraxacum koksaghyz*)[142], which can be grown in moderate climates and degraded soils[143]. Over recent years, several tyre companies have produced tyres made from guayule-derived rubber[144,145,146] and dandelion-derived prototypes[147] have also been tested. However, production processes are more complex and require further research and development to be deployed at larger scales. As research efforts continue, alternative sources of natural rubber may help to reduce natural rubber-related pressure on tropical forests in the future by diversifying origins. Nevertheless, as guayule and Russian dandelion have relatively low yields compared to Pará rubber trees (and therefore require larger areas), further analysis is needed on the risk of conversion of other ecosystems to respond to increasing demand for natural rubber.

BEEF & LEATHER

The world's land footprint for beef & leather (i.e. the grazing area dedicated for cattle globally) encompasses an estimated 1.7 billion hectares[79] – an area nearly four times the size of Western Europe. After years of continuous growth, this footprint has levelled off and even declined in around two-thirds of countries (particularly in North America, Europe and Australia, as well as Brazil and China) between 2000 and 2016[148].

While this might be interpreted as good news, experts warn that emerging producer countries, mainly located in Sub-Saharan Africa, are poised to reverse this trend should demand for cattle products outpace productivity. For instance, one recent study predicted that the global pasture area for cattle could expand by around 73 Mha by 2050, most notably within the Middle East and Africa – a scenario that would ultimately offset all of the global reductions in the area occupied by cattle since 2000[149].

The UK's overseas footprint for beef & leather is equal to about 0.2% of the world's cattle grazing footprint. This has decreased by about 28% since our previous study (Fig. 8a) from 5.4 to 3.8 Mha. This decrease is mostly due to a reduction in leather imports as well as in beef imports from Namibia, which has a large land footprint because of its very extensive pasture system and low productivity (Fig. 8b).

The UK's land footprint in countries with very high and high risk has also decreased from 47% to 35% since 2011-15. Nevertheless, more than a third of the current UK beef & leather land footprint (around 1.4 Mha, or roughly the size of Northern Ireland) was located in high risk countries, such as China, Australia and Brazil. For instance, Australia, which now exhibits the highest deforestation rates amongst developed countries[150], experienced an increase in tree cover loss of around 34% between 2016 and 2018. Such a remarkable increase in deforestation and conversion rates led to a worsened risk score in our current study, from medium to high risk. In Brazil, beef production is one of the main drivers of deforestation and conversion, especially in the Amazon[151].

The land required overseas to supply the UK's demand for beef & leather has decreased from 5.4 Mha to 3.8 Mha since our previous analysis (2011-15) – a 28% decline (Fig. 8a). This decrease is mostly due to a reduction in leather imports, as well as lower beef imports from Namibia, which has a very extensive, low-productivity pasture system and therefore a large land footprint.

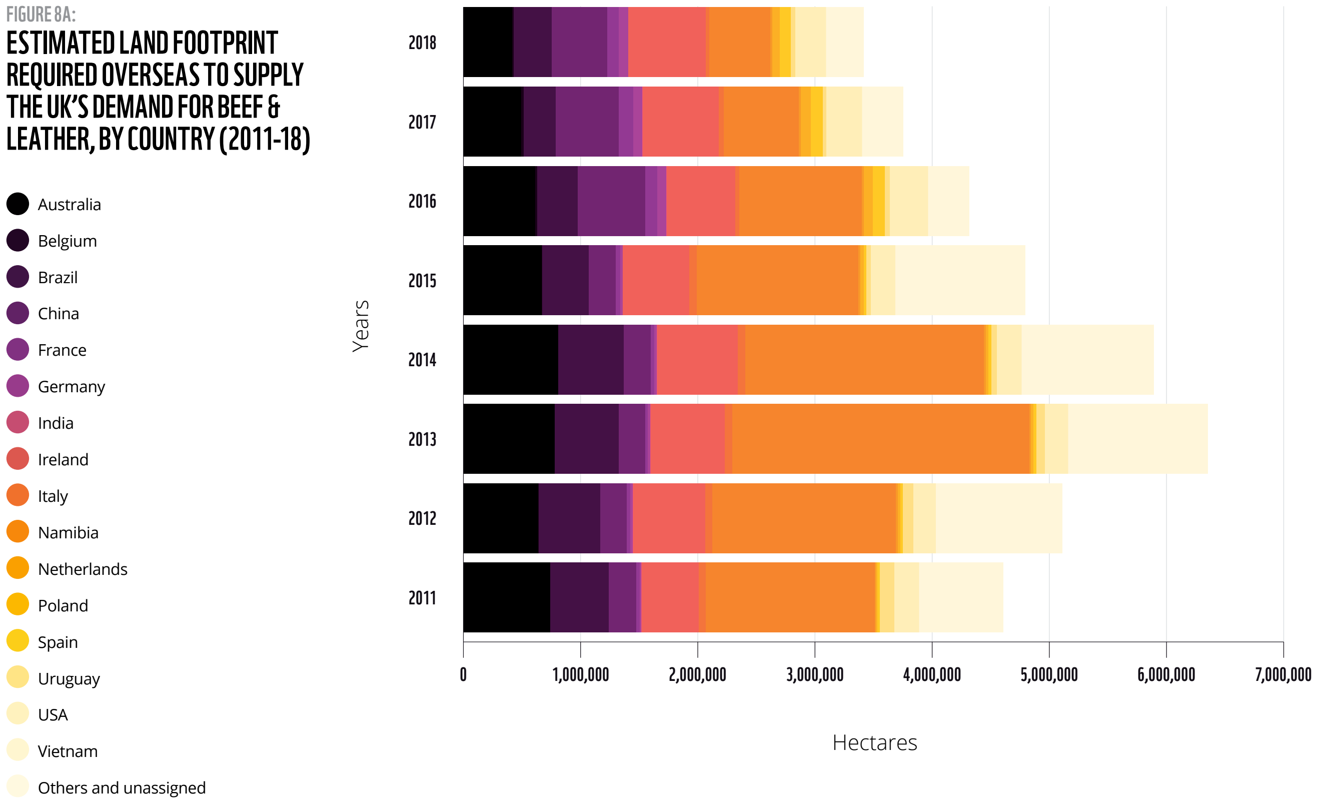
Imports currently supply approximately a quarter of the volume of beef consumed within the UK; the remaining three-quarters is supplied by domestic production (mostly from England).

More than one-third of the total UK overseas land footprint for beef & leather (around 1.4 Mha, or roughly the size of Northern Ireland) was located in risky countries, such as Australia, Brazil and China.

IN BRAZIL, BEEF PRODUCTION IS ONE OF THE MAIN DRIVERS OF DEFORESTATION AND CONVERSION, ESPECIALLY IN THE AMAZON

FIGURE 8A:

ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY THE UK'S DEMAND FOR BEEF & LEATHER, BY COUNTRY (2011-18)



BEEF

To date, China, the US and Vietnam are the main importers of beef globally, while Brazil, Australia and the US are the main exporters[78]. The global demand for beef is expected to slow over the coming decade due to a reduction in animal protein consumption and/or a shift to more affordable types of meat (e.g. chicken)[77]. Nevertheless, production is still expected to increase by around 13% by 2028, mainly in the Global South, with Brazil and Argentina featuring high on the list[77].

Between 2016 and 2018, the UK consumed, on average, 1 million tonnes of carcass weight equivalent (CWE) of beef annually. Imports only supply a quarter of the total beef consumption in the UK, given the large domestic beef industry. England, Northern Ireland and Scotland[152] are the main beef producers within the UK. In terms of imports, between 2016 and 2018, the largest proportion of beef (63%), by weight, came from Ireland, followed by Brazil (8%) and Poland (7%).

Between 2016 and 2018, more than half of the imported beef products were fresh (51%) and frozen meat (22%), see Fig. 8c. Per capita beef consumption in the UK is more than double the world average (7.9kg per year) but still moderate compared to the leading beef-consuming nations, such as the US and Australia where the average person consumes more than 45kg per year[153,154].

63%

OF BEEF IMPORTS CAME FROM IRELAND BETWEEN 2016 AND 2018

FIGURE 8B:

ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY THE UK'S DEMAND FOR BEEF, BY COUNTRY (2011-18)

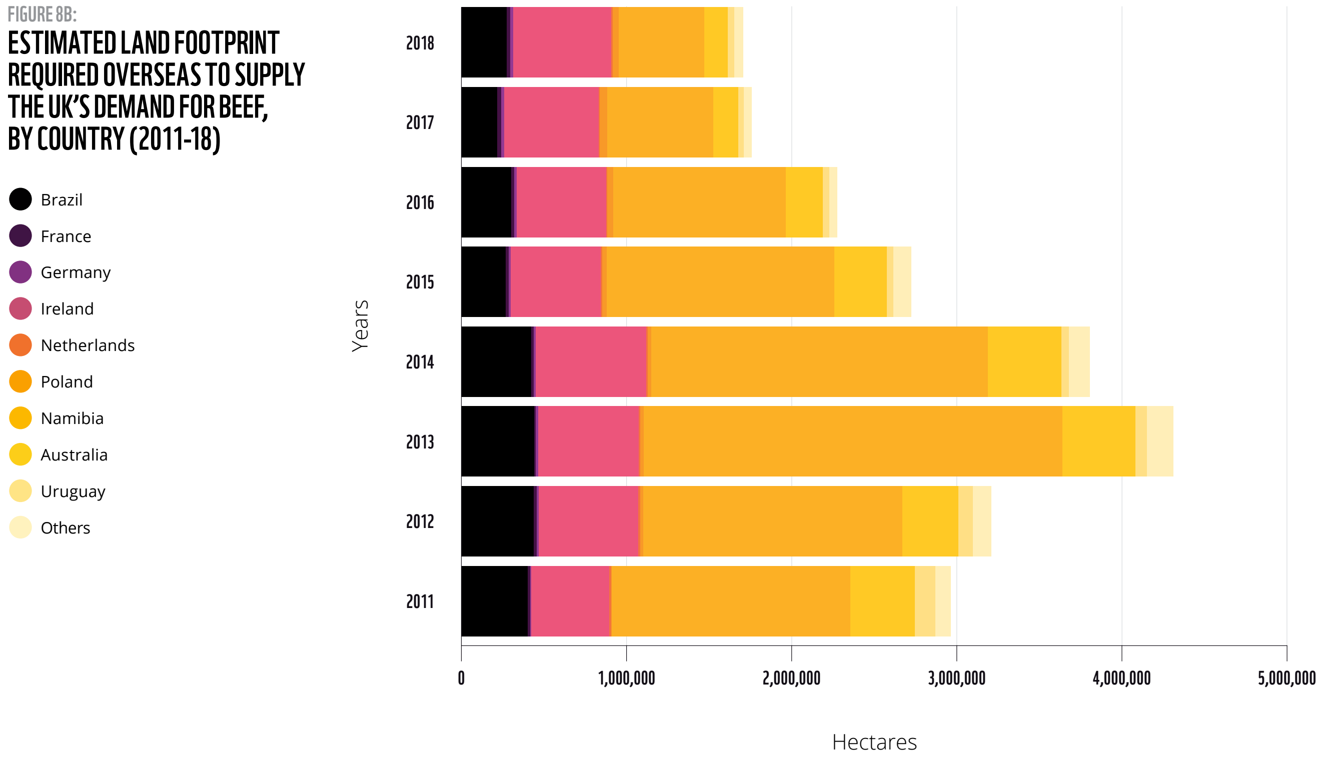
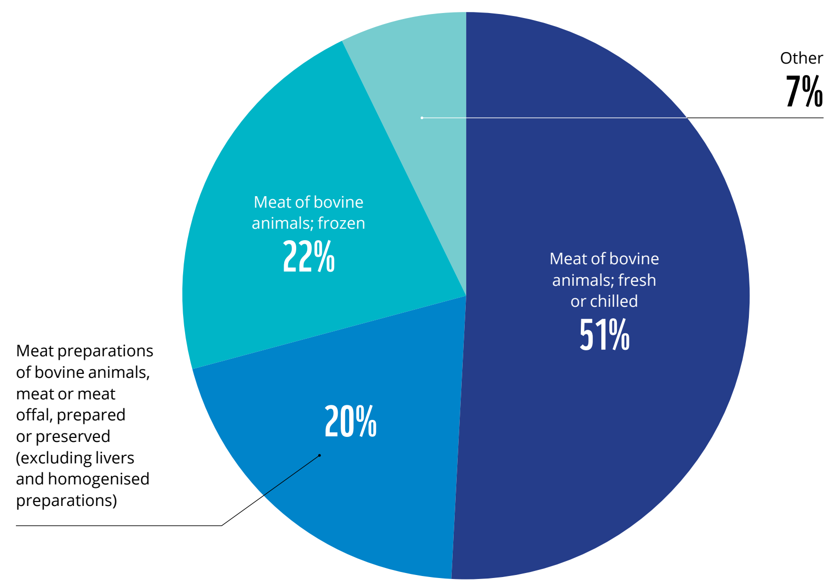


FIGURE 8C:

ESTIMATED PROPORTION OF BEEF IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)



14%

OF LEATHER SUPPLIED TO THE UK CAME FROM GERMANY BETWEEN 2016 AND 2018

LEATHER

Bovine leather is the predominant source of leather, accounting for around 60% of all globally traded leather[78]. This study focuses on bovine leather, as cattle are an important driver of global land-use change compared to other livestock species[155].

The largest global importers of leather are China and Italy, while Brazil and the US are the biggest exporters[156]. About 2.9 million tonnes of unprocessed bovine leather are traded globally each year; however, much less is known about the globally traded volumes of leather contained within manufactured products. Accounting for both unprocessed leather and leather embedded in manufactured products, the UK imported, on average, 173,000 tonnes of leather between 2016 and 2018. In the same period, domestic production was about 167,000 tonnes per year and exports were roughly 138,000 tonnes per year[157]. Therefore, the UK's leather annual consumption between 2016 and 2018 was roughly 202,000 tonnes of hide weight equivalent (HWE) per year.

The main imports of leather were as vehicle seats (34%), raw hides (27%) and footwear (17%) – see Fig. 8e. While vehicle seats are predominantly used in the motor vehicle manufacturing industry, raw hides are used in the manufacture of a wide range of products (e.g. musical instruments, chew toys for pets). The motor vehicle industry in the UK has had a slight decline since 2016, whereas the footwear market has grown[158] and this trend is expected to continue, growing by roughly 10% by 2023[159].

Between 2016 and 2018, the main country supplying leather to the UK was Germany (14% of total imports, by weight) followed by China (8%). The global leather supply chain is highly complex with many source countries and it is hard to track to the producer region. In our analysis, about one-third of total imports to the UK either fell below our cut-off threshold (i.e. <2% of total imports) or was from unknown sources. This highlights the importance of increased transparency and traceability in leather supply chains.

THE MAIN IMPORTS OF LEATHER WERE AS VEHICLE SEATS (34%), RAW HIDES (27%) AND FOOTWEAR (17%)

FIGURE 8D:
ESTIMATED LAND FOOTPRINT REQUIRED OVERSEAS TO SUPPLY THE UK'S DEMAND FOR LEATHER, BY COUNTRY (2011-18)

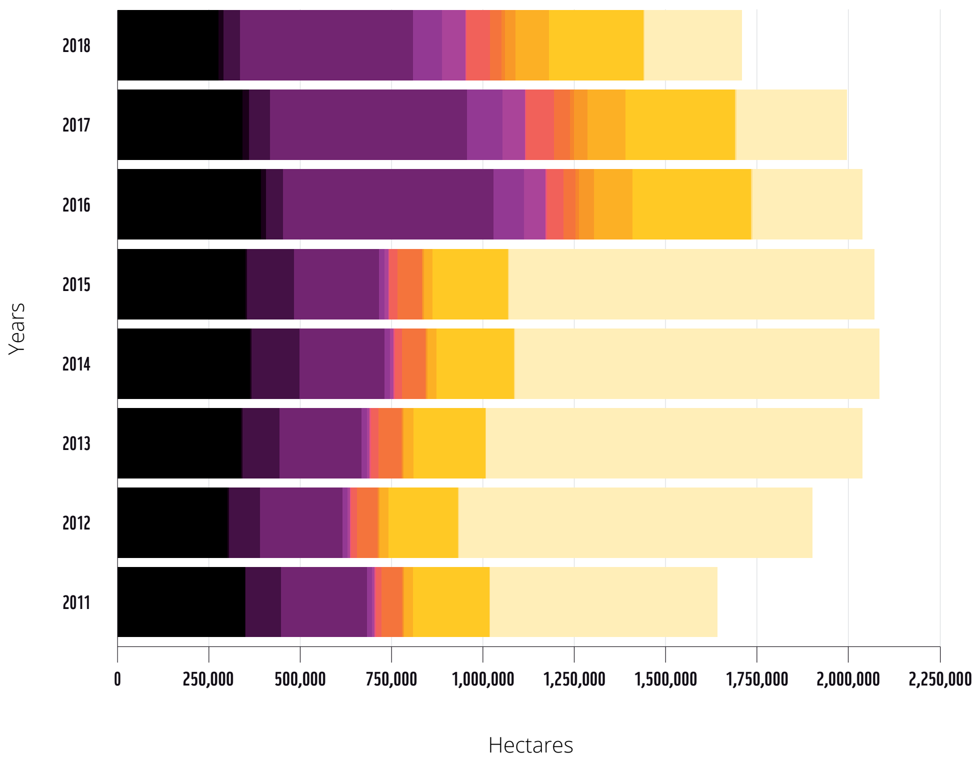
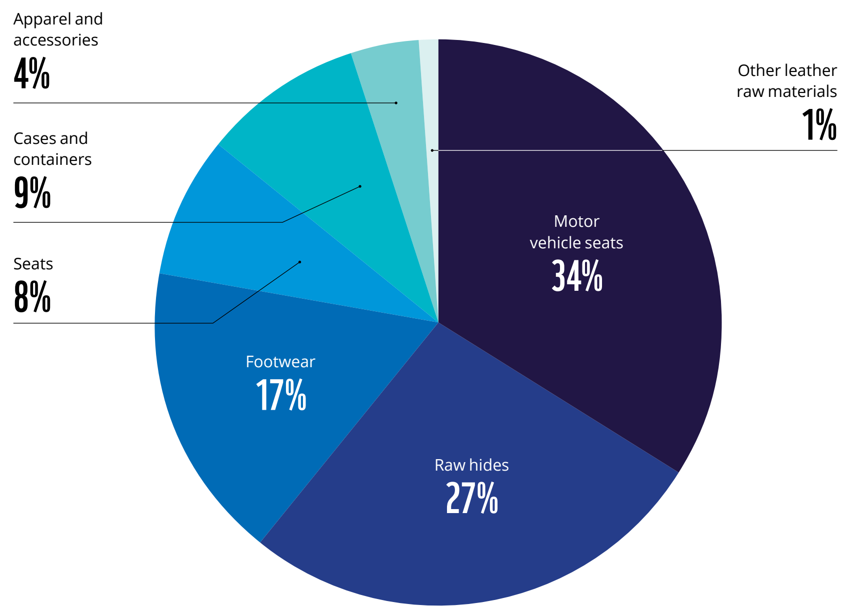
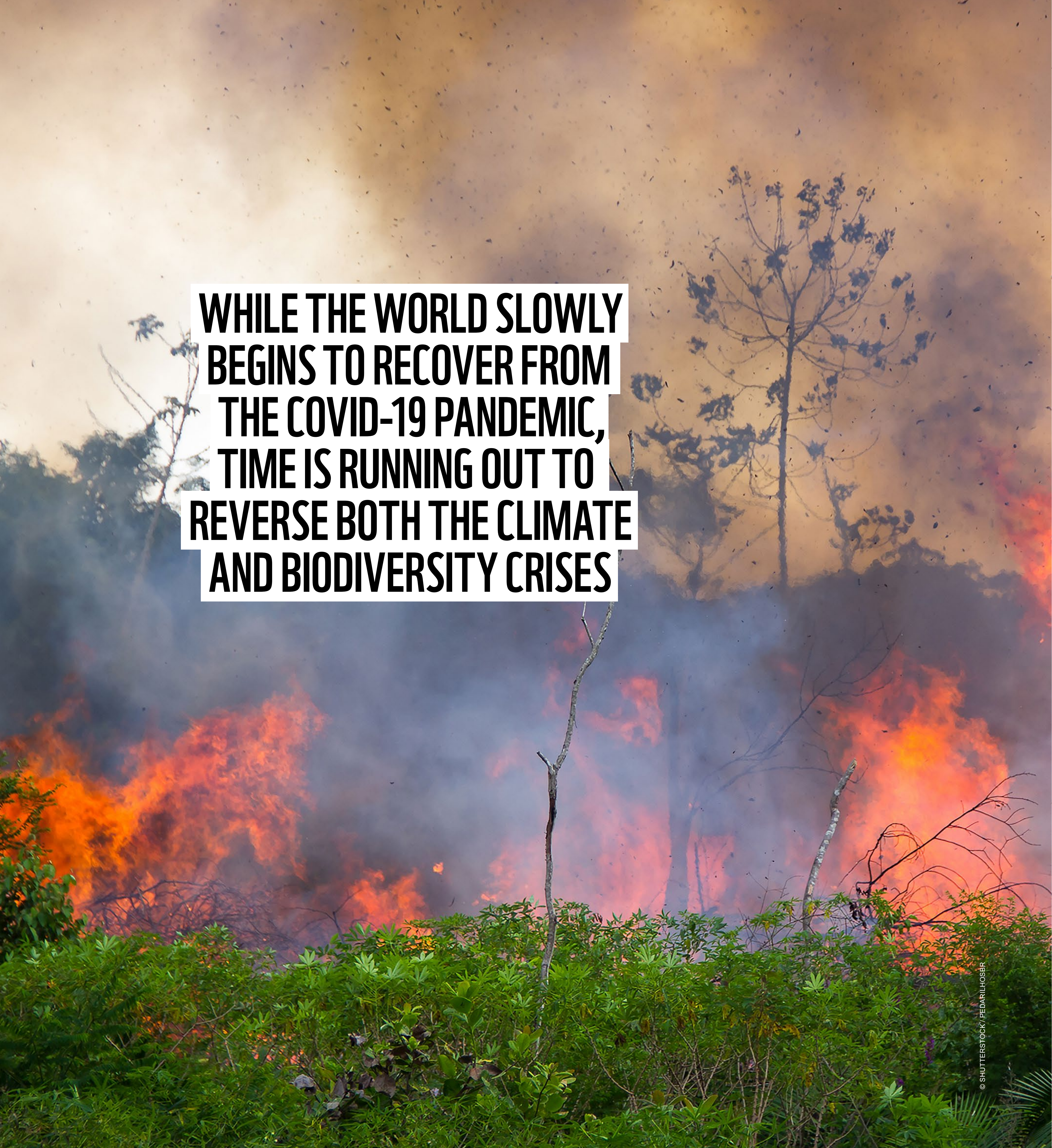


FIGURE 8E:
ESTIMATED PROPORTION OF LEATHER IMPORTED INTO THE UK, BY PRODUCT (AVERAGE 2016-18)





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FINAL CONSIDERATIONS

Our main findings mirror those of our previous report[2] revealing that **the UK requires a large and increasing amount of land overseas to fulfil its demand for only seven agricultural and forest commodities, while there is still a high risk that these supply chains are associated with deforestation, conversion of natural ecosystems and/or human rights abuses.**

It is important to highlight that our analysis did not include data for 2019 and 2020, and therefore, given the large increases in both deforestation and conversion rates recorded over the course of the last 18 months, it is likely that the risks associated with the UK's supply chains are even higher than illustrated here. Moreover, the fact that the majority of imported timber and pulp & paper products is coming from lower risk countries, according to our risk assessment, does not excuse the need to check for unsustainable forest management practices and destruction of forests that may occur in medium and low risk countries, such as the US and Canada. We also recognise that the UK's overseas land footprint extends to many more products and to many other countries than identified in this report. This report also does not address the marine sector where significant impacts are also being felt.

Until now, neither corporate and public policies nor regulation have been able to eradicate deforestation, conversion and human rights abuses from the UK's commodities supply chains. We recognise that over the past 10 years there has been an increasing number of deforestation- and conversion-free commitments made by corporates, but unfortunately, little progress has been observed on the ground[160]. Instead, deforestation and conversion rates have accelerated significantly in producer countries[43] and human rights abuses continue to occur unabated in some places[161].

Businesses need to be key players in leading the transition towards deforestation-/conversion-free and fair supply chains, and should act urgently to implement their commitments. However, they cannot transform global supply chains and production systems alone[152]. It is also time to recognise the fact that voluntary corporate actions cannot be solely relied upon to tackle the problem.

Governments have a pivotal role in accelerating this transformation, such as by setting up minimum required standards for corporate behaviour, transparency, information knowledge and availability of monitoring and verification tools[162,163]. Strengthened regulation and law enforcement are also critical to ensuring faster progress on the ground[164]. Further, international cooperation is critical to address these problems at a global scale. By establishing robust policy and legislative frameworks, as well as by supporting producer countries, governments can enable action to transform supply chains into systems that secure benefits for people as well as climate and nature.

While the world slowly begins to recover from the Covid-19 pandemic, time is running out to reverse both the climate and biodiversity crises. Preserving and restoring nature is crucial to reduce the occurrence of such pandemics in the future. We also know that the effects of recent climate change could help to exacerbate the frequency of zoonoses such as Covid-19. Addressing the climate and biodiversity crises is essential to fulfil our demand for food and fibre, given their impacts on supply chains.

BY ESTABLISHING ROBUST POLICY AND LEGISLATIVE FRAMEWORKS, GOVERNMENTS CAN TRANSFORM SUPPLY CHAINS INTO SYSTEMS THAT SECURE BENEFITS FOR PEOPLE AS WELL AS CLIMATE AND NATURE

We cannot hope to tackle the global climate and biodiversity crises without simultaneously bringing about a halt to the deforestation and conversion embedded within commodity production. Efforts to restore degraded areas and preserve nature in producer landscapes, as well as to create new ways to secure the livelihoods of the local populations, should also be included in future plans towards a wider transformation of commodity production systems.

Given that the UK is a signatory of both the Amsterdam Declarations and the Paris Agreement, has endorsed the NYDF and has committed to meet the UN's SDGs, we urge that drastic measures are taken in order to ensure that these commitments are turned into reality on the ground.

The UK has a golden opportunity to assert leadership in driving the environmental agenda and send a strong signal to the rest of the world. For instance the current Agriculture, Environment and Trade bills being discussed in Westminster as well as new upcoming trade agreements could secure high environmental and social standards over imports, which would help to protect and restore the world's nature, contribute to mitigating climate change, and secure fair and sustainable supply chains. As the co-host of the UNFCCC COP26, the UK government has a unique opportunity to position itself as a global environmental leader, by paving the way towards responsible supply chains through more stringent regulation and policy, and by joining forces with other consuming and producing countries to galvanise a global movement to transform commodity production systems.

BOX 6:

THE ROLE OF NEW TRADE AGREEMENTS TO ACHIEVE RESPONSIBLE SUPPLY CHAINS

International trade is a means, not an end in itself, to achieve better living standards between trading partners, and can play a positive role in enhancing global, equitable and rights-based prosperity. Indeed, as Covid-19 threatens disruptions to supply chains, now more than ever is a time to keep trade flowing and to ensure that benefits accrue to consumer and producer nations alike. Yet trade should not have primacy over, or be conducted in isolation from, climate commitments and environmental responsibilities. Given that trade agreements are legally binding while climate and environmental commitments often lack legal enforceability, environmentally robust trade agreements can help to ensure commitments translate into reality.

At a time when the UK is negotiating new trade agreements with key trading partners, it is particularly important to ensure that these deliver on UK commitments and responsibilities to support the transition to resilient, reliable and sustainable commodity supply chains that benefit people and nature. If there is consistency and alignment across government policies, new trade deals could strengthen efforts to deliver the SDGs and tackle climate change and the biodiversity crisis.

INTERNATIONAL TRADE CAN PLAY A POSITIVE ROLE IN ENHANCING GLOBAL, EQUITABLE AND RIGHTS-BASED PROSPERITY

As a member of the EU, the UK was subject to 38 free trade agreements (FTAs)[xxvii], allowing it access to favourable terms of trade with 71 countries[165]. The UK government is attempting to roll over 34 of these FTAs post-Brexit, with varying levels of success[166]. These updated FTAs may involve lowered or eliminated import duties and looser regulatory requirements, while new FTAs may additionally alter patterns of trade. UK trade post-Brexit could thus pose increased risk of worsening environmental impacts and shift the frontiers of the UK's footprint into other areas of important biodiversity.

xxvii FTAs are multinational agreements which allow cooperating parties to trade under lower levels of regulation compared to the basic World Trade Organization (WTO) agreements.

On the other hand, the development of new trade deals could instead provide a chance to promote an ambitious UK environmental policy, for example through strong environmental clauses in new FTAs (e.g. to ban deforestation, land conversion and other impacts on natural ecosystems) and the introduction of a due diligence obligation for businesses. The UK accounts for slightly less than 1% of the global population and around 2% of global GDP, yet its share of the global land footprint is sizeable – especially for cocoa (9%), palm oil (5%) and pulp & paper (5%). New trade deals therefore offer a valuable opportunity to drive progress in implementing high social and environmental standards across producer countries. However, given that the UK government explicitly removed commitments to non-regression in levels of environmental protection from the Withdrawal Agreement[167], and the fact that the UK is unlikely to be in a strong bargaining position post-Brexit, there is a real risk of 'more trade' being chosen over higher environmental and labour standards.

THE UK ACCOUNTS FOR SLIGHTLY LESS THAN 1% OF THE GLOBAL POPULATION AND AROUND 2% OF GLOBAL GDP, YET ITS SHARE OF THE GLOBAL LAND FOOTPRINT IS SIZEABLE – ESPECIALLY FOR COCOA (9%), PALM OIL (5%) AND PULP & PAPER (5%)

The UK government is currently working to develop new FTAs, especially with countries that it sees as potential providers of political, economic and strategic benefits, and with which it can reach an agreement relatively quickly[166]. For instance, a speedily concluded trade deal with the US may signal the UK's intent to reorient trade flows and to be open for business, yet if this is at the expense of lowered or ignored environmental standards (e.g. unsustainable intensive agricultural practices such as high use of fertilisers and pesticides), it will have potentially far-reaching and long-lasting consequences. Indeed, it is here that serious risk lies: rushing into new FTAs without implementing strong environmental safeguards could worsen the UK's overseas footprint, especially if these agreements are with countries which already face high environmental and social risks from commodity production.

For instance, Brazil is amongst possible priority countries for new UK FTAs, and it has shown a keen desire to negotiate a UK-Mercosur trade deal[168]. This interest is likely fuelled in part by disruptions to the new EU-Mercosur FTA in the wake of a sharp increase in Amazon fires in 2019 – largely due to forest clearance for agriculture – with several EU member states announcing that they would not ratify the agreement if the fires were not addressed[169]. Around the same time, an Argentinian study was released suggesting that a UK-Mercosur FTA could be settled relatively quickly and could triple meat exports and double agro-industrial exports from Mercosur countries to the UK[170]. Brazil is already classified as a high risk country according to our analysis, and a Mercosur-UK FTA would likely only increase the risk given that it is unlikely that Mercosur would accept a deal that imposes strong environmental regulations.

Other 'risky' countries have expressed interest in securing favourable deals with the UK. Concerningly, the prime minister of Malaysia announced his country's interest, but stated that an agreement could only be met if the UK relaxed the restrictions on palm oil imports imposed by the EU[171].

The UK's trade policy must not be negotiated in isolation but should be part of a coherent whole-of-government approach so that all environmental, energy, development, diplomatic, security and trade policies do not result in increased poverty and social inequality, further loss of carbon-rich, biodiversity-rich ecosystems overseas, wider environmental impacts on nature (e.g. pollution, soil erosion) or exacerbated climate change.

SOY FROM MATO GROSSO

KEY FINDINGS

- Concerns over continued destruction and loss of biodiversity in Mato Grosso remain high: Mato Grosso has the second highest rate of deforestation and land conversion of the major soy exporting states in Brazil, having lost over 2 Mha of tree cover between 2016 and 2018 — equal to an area roughly the size of Wales.
- Around half of all soy imported directly into the UK from Brazil comes from Mato Grosso – on average 298,000 tonnes per year between 2015 and 2017. To produce such a volume, about 93,000 hectares of soy plantations are needed – equivalent to more than half the size of Greater London.
- Cargill is the main trader supplying the UK market with soy from Mato Grosso, responsible for 87% of the total soy volume imported from the state into the UK market between 2015 and 2017.

MATO GROSSO: A BIODIVERSITY HOTSPOT UNDER THREAT

Mato Grosso is located in the centre-west of Brazil and encompasses three important biomes: the Amazon, the Cerrado and the Pantanal. Of its total land area, 53% is located within the Amazon biome, 40% in the Cerrado and 7% in the Pantanal[172]. Due to such a unique location, Mato Grosso holds high levels of biodiversity with a mix of ecosystem types ranging from forests, through woody savannahs and wetlands[173]. Mato Grosso is also located right in the middle of what is known as the Brazilian deforestation arc[174] – a region that has historically experienced high deforestation rates and that is marked by land conflicts driven by agriculture and logging among other drivers. Thus, commodity production in this region has usually resulted in impacts on natural ecosystems.

BOX 7:
THE AMAZON AND CERRADO BIOMES

The Amazon forest is renowned for its exuberance and biodiversity. It holds around one in 10 known species on Earth and provides valuable ecosystem services[175] including climate change mitigation and holding one-fifth of the world's flowing fresh water. It is also home to thousands of indigenous peoples. Deforestation rates in the Amazon have been ramping up, after a short period of decline due to strong efforts from markets and the NGO community (e.g. Soy Moratorium, law enforcement, conservation initiatives, etc.)[176]. The fires seen in 2019 and the massive destruction they have caused were visual demonstrations of the emergency this ecosystem is experiencing.

The Cerrado, much less known than the Amazon, is a complex of grasslands, savannahs and forests, important for its high biodiversity and high endemism[174], its role in regulating regional climate[177] and providing other valuable ecosystem services[178]. The Cerrado contains about 5% of the world's biodiversity, including 12,070 plant species, 856 species of birds and 466 species of reptiles and amphibians – roughly a third of all species found there are endemic, which means they can only be found in this region[179]. Examples of endemic species are the giant armadillo (*Priodontes maximus*), the northern tiger cat (*Leopardus tigrinus*), and the maned wolf (*Chrysocyon brachyurus*). Unfortunately, only about 8% of the Cerrado is protected[180] in reserves and conservation units.

As in the Amazon, the destruction of the Cerrado has impacted wildlife, the provision of ecosystem services, and the livelihoods of people that depend on this ecosystem directly. The Cerrado has experienced some of the highest rates of deforestation and conversion within the past decade. Once spanning over 200 Mha – an area bigger than the UK, France and Germany combined – it has lost more than 50% of its original native vegetation due to the expansion of large-scale commercial agriculture[181].

Soy expansion has increased dramatically in the region, partly driven by the success of the Amazon Soy Moratorium. Since 2006, the Moratorium has successfully reduced deforestation due to soy production in the Amazon, but at the expense of soy-driven land conversion in the Cerrado. In particular, a large expansion of soy plantations took place in Mato Grosso, with a ~60% increase in cropland area between 2006 and 2017[182]. It is important that future policies to stop deforestation and land conversion in Brazil take into account the wider landscape context to avoid potential impacts being shifted from one biome to another, and to ensure mutual benefits are secured to all critical biomes.

2 MHA

OF TREE COVER LOST IN MATO GROSSO BETWEEN 2016 AND 2018

THE CERRADO CONTAINS ABOUT 5% OF THE WORLD'S BIODIVERSITY, INCLUDING OVER 12,000 PLANT SPECIES, MORE THAN 850 SPECIES OF BIRDS AND OVER 450 SPECIES OF REPTILES AND AMPHIBIANS

The IUCN currently categorises 24 of the flora and fauna species found within Mato Grosso as threatened, including one plant which is Critically Endangered, one plant whose survival is conservation dependent, and a further 22 species which are either Endangered or Vulnerable (see Annex A for full list of species and details). Endangered animals include the black-faced black spider monkey (*Ateles chamek*) (Fig. 9) and white-cheeked spider monkey (*Ateles marginatus*). Vulnerable animals include the giant anteater (*Myrmecophaga tridactyla*) (Fig.9) and giant armadillo (Priodontes maximus), while Vulnerable plants include the Brazil nut (*Bertholletia excelsa*) and big-leaf mahogany (*Swietenia macrophylla*).

FIGURE 9:
(LEFT) BLACK-FACED BLACK SPIDER MONKEY (ATELES CHAMEK), LISTED AS ENDANGERED IN MATO GROSSO BY THE IUCN. (RIGHT) GIANT ANTEATER (MYRMECOPHAGA TRIDACTYLA), LISTED AS VULNERABLE IN MATO GROSSO BY THE IUCN.

FIGURE 10A:
TOTAL TREE COVER LOSS (HECTARES) WITHIN THE MAJOR BRAZILIAN SOY-EXPORTING STATES, BY STATE BETWEEN 2011 AND 2018

Source: Global Forest Watch

- Acre
- Bahia
- Goiás
- Maranhão
- Mato Grosso
- Mato Grosso do Sul
- Minas Gerais
- Pará
- Paraná
- Piauí
- Rio Grande do Sul
- Rondônia
- Santa Catarina
- São Paulo
- Tocantins

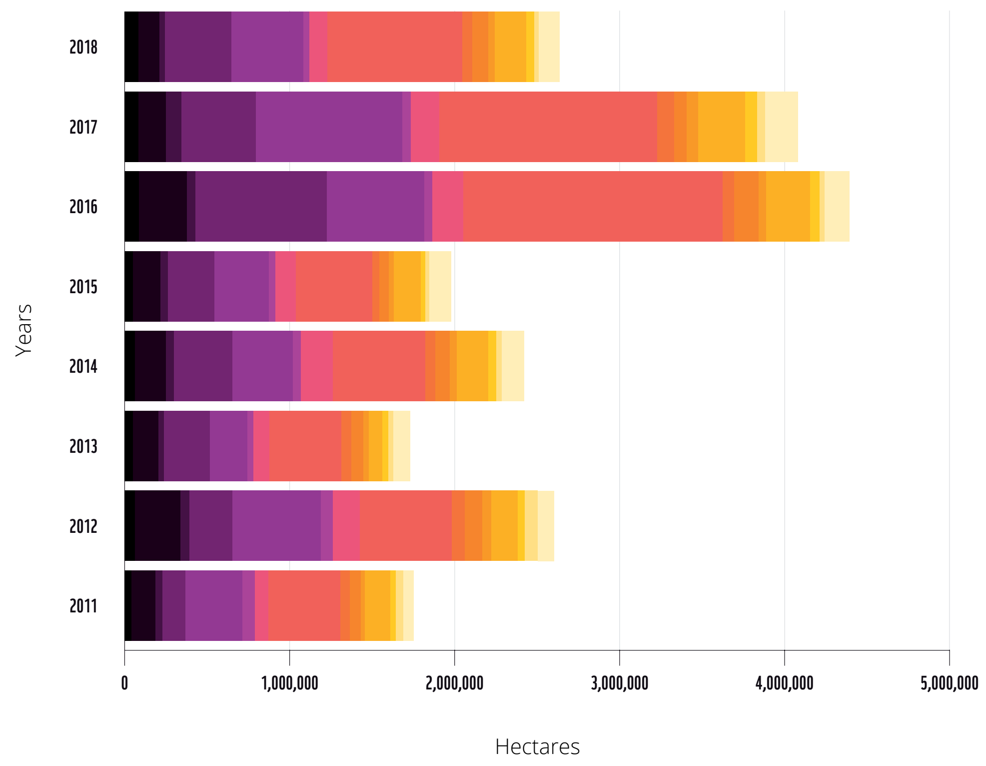
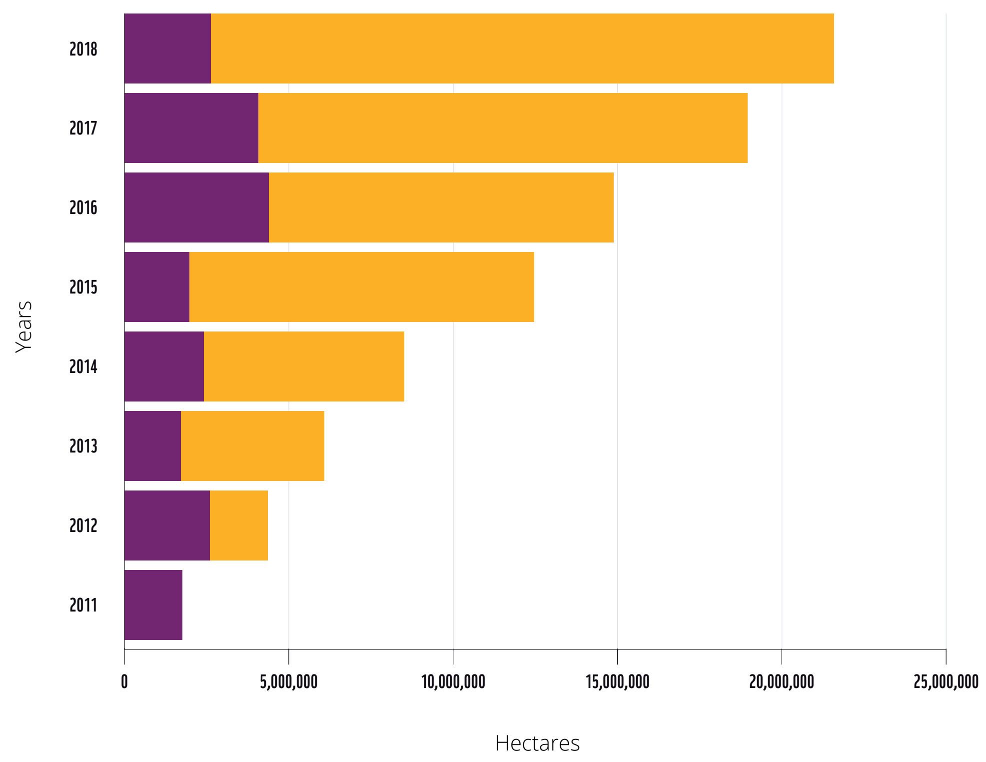


FIGURE 10B:
TOTAL AND CUMULATIVE TREE COVER LOSS (HECTARES) WITHIN THE MAJOR BRAZILIAN SOY-EXPORTING STATES, BETWEEN 2011 AND 2018

Source: Global Forest Watch

- Total tree cover loss
- Cumulative tree cover loss



Direct land conversion due to soy has reduced in Mato Grosso lately, compared with the rates in the early 2000s[183]. Nevertheless, tree loss is far from low. Between 2016 and 2018, Mato Grosso lost over 2 Mha of tree cover. Deforestation and conversion rates in the state are the second highest of the major soy-producing Brazilian states, second only to Pará (Figs. 10a and b). Such deforestation rates are accelerating: in 2019 these rates increased by 19% in Mato Grosso's Amazon parts. Soy still plays a key role in driving such destruction, but indirect soy-driven land conversion – soy fields replacing cattle pastures and other croplands which leads to natural forests and other natural ecosystems being converted to pasture – is now a more common pattern in Mato Grosso than in the early 2000s[184].

SOY PRODUCTION AND TRADE IN MATO GROSSO

China is the main direct importer of soy from Mato Grosso: it imported on average 10.6 million tonnes per year for 2015-2017[94]. Other key importers are the Netherlands, Thailand, Indonesia and Spain (importing between 1 million and 1.7 million tonnes annually). A significant proportion of soy from Mato Grosso is also traded domestically – up to 6.7 million tonnes a year on average in the same period.

The UK is the 12th largest direct importer of soy from Mato Grosso globally. Amongst all Brazilian soy producer states, Mato Grosso is by far the largest exporter of soy to the UK (Fig. 11a). Between 2015 and 2017, an average of 298,000 tonnes of soy were imported per year[xxviii] from the state to the UK – a total of 893,000 tonnes in three years. The amount of soy imported into the UK from Mato Grosso almost doubled from 2015 to 2016 but decreased slightly from 2016 to 2017 (Fig. 11b). Meanwhile, soy imports more than tripled from other Brazilian states, such as Bahia, Pará and Rondônia (Fig. 11b).

FIGURE 11A:
SOY VOLUMES AND PERCENTAGE OF TOTAL SOY EXPORTS TO THE UK IN 2017, BY STATE

Source: TRASE.

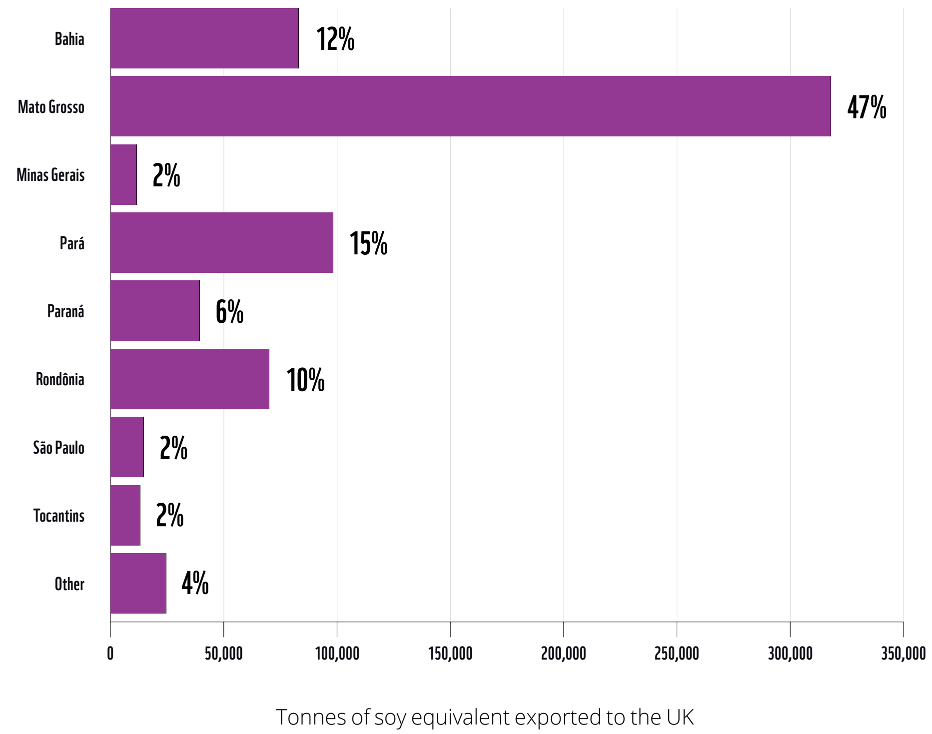
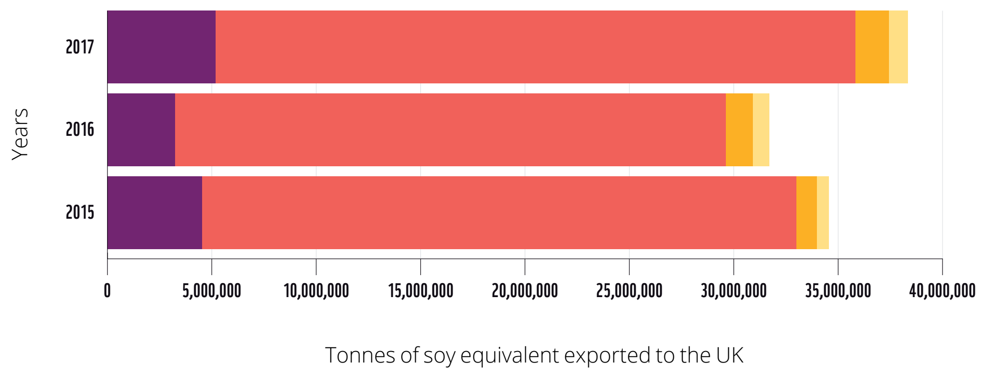


FIGURE 11B:
TONNES OF SOY EQUIVALENT EXPORTED TO THE UK BY THE TOP FOUR SOY PRODUCING BRAZILIAN STATES THAT EXPORTED SOY DIRECTLY TO THE UK (2015-2017)

Source: TRASE.



MAIN SOY PRODUCERS WITHIN MATO GROSSO

Soy production occurs across the state of Mato Grosso. The top soy exporting municipality for the UK market is Sapezal, on the western side of Mato Grosso close to the Bolivian border, with on average over 44,000 tonnes per year. Other municipalities exporting soy directly to the UK are Porto dos Gaúchos, Ipiranga do Norte and Sinop (between 5,900 and 7,900 tonnes each; see Annex B for further details).

Between 2015 and 2017, soy plantations for direct UK imports occupied on average 81,000 hectares each year in Mato Grosso[94]. This is a significant underestimate, as it does not include the UK imports from 'unknown' municipalities (i.e. those for which trade could not be assessed/assigned) which is on average 15% of the total soy imported to the UK. Thus, a better estimate might be about 93,000 hectares – an area equivalent to more than half the size of Greater London.

In general, in the largest producing municipalities exporting to the UK, tree loss between 2015 and 2017 was not correlated with the volumes traded in the same period. This is probably because these municipalities already have well-established plantations and their natural vegetation was converted years ago. For example, in an analysis of Sapezal, the largest exporter to the UK, the bulk of land conversion to cropland happened between 2001 and 2013, resulting in a 10% reduction in the municipality's tree cover, or the conversion of 84,000 hectares[185]. The dynamics of deforestation and land conversion are complex and may change over time, alternating between direct conversion of vegetation to cropland and replacement of a crop by another crop. In Mato Grosso specifically, soy plantations have been major direct drivers of deforestation in the past and then shifted to replace cattle pastures, indirectly driving pasture expansion over forests to the north in the Amazon frontier[186], or more recently, over the native Cerrado vegetation and other previously deforested land[184].

Despite this, between 2015 and 2017, about 385 hectares of natural vegetation in Mato Grosso were cleared to supply the UK with soy[94]. As this estimate excludes soy that is not assigned to any specific municipality and any indirect flow through intermediate countries, a more likely estimate is that the area of tree loss from deforestation and conversion due to soy production to supply the UK's demand was at least 442 hectares, for the period between 2015 and 2017 – roughly the size of 276 cricket fields. This land conversion is likely to have resulted in the emissions of at least 85,000 tonnes of CO_2[xxix].

298,000

TONNES OF SOY IMPORTED PER YEAR FROM MATO GROSSO TO THE UK

xxviii This excludes indirect imports, for example via Rotterdam in the Netherlands, and embedded soy imports, for example in pork or chicken products.

xxix Note that this does not account for the area and CO_2 emissions from conversion of natural grasslands, which may be much higher in Mato Grosso than deforestation.

SOY INFRASTRUCTURE

Infrastructure for handling and processing soybean represents a major investment for companies. Therefore, such facilities are a good indication of the long-term commitment of individual traders to a specific region. For instance, Mato Grosso has received significant infrastructure investment in order to keep pace with its increasingly large soy production industry, which now boasts 384 storage facilities, 13 crushing facilities and three refineries[xxx] (Fig. 12).

These facilities are predominantly located along the borders between the Cerrado and Amazon biomes, as well as in the southern reaches of the state. Alarmingly, a large number are located close to several protected areas and indigenous lands. Of particular concern is the ongoing development of the BR-163 highway – which serves as a vital artery between the soy plantations of Mato Grosso and the river port of Miritituba, located within the neighbouring state of Pará – and the surging deforestation along its transect[189]. If we continue with business as usual, projections warn that this area will likely suffer from intensified burning and deforestation events over the next 30 years[190].

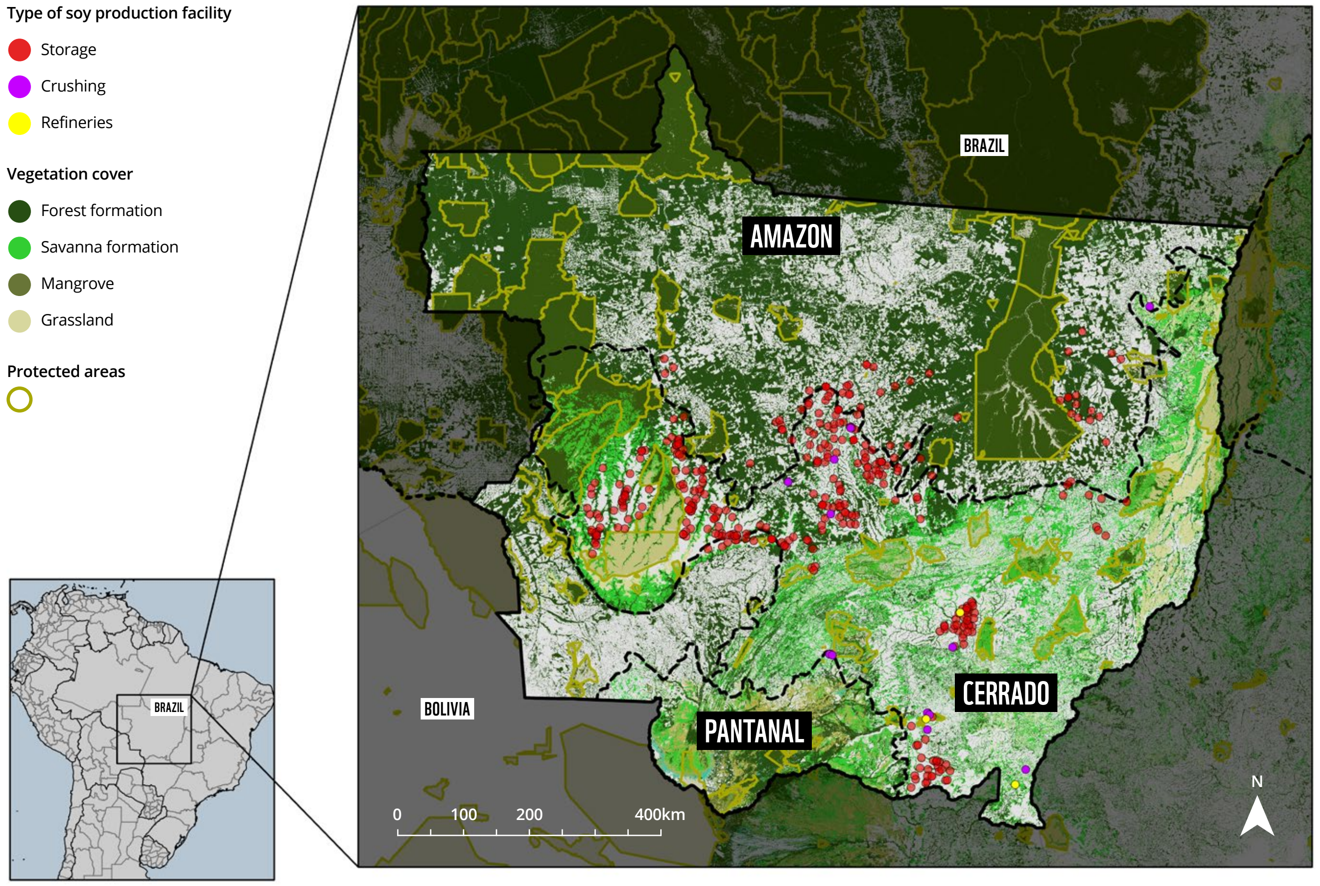


FIGURE 12:
MAP OF MATO GROSSO DETAILING SOY FACILITIES ACTIVE IN 2016[xxxi] AND 2017, VEGETATION COVER IN 2017[187], AND PROTECTED AREAS[188]

Nearly all the storage facilities are owned by individual Brazilian companies. Crushing facilities are owned by a mixture of Brazilian companies and international traders, including Bunge with two facilities and Cargill, Archer Daniels Midland (ADM) and Amaggi with one facility each. The three refineries are owned by some of the largest exporters to the UK, with Cargill and Louis Dreyfus Commodities owning one each, and ADM and Bunge both listed as owners of the third.

xxx According to TRASE data for 2016 and 2017. www.trase.earth/logistics-map
xxxi TRASE: logistic map of soy facilities.

COMPANIES TRADING SOY FROM MATO GROSSO TO THE UK

Twenty-five companies exported soy out of Mato Grosso to the UK between 2015 and 2017 (see Table 4). Amongst these were large multinational traders, such as Cargill and Bunge, and smaller Brazilian traders, such as Petrovina Sementes and Girassol Agrícola. Nevertheless, Cargill dominates the trade from Mato Grosso to the UK market, exporting almost 645,000 tonnes of soy directly to the UK between 2015 and 2017.

The soy supply chain is complex. For instance, smaller traders usually sell to larger traders after exporting soy from Mato Grosso, but before the soy is finally imported into the UK market – a link in the supply chain which is currently dominated by a small number of large traders. Cargill is by far the largest of these middlemen. In addition to the soy it exported directly, the company purchased another 139,000 tonnes from other traders, before finally importing 783,000 tonnes of soy into the UK between 2015 and 2017[94]. This is equivalent to 87% of the total volume imported to the UK from the state of Mato Grosso in the same period.

In addition to Cargill, seven other large traders completely dominated soy imports to the UK. Amaggi was the second largest importer, followed by Bunge, with both importing similar volumes to those shown in Table 4 (~25,000-26,000 tonnes), showing they did not buy additional soy from smaller traders.

645,000

TONNES OF SOY IMPORTED DIRECTLY TO THE UK FROM MATO GROSSO BY CARGILL BETWEEN 2015 AND 2017

TABLE 4:
COMPANIES WHICH EXPORTED SOY FROM MATO GROSSO TO THE UK (2015-17)
Source: TRASE

Exporting company	Total soy exported to the UK (tonnes)
Cargill	644,641
Usina Conquista do Pontal	43,320
Amaggi	29,035
Cervejaria Petrópolis	27,900
Bunge	26,243
Adami Sá Madeiras	25,070
ADM	21,124
Glencore	19,276
Galvani Indústria, Comércio e Serviços	10,114
Petrovina Sementes	9,908
Louis Dreyfus	9,430
Girassol Agrícola	4,980
Santher Fábrica De Papel Santa Therezinha	4,351
Traders exporting <4,000 tonnes each	17,581
Total	**892,973**

BOX 8:
UK FINANCIAL LINKS TO SOY TRADERS IN THE AMAZON

The UK is a globally important centre of international trade finance, including for soft commodities that may be linked to deforestation and land conversion as well as other associated impacts. The UK's largest banks, including Barclays, HSBC, Standard Chartered, Lloyds and Royal Bank of Scotland, provide a broad range of financial services to large soy traders and processors whose soy supplies may be derived from areas of the Amazon that are politically and socio-economically challenging[191]. For example, between 2013 and 2018, Barclays and HSBC were estimated to provide upward of US$6 billion in loans and underwriting services to soy traders, such as JBS, Louis Dreyfus, ADM, Minerva, Marfrig, Bunge and Cargill. While these traders are key to the processing and trade of the commodity, the complexity of traceability in these supply chains exposes companies to a broad range of risks, several of which have been shown to be financially material.

MITIGATION EFFORTS IN MATO GROSSO

There have been a few initiatives to reduce deforestation and land conversion and achieve sustainable production at the state and municipality levels in Mato Grosso. One of the most prominent examples is the Produce, Conserve and Include (PCI) Strategy[xxxii]. A number of initiatives, driven by NGOs in collaboration with the private sector and local governments, have been set up under the PCI umbrella[192].

The Dutch Sustainable Trade Initiative, IDH, has been an important partner for the Mato Grosso state government to drive sustainable soy and beef production, conservation and restoration, guided by the PCI Strategy. For example, IDH has set up an initiative to promote sustainable soy production and improve access to international markets, bringing together international traders and the European Feed Manufacturers' Federation (FEFAC) and channelling funds to support soy producers[193]. More recently, in the Juruena Valley, local Compact initiatives, supported by IDH and retailers sourcing from the region, have been agreed with goals to increase sustainable production, support and training for smallholders, ensure compliance with environmental law and preserve and restore vegetation[194]. In the municipality of Sorriso – a large soy producer in Mato Grosso – a similar local initiative was announced early in 2020 to improve certification levels among soy producers[195]. IDH, in collaboration with other organisations, is also developing models for verified sourcing areas[196] for sustainable soy and cattle in Mato Grosso, and encouraging their international market uptake[197]. Initiatives such as these are critical to tackle drivers of deforestation and conversion on the ground.

There have been some successes in achieving the PCI Strategy goals, such as increasing production and ensuring smallholders' livelihoods while driving compliance with Brazilian environmental legislation, conservation of key biodiversity areas and restoration of degraded land[198,184]. Large reductions in deforestation and conversion rates had been seen in Mato Grosso by 2016[193] compared to the prior decade, when rates of conversion were extremely high (~400,000 ha to 1.1 Mha per year). Despite this reduction, deforestation and conversion rates continue to be high in the state, and have increased in the most recent years[199,200].

IF WE CONTINUE WITH BUSINESS AS USUAL, PROJECTIONS WARN THAT THIS AREA WILL LIKELY SUFFER FROM INTENSIFIED BURNING AND DEFORESTATION EVENTS OVER THE NEXT 30 YEARS

xxxii The PCI Strategy aims at addressing deforestation and land degradation and achieving sustainable agriculture in the state of Mato Grosso, bringing together supply chain actors, local government and civil society. It mostly focuses on soy and beef production – for both of which Mato Grosso state is the largest producer in Brazil.

FINAL CONSIDERATIONS AND SPECIFIC RECOMMENDATIONS

A comprehensive strategy and implementation plan are needed to start tackling the problem of deforestation and land conversion in Mato Grosso. In addition to bold actions from the private sector, long-term commitment and action from political leaders, markets and financial institutions are needed to ensure lasting success for projects like the PCI. The UK government has an opportunity to influence and support positive actions in collaboration with local and national governments in Brazil.

384

STORAGE FACILITIES, 13 CRUSHING FACILITIES AND 3 REFINERIES IN MATO GROSSO – DEMONSTRATING SIGNIFICANT INFRASTRUCTURE INVESTMENT

AS A STARTING POINT, WE RECOMMEND A SERIES OF SPECIFIC ACTIONS TO INCLUDE WHEN DEVELOPING ACTION PLANS TO TACKLE DEFORESTATION AND LAND CONVERSION IN MATO GROSSO:

- **Catalyse sustainable finance** to support and scale up the PCI strategy and other similar initiatives, in collaboration with local government, private sector and civil society.
- **Invest in remote sensing databases**, providing freely available and up-to-date deforestation and conversion data – although Brazil has well-developed monitoring systems, data is not currently available for the entire Mato Grosso state, as such systems only focus on the Amazon and Cerrado biomes.
- **Provide support to strengthen and enforce the Brazilian Forest Code** – securing high standards in trade that take into account the requirements of the legislation and go beyond when necessary, further support to strengthening governance and clear frameworks for monitoring supply chains.
- **Enable and strengthen policies and regulation to increase transparency** – on the demand side, introduce regulation to drive faster change (e.g. due diligence requirements); on the production side, publish lists of municipalities with the largest deforestation and conversion rates, as well as those leading on sustainable agricultural practices (e.g. Green Municipalities Programme[201] – PMV) and promote farmers registration in the Brazilian National Environmental Registry of Rural Properties – CAR[202].
- **Promote private sector commitment** to long-term support for farmers and market incentives for certified sustainably produced products.
- **Consider the implications of interventions more holistically** – for example, although the Soy Moratorium managed to protect parts of the Amazon within Mato Grosso, it was not as successful in the Cerrado. Similar future interventions should consider other biomes (e.g. the Cerrado, Pantanal and Pampas) in the landscape in order to minimise the risk of further negative impacts.

PALM OIL FROM WEST KALIMANTAN

KEY FINDINGS

- Between 2011 and 2018, West Kalimantan province lost about 2 Mha of tree cover – equal to an area the size of Wales.
- Oil palm plantations are one of the key drivers of deforestation and other environmental and social impacts in this landscape.
- Major traders importing palm oil into the UK market (AAK, ADM, Bunge and Cargill) source from a large number of mills in West Kalimantan, very few (~10%) of which are certified by the RSPO.
- Three UK banks – HSBC, Standard Chartered and Prudential — were identified as lending US$710 million to palm oil client companies in Indonesia. Of this, US$185 million was lent to six companies owning mills in West Kalimantan; only one out of these 12 mills is RSPO certified.
- Greater transparency across supply chains is urgently needed to address the lack of accountability for impacts and risks of supply chain actors (producers, traders, downstream buyers).

OIL PALM EXPANSION: IMPACTS ON ECOSYSTEMS AND BIODIVERSITY

The West Kalimantan (*Kalimantan Barat* in Indonesian) province is located on the island of Borneo (Fig. 15). Borneo is a global biodiversity hotspot whose forests contain many unique species including the Bornean orangutan (*Pongo pygmaeus*), the Bornean pygmy elephant (*Elephas maximus borneensis*) and the sun bear (*Helarctos malayanus*). Conversion of forest habitat to oil palm plantations threatens this biodiversity.

Kalimantan is home to some of the most extensive areas of peat swamp forest in Asia, much of it now degraded or used for oil palm cultivation. Peat swamp forest is a Critically Endangered habitat characterised by deep layers of peat soil and highly acidic water. In addition to their high biodiversity, these types of forests hold large amounts of carbon sequestrated in their soils. When the forests are cleared or burned, the carbon is released to the atmosphere, exacerbating climate change.

The IUCN provides the conservation status of species within the entirety of Kalimantan (not specifically in West Kalimantan). There are 395 species of conservation concern, and of these, 122 are animals and 153 are plants. One species, the Kalimantan mango (*Mangifera casturi*) is considered Extinct in the Wild. Other notable species of conservation concern include the Bornean orangutan (Critically Endangered), the Bornean bay cat (*Catopuma badia*, Endangered), the banteng (*Bos javanicus*, Endangered) (Fig. 13) and several valuable and widely-traded timber species including light red meranti and red meranti (various species of Shorea).

FIGURE 13:
(LEFT) BORNEAN ORANGUTAN (PONGO PYGMAEUS) WITH INFANT AT CAMP LEAKEY IN KALIMANTAN, INDONESIA
(RIGHT) BANTENG (BOS JAVANICUS) IN JAHANJANG, BORNEO, KALIMANTAN

Around two-thirds of the forest area converted to oil palm plantations globally is estimated to be caused by the international trade in palm oil[203,98,204]. In Indonesia, the area of oil palm plantations increased to over 10 Mha between 1990 and 2014[205]. Kalimantan is currently experiencing one of the largest deforestation rates in Southeast Asia[206]. Almost half the oil palm expansion in Indonesia and 90% in Kalimantan has happened at the expense of forests[206,207].

The creation of large-scale plantations has, in some instances, also resulted in local and indigenous peoples losing their customary land, and along with it, part of their traditional livelihoods and cultural reference. This has been particularly acute in Indonesia and has sometimes escalated into conflict and occasionally violence. In West Kalimantan, land rights were the most common cause of conflict between local communities, including indigenous Dayak groups, and plantation companies, being the cause of 53 of 119 (45%) recorded conflicts between 1999 and 2009[208].

BOX 9:
AGRICULTURAL EXPANSION AND FOREST FIRES IN INDONESIA

The use of fire in order to clear forests for agricultural expansion in Kalimantan and Sumatra is a major source of GHG emissions. Burning is particularly severe during the dry seasons associated with El Niño events, and in drained peatlands – a common practice in the region which represents a particular fire hazard. The 2015 fires in Indonesia caused emissions of 1.6 and 1.7 billion tonnes of CO_2e and effectively tripled Indonesia's total GHG emissions for that year. Approximately 17% of fires between 2012 and 2015 in Sumatra and Kalimantan occurred within oil palm concessions. There is some uncertainty in the attribution of fires to oil palm growers, as the methods used do not account for fires that have been started by communities living within or nearby concession boundaries[209].

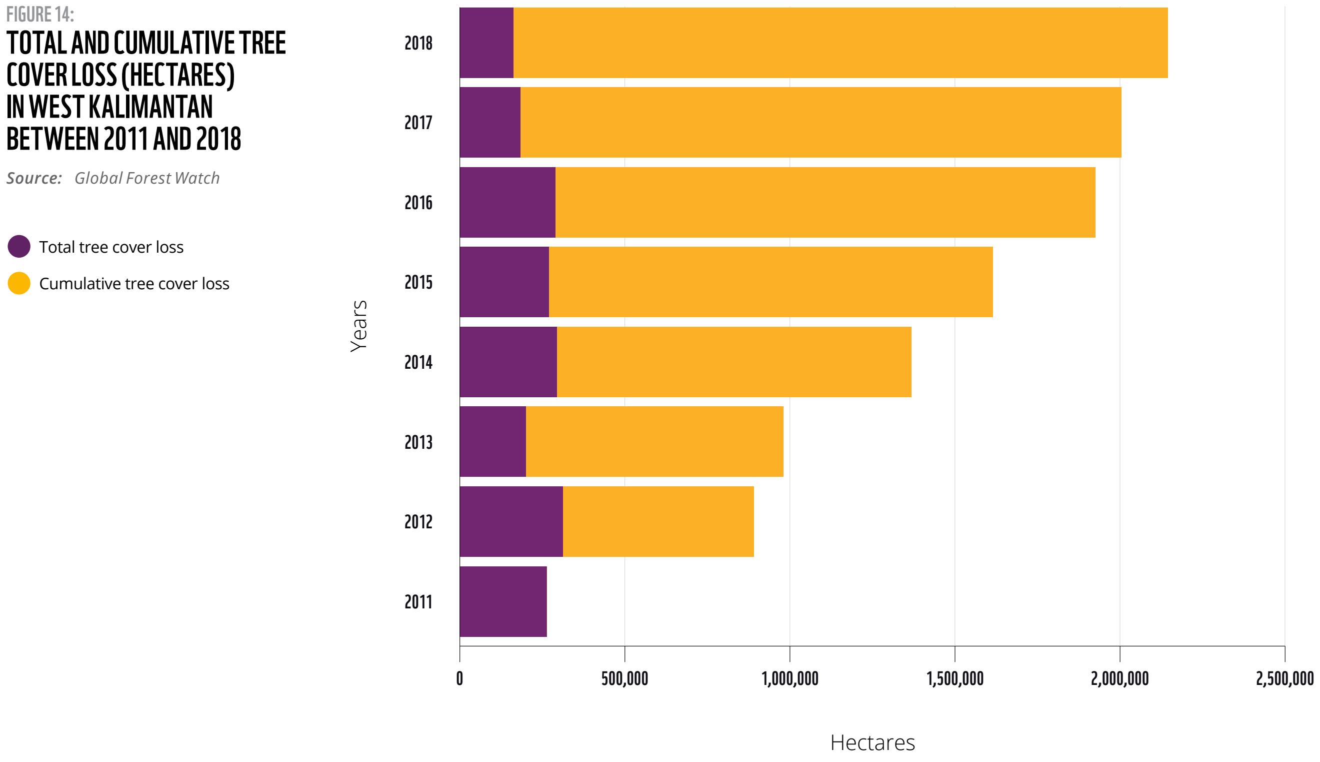
West Kalimantan lost almost 2 Mha of tree cover between 2011 and 2018, at an average rate of nearly 250,000 hectares per year (Fig. 14). This is an area of forest roughly the size of Wales lost in just eight years, and represents a loss of nearly 16% since 2010. Up to 2010, most deforestation was driven by logging activities and conversion to oil palm and timber plantations[210]. More recently, oil palm expansion appears to have become the primary driver, given the extent of new plantations and their overlap with areas showing the highest forest loss[44].

Tree cover loss in West Kalimantan was responsible for around 14% of Indonesia's total tree cover loss (1.9 Mha out of 13.7 Mha) between 2011 and 2018, despite the province representing just 7.8% of Indonesia's total land area. Despite the large rates of deforestation, almost a quarter (23%) of West Kalimantan's forests are still standing[211], of which about 30% is conserved. Promoting sustainable palm oil production and securing these remnant forests, especially in high conservation value (HCV) and high carbon stock (HCS) areas, could help conserve vital biodiversity and meet Indonesia's Nationally Determined Contribution (NDC) under the Paris Agreement.

FIGURE 14:

TOTAL AND CUMULATIVE TREE COVER LOSS (HECTARES) IN WEST KALIMANTAN BETWEEN 2011 AND 2018

Source: Global Forest Watch



1.9 MT

OF PALM OIL WERE PRODUCED IN WEST KALIMANTAN PROVINCE IN 2015

PALM OIL PRODUCTION IN WEST KALIMANTAN AND LINKS TO THE UK MARKET

There is no publicly available up-to-date information on the direct trade volumes of palm oil imported from Indonesia into the UK market. The only available database (TRASE), though useful to provide insights on the links to the UK market, only has data until 2015. We therefore provide an assessment of the sustainability of palm oil mills and their links with the main traders operating in the UK, as well as on financial flows from the UK to Indonesian companies, as a proxy to understand the sustainability of palm oil entering the UK market (see Methods for further details).

PALM OIL PRODUCTION AND CERTIFICATION

Nearly 1.9 million tonnes of palm oil were produced in West Kalimantan province in 2015, with around half being consumed within Indonesia and 9% exported directly to the EU[94].

There are 1,095 registered palm mills in Indonesia[212], including 96 (8.8%) within West Kalimantan (Fig. 15). Of these, only 10 (10.4%) are certified by the RSPO – a proportion lower than the Indonesian average (18.4%). Two of the RSPO certified mills are certified to handle Identity Preserved material (2%) – again lower than the national average – and 8% are certified as RSPO Mass Balance.

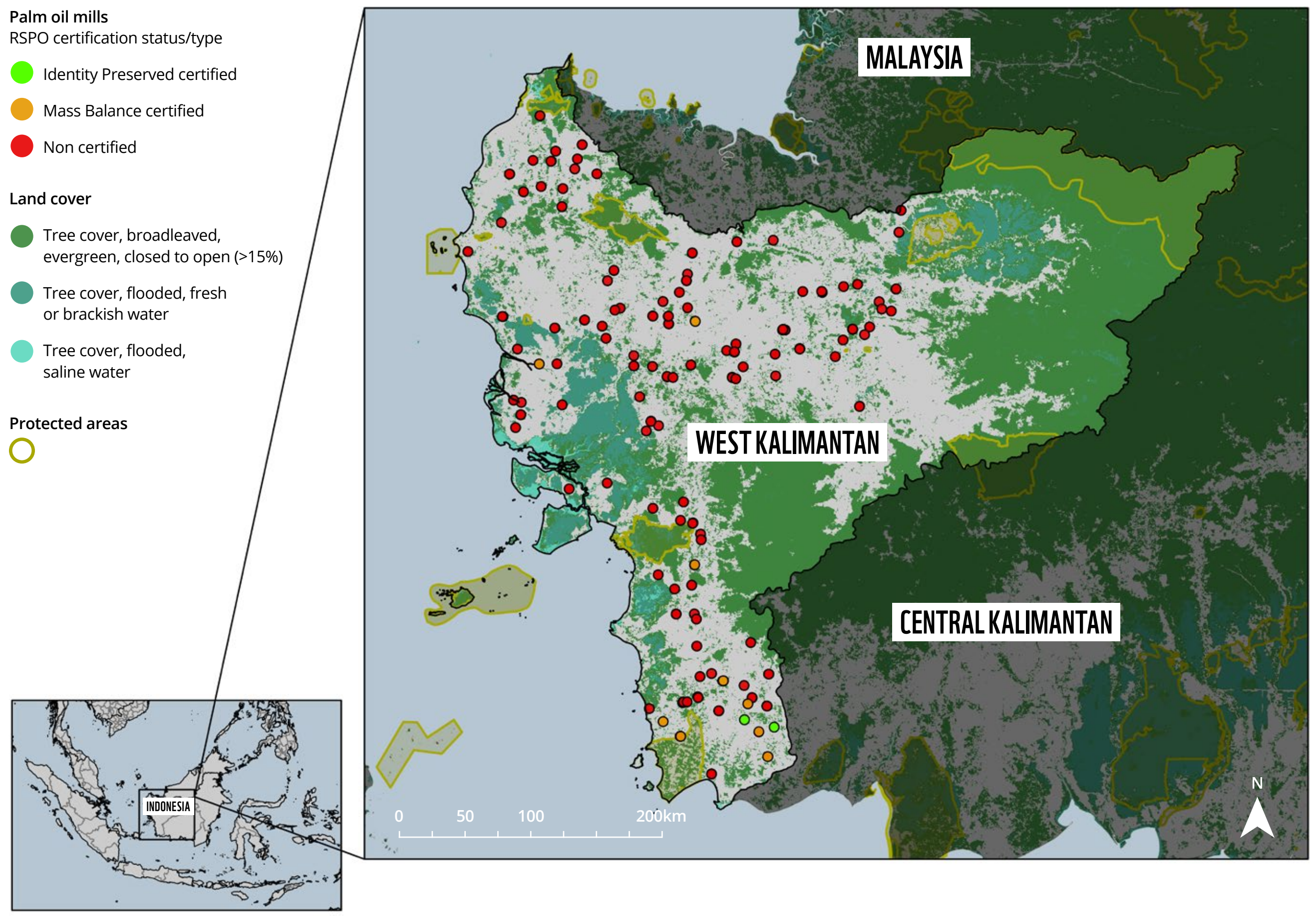


FIGURE 15:

MAP OF WEST KALIMANTAN DETAILING THE LOCATION OF PALM OIL MILLS AND THEIR CERTIFICATION STATUS*, VEGETATION COVER IN 2015, AND PROTECTED AREAS*****

Source: * *Global Forest Watch*
** *European Space Agency[213]*
*** *WDPA[191]*

TRADERS SOURCING PALM OIL FROM WEST KALIMANTAN

Some of the world's biggest traders own palm oil mills in West Kalimantan. The main traders responsible for palm oil imports from Indonesia into the UK market are AAK, ADM, Bunge and Cargill. Wilmar and Sime Darby are also key companies trading palm oil to the UK. For each of these, we provide a summary of their reach in the UK, sourcing links in West Kalimantan and certification status of their sourcing mills.

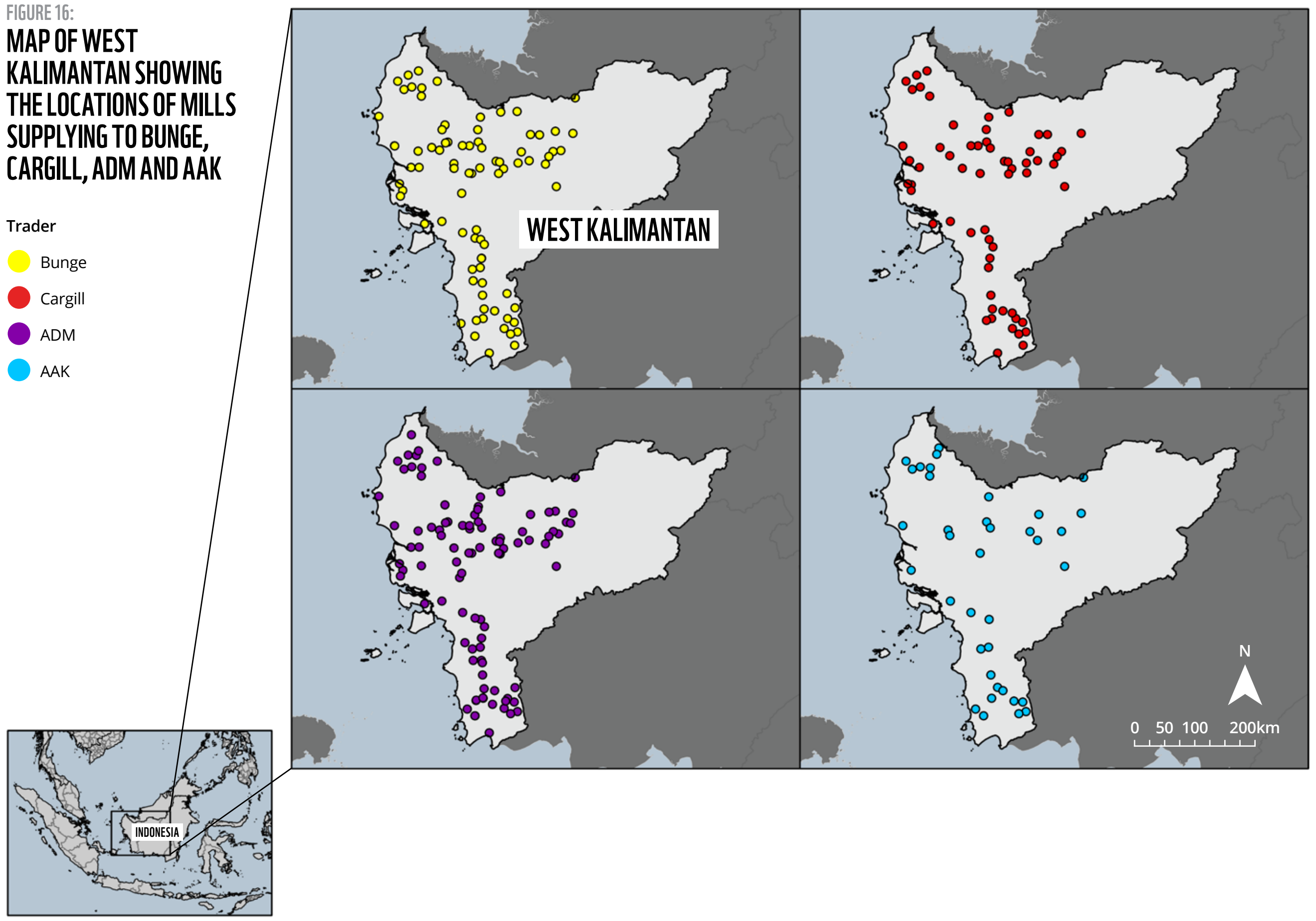
AAK owns one of the four palm oil refineries in the UK, near the port of Hull. AAK sources from 612 mills in Indonesia, 37 of them (6%) in West Kalimantan (Fig. 16). Of the sourcing mills located in West Kalimantan the majority (32 mills, or 86%) are not RSPO certified, while four mills (11%) are certified to handle RSPO Mass Balance material and just one mill (3%) is certified to handle RSPO Identity Preserved material.

86%

OF AAK'S SOURCING MILLS LOCATED IN WEST KALIMANTAN ARE NOT RSPO CERTIFIED

ADM, like AAK, has global palm oil operations, and owns the ADM PURA refinery in Purfleet, London. In total, ADM sources from 1,048 mills in Indonesia[xxxiii]. We identified 102 mills providing palm oil to ADM in West Kalimantan (Fig. 16). Only 11 of the mills on ADM's supplier list (11%) are RSPO certified[xxxiv].

FIGURE 16:
MAP OF WEST KALIMANTAN SHOWING THE LOCATIONS OF MILLS SUPPLYING TO BUNGE, CARGILL, ADM AND AAK



Bunge is a major global trader of palm oil products and has increased its European operations since 2018, when it purchased IOI Loders Croklaan (based in the Netherlands). Bunge sources from 973 mills in Indonesia, with 89 mills (9% of its suppliers) located in West Kalimantan (Fig. 16). Bunge does not provide the certification status of the mills that supply it.

BUNGE IS A MAJOR GLOBAL TRADER OF PALM OIL PRODUCTS AND HAS INCREASED ITS EUROPEAN OPERATIONS SINCE 2018

Cargill sources from 759 mills in Indonesia, 60 of which (8%) are in West Kalimantan. Like Bunge, Cargill does not declare the certification status of these mills (Fig. 16). In its most recent mill list (2019 Q3), Cargill has suspended purchases from three mills from West Kalimantan, which might be linked to allegations of non-compliance with Cargill's sustainability policies[214]. In addition, Cargill is listed as the parent company of six mills in West Kalimantan, two certified to handle RSPO Identity Preserved material, one certified for Mass Balance, and three uncertified.

xxxiii This is a greater number of mills in the province than is listed by Global Forest Watch, however, we could not find any duplicate geolocations amongst the ADM list, suggesting that this figure may be correct.

xxxiv No details provided on the type of certification.

US$710M

LENT BY THREE UK BANKS TO PALM OIL CLIENT COMPANIES IN INDONESIA

Olenex, a joint venture between ADM and Wilmar, owns and operates oil facilities and refineries in Europe, and manages sourcing, trading, sales and marketing operations globally. In particular, the company acts as a major marketer of Wilmar oil palm products in Europe. Wilmar is one of the world's largest palm oil producers, owning plantations, mills and refineries. Therefore, mills owned by Wilmar are used as a surrogate for Olenex's supply from West Kalimantan. In total Wilmar owns four mills within the province, one of which is RSPO Mass Balance certified, the other three being uncertified. All of the mills are in the northwest of the province.

Sime Darby is listed as the owner of three mills in the province by Global Forest Watch, two of which are RSPO Mass Balance certified; the third is not certified.

UK BANKS FINANCING PALM OIL COMPANIES IN INDONESIA

Three UK banks – HSBC, Prudential and Standard Chartered – were identified as lending US$710 million to palm oil client companies in Indonesia. These transactions took many different forms, including bonds, loans and credit facilities. Standard Chartered was the largest lender, making up 54% of the total (Table 5).

In total, 19 Indonesian palm oil companies were identified as clients of the UK banks HSBC, Standard Chartered and Prudential. The largest client is Agro Multi Persada, accounting for US$150 million (21%), followed by Bumitama Agri US$88 million (12%) and Bumitama Gunajaya Agro US$75 million (11%).

TABLE 5:
FINANCIAL SERVICES PROVIDED BY UK BANKS TO INDONESIAN PALM OIL COMPANIES
Source: *Forests & Finance*

UK bank and transaction type	US$ (million)
HSBC	**318.0**
Bond issuance	5.7
Corporate loan	127.3
Revolving credit facility	96.9
Share issuance	88.2
Prudential (UK)	**5.9**
Revolving credit facility	5.9
Standard Chartered	**386.5**
Corporate loan	324.9
Revolving credit facility	61.5
Total	**710.5**

LINKS BETWEEN UK BANKS AND SUPPLIERS OR MAJOR TRADERS IN WEST KALIMANTAN

A total of 130 of the palm oil mills in the GFW mill list for Indonesia were receiving UK financial services, 12% of the total number of mills in Indonesia. Of these, 42 are included within AAK's mill list (7%), 40 in ADM's (4%), 55 in Cargill's (7%) and 12 in Bunge's (1%). There was no reported investment by UK banks in either Wilmar or Sime Darby.

Within West Kalimantan, companies owning a combined total of 12 mills reportedly received financial services from UK banks, 7% of the total number of mills listed by GFW in the region (Table 6). Five of these are included within AAK's mill list (14%), three in ADM's (3%), two in Cargill's (3%) and two in Bunge's (2%). The total value of the financial services provided by UK banks to mill-owning companies within West Kalimantan was over US$185 million, with one company, Bumitama Gunajaya Agro, accounting for US$75 million alone (40% of the total). Bumitama Gunajaya Agro supplies AAK, Cargill and Bunge. The mill owned by Bumitama Gunajaya Agro is the only RSPO certified mill within West Kalimantan owned by any of the companies receiving financial services from the UK banks.

US$185M

TOTAL VALUE OF FINANCIAL SERVICES PROVIDED BY UK BANKS TO MILL-OWNING COMPANIES WITHIN WEST KALIMANTAN

MITIGATION EFFORTS IN WEST KALIMANTAN

Despite large rates of deforestation and wider environmental and social impacts due to palm oil production in West Kalimantan and in Indonesia overall, there has been some encouraging progress in trying to address these challenges. For instance, the Indonesian government introduced a permanent moratorium on the issuing of new licences for oil palm plantations and increased efforts to ensure that laws were enforced (the moratorium was originally introduced as a temporary measure in 2011, before being made permanent in 2019, but it is unclear how well it is enforced)[215]. Similarly, a number of companies with global supply chains that source from palm oil mills in West Kalimantan have pledged to halt deforestation in their supply chains (e.g. Unilever, Mars Inc. and Reckitt Benckiser). Some districts have adopted progressive policies to preserve and restore forests and support smallholders (we mention a few examples below), and civil society groups have proven highly organised and active in driving action towards sustainability[216,217]. Moreover, a few landscape/ jurisdictional initiatives to promote sustainable palm oil production have been established in recent years (see examples below).

A number of initiatives to improve sustainability and reduce deforestation are taking place in districts within West Kalimantan. For example, IDH is working together with Kayong Utara to ensure the conservation of HCV areas (focusing on biodiversity and carbon sequestration gains); and with Ketapang to create ecological corridors for wildlife and improve productivity of smallholders[218]. Also, in Ketapang, stakeholders have recently signed an agreement co-led by IDH and the district government on a project to protect and restore forests, including HCV and HCS areas in agricultural land, securing sustainable palm oil production and smallholder livelihoods: the Compact Project[xxxv]. Among the key stakeholders (producers, investors, government representatives, etc.) participating in the Compact, Bumitama Gunajaya Agro – one of the UK banks' largest clients – has pledged €1 million to the project, in collaboration with a large investor, PT Varie Twelve.

xxxv The Compact aims to protect 1 Mha of forest cover including 90,000 ha HCV and HCS areas in agricultural land. It also aims to restore up to 20,000 ha of forest and peatland and improve sustainable palm oil production, as well as to increase oil palm independent smallholders' livelihoods across Ketapang by 2022, through a jurisdictional landscape approach. More info: www.idhsustainabletrade.com/news/ketapang-pioneers-the-first-ppi-compact-of-west-kalimantan-landscape

TABLE 6:

INDONESIAN PALM OIL COMPANIES RECIPIENTS OF UK BANKS' FINANCIAL SERVICES; AND THE NUMBER OF MILLS IN WEST KALIMANTAN, OWNED BY EACH COMPANY, WHICH SUPPLY TO TRADERS

*Notes: * 'Group revolving' denotes the reported investment by Prudential's revolving credit facility to PT Bumiraya Investindo (BRI), PT Airlangga Sawit Jaya (ASJ), PT Charindo Palma Oetama (CPO), PT Mitra Jaya Agro Palm (MJAP), PT Muarobungo Plantation (MBP) and PT Tandan Abadi Mandiri (TAM).*

		Number of mills supplying to each trader				
Palm oil producing company	**Value of financial services provided by UK banks (US$ million)**	**GFW**	**AAK**	**ADM**	**Cargill**	**Bunge**
Agro Multi Persada	149.6					
Astra Agro Lestari	23.2					
Astra International	65.3					
Austindo Nusantara Jaya	7.6					
Barito Pacific	2.2	1		1		
BGA	37.5			1		
Bumiraya Investindo	31.3					
Bumitama Agri	88.2					
Bumitama Gunajaya Agro	75.0		4		1	1
Indofood Sukses Makmur	0.6					
Kirana Megatara	59.1					
Monrad Intan Barakat	12.5					
Perkebunan Nusantara III	5.9	3				
'Group revolving loan'*	31.3					
Saban Sawit Subur	30.1	2	1	1	1	1
Tiga Pilar Sejahtera Food	5.7					
Toba Bara Sejahtra	1.6					
Triputra Agro Persada	35.0	1				
Tunas Baru Lampung	12.3					
Wisesa Inspirasi Nusanta	36.7					
Total	**185.7**	**7**	**5**	**3**	**2**	**2**

MOST OF THE DISTRICTS MENTIONED HAVE HIGH RATES OF DEFORESTATION AND SIGNIFICANT RISKS OF CONVERSION OF PEATLANDS TO OIL PALM PLANTATIONS

Sintang and Kab Sanggau districts have joined LTKL (sustainable district associations, a consortium of districts in Indonesia to improve sustainability) to develop a regional plan for achieving sustainability in the mid-term[219]. WWF-Indonesia has been working together with the Sintang district government on a number of initiatives, for example in a multi-stakeholder process to develop the Regional Action Plan for Sustainable Palm Oil Production[219]; as well as on a project in collaboration with HSBC to support palm oil smallholder producers by helping them to acquire a certification standard (RSPO or Indonesian Sustainable Palm Oil – ISPO) and in further capacity building to implement sustainable practices[220]. In addition, Kapuas Hulu Regency has an agreement with Germany through GIZ - FORCLIME to improve sustainability and reduce deforestation in commodity agricultural systems in the district[219,222].

Most of the districts mentioned above have high rates of deforestation and significant risks of conversion of peatlands to oil palm plantations. Therefore, these districts should be regarded as priorities when considering further investments, scaling up current initiatives or implementing new initiatives at the jurisdictional level for promoting sustainable palm oil production in the region[221].

The governor of West Kalimantan has committed to a few initiatives to protect forests and secure sustainable production at the jurisdictional level, such as the Green Growth Plan[222] and the Governor's Climate and Forests Task Force[223] – both supported by international organisations. The recently enacted provincial regulation PERDA (no. 6/2018) is another opportunity to reduce commodity-driven deforestation and conversion in West Kalimantan, requiring farmers to allocate 7% of their land for conservation[224].

BOX 10:

FUTURE TRADE DEALS TO DRIVE SUSTAINABILITY IN THE PALM OIL SECTOR

At the global level, the EU is currently negotiating a new free trade agreement with Indonesia, otherwise known as a Comprehensive Economic Partnership Agreement (CEPA)[224]. Negotiations are taking place amidst the ongoing backlash from palm oil producing nations, including Indonesia and Malaysia, following the EU's decision to phase out the use of palm oil in biofuels by 2030[225,226]. They argue that a ban on palm oil in biofuels would only serve to displace negative impacts to other commodities, which have lower yields and are more resource intensive (e.g. rapeseed, sunflower, soy, etc.)[227], as well as undermine the progress of leading certification/sustainability standards.

The UK government appears to favour a different approach and one that would see an increase in Indonesian palm oil imports to the UK[228]. However, without stringent government regulation, such as a legally binding due diligence obligation and strong environmental and social safeguards on trade deals – an idea that the EU itself is committed to – such an increase in imports could allow vast quantities of uncertified and/or 'unsustainable' palm oil to enter the UK market. In a post-Brexit world, the UK has a window of opportunity to ensure that any future trade deals with Indonesia and other leading palm oil producers do not end in further destruction of nature and negative social impacts.

FINAL CONSIDERATIONS AND SPECIFIC RECOMMENDATIONS

We have presented a number of encouraging initiatives to tackle deforestation and ecosystem conversion and social impacts of palm oil production in West Kalimantan. A coordinated strategy and implementation plan are essential to ensure the success of such initiatives for the landscape as a whole. This will require robust multi-stakeholder efforts with strong political leadership and commitment, to enable action from the private sector, civil society and other stakeholders.

7%

OF FARM LAND TO BE ALLOCATED TO CONSERVATION IN WEST KALIMANTAN UNDER THE RECENTLY ENACTED REGULATION

SPECIFIC RECOMMENDATIONS FOR THIS LANDSCAPE ARE TO:

Strengthen environmental policies and regulation and promote alignment across government levels:

- Stronger environmental policies and regulation as well as efforts to improve enforcement of current laws are needed at both demand and production ends. Policies to curb deforestation and drive sustainable commodity production in Indonesia have been made without an overall comprehensive framework for action. They have been implemented by only a few jurisdictions and in isolation from other policies/legislation, lacking road maps and incentives to transform the sector (e.g. legal environmental frameworks are poorly aligned across various regulatory bodies, making it hard to enforce and monitor law compliance)[223]. Mismatches in policies and regulations set up by local, regional and national authorities need to be overcome before adopting measures that may truly address the problem of deforestation, land conversion and associated human rights issues in the long term. The UK government has the opportunity to support and accelerate this process through, for example, setting up stronger requirements on the demand side (due diligence obligation), international diplomacy, and development funds and international climate finance.

Promote business action and supplier engagement:

- All six members of the former Indonesian Palm Oil Pledge (IPOP) commitment, including Wilmar and Cargill, source from districts in West Kalimantan. Most of the traders (including Cargill, ADM, AAK and Wilmar) have made individual commitments on no deforestation on peatlands and no exploitation (NDPE). Given the high concentration of mills supplying to these companies and the large extent of peatlands under risk of conversion[223], West Kalimantan can benefit from the support of those companies to ensure forest conservation and improve sustainability (e.g. engagement with suppliers including payment for ecosystem services, training, price premiums).

Foster and support partnerships between NGOs and civil society groups:

- These include initiatives to promote landscape-level conservation (e.g. Kapuas Hulu – WWF project[229]), and to improve training, monitoring and effective advocacy (e.g. SETAPAK[230]).
- Initiatives monitoring deforestation-free commitments that are led by NGOs offer an opportunity to improve transparency in the sector and ideally improve sustainability.

Collaborate with local and regional governments:

- We have identified above a few examples of local and regional governments that are willing to adopt partnerships to improve sustainability in the region. Catalysing public and private funds for these landscapes to scale up ongoing initiatives or support new initiatives to promote sustainable palm oil production, strengthen forest governance and monitor legal compliance is a good strategy to help secure deforestation- and conversion-free supply chains.

COCOA FROM IVORY COAST

KEY FINDINGS

- The area of land used to produce cocoa in Ivory Coast increased by 50% between 2011 and 2018, from 2.7 Mha to 4 Mha. Over the same period, the country lost 2.4 Mha of tree cover, an area greater than the size of Wales.
- The loss of tree cover between 2011 and 2018 is linked to the emission of at least 447 Mt CO_2.
- Cocoa production is concentrated in areas that have experienced the highest rates of deforestation, and there is evidence of forest clearance in certified cocoa cooperatives. Alarmingly, deforestation has also occurred within protected areas; a 2015 study of 23 Ivorian protected areas found that 74% of the surveyed land had been converted to cocoa plantations – and six of these protected areas had been entirely converted to farms, mainly for cocoa[231].
- The vast majority of cocoa produced is traded internationally, over 60% of which is imported by the EU. European countries, including the UK, are therefore inextricably linked to the socio-environmental impacts of cocoa production.
- Cocoa traders do not disclose which cooperatives they source from to supply the UK market. In the absence of greater supply chain transparency, it has to be assumed as a first order estimate that any cooperative within the country could be supplying cocoa linked to deforestation to the UK.

37%

OF GLOBAL COCOA PRODUCTION IN 2018 CAME FROM IVORY COAST

INTRODUCTION

Ivory Coast is the largest producer of cocoa globally, accounting for 37% of global production in 2018, almost twice as much as its neighbour Ghana, the second largest producer[232]. Cocoa is a significant source of income and employment in the country, involving close to one million producers – predominantly smallholders – who provide income to five million people, one-fifth of the country's population. Cocoa exports are the country's biggest source of foreign exchange[233], but only 7% of cocoa farmers earn a living income – on average, cocoa farming households earn only 37% of a living income in rural Ivory Coast[234]. This disparity is even worse for women, who are estimated to carry out over two-thirds of the labour, but earn less than a quarter of cocoa income[235].

The EU is by far the largest consumer of cocoa, responsible for 60% of global imports[236], with the UK importing a considerable portion of global cocoa production (the UK footprint accounts for 9% of the global land footprint for cocoa production). About half of the UK's imports are estimated to originate in Ivory Coast[xxxvi]. UK demand for cocoa therefore has a substantial risk of being associated with negative environmental and social impacts from cocoa production within the country.

xxxvi See Cocoa section, in the main report.

There are significant issues associated with the production of cocoa including deforestation, hazardous chemical use and habitat destruction in the high-biodiversity regions in which it is produced. Cocoa grows in warm climates with plentiful rainfall (i.e. between 10° north and 10° south of the Equator), so its production range tends to correspond with that of tropical rainforests[237]. However, in West Africa, cocoa is predominantly grown in monoculture, full-sun systems which require land clearance, contributing to the destruction of rainforests[238]. Degradation of soils and water quality is also a major issue.

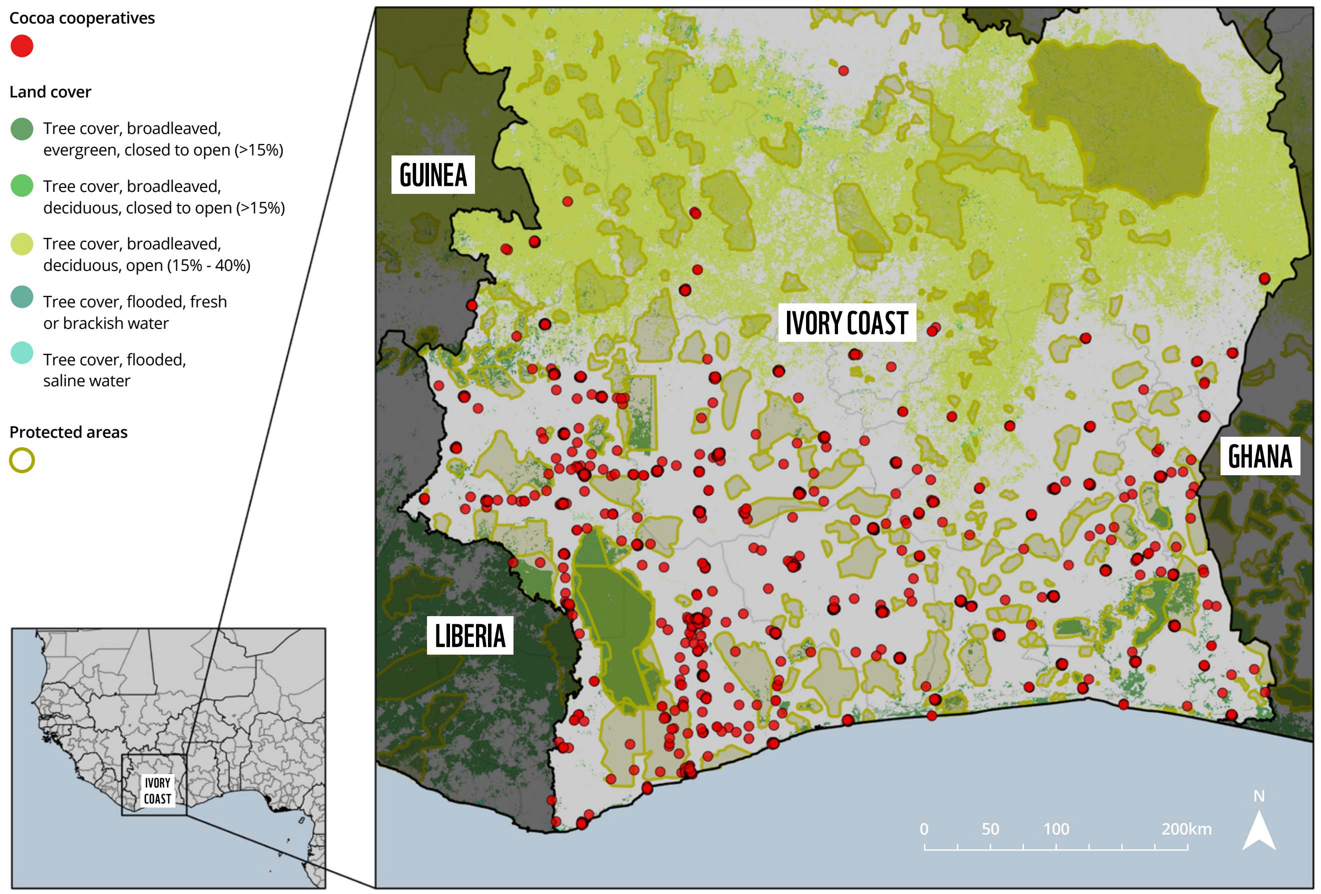
There are also socio-economic issues associated with the production of cocoa in Ivory Coast. More than half of cocoa producers in the country live below the poverty line, earning less than US$1.20 a day. As a country, Ivory Coast's share in the profit of the global cocoa-chocolate chain stands at only 5-7%[235] and cocoa farmers receive a similarly small proportion of the value of a chocolate bar[239]. There is also evidence of widespread corruption and the use of forced and child labour in cocoa farming in Ivory Coast[240]. A 2018 study estimated that 891,000 children aged 10 to 17 years worked in cocoa production in Ivory Coast between October 2016 and November 2017. Approximately 86% of these children were reported to be working in hazardous conditions in 2017, including working with sharp tools, lifting heavy loads, and being involved in land clearing[241].

COCOA PRODUCTION IN IVORY COAST

There are around 3,350 cocoa cooperatives within Ivory Coast[xxxvii]. Cocoa cooperatives are found throughout the country (Fig. 17), with a dense concentration in the south and central districts. The number of cooperatives is particularly high in Bas-Sassandra, Montagnes, Sassandra-Marahoué, Gôh-Djiboua, Lagunes and Comoé districts, all of which have in excess of 200 cooperatives (Annex C.1).

FIGURE 17:
MAP OF IVORY COAST DETAILING THE LOCATION OF COCOA COOPERATIVES*, VEGETATION COVER IN 2015, AND PROTECTED AREAS*****

Source: * *Mighty Earth*
** *European Space Agency*[214]
*** *WDPA*[191]



xxxvii Analysis from Mighty Earth's cocoa cooperatives in Ivory Coast. Refer to Methods for further details.

TREE COVER CHANGE IN IVORY COAST

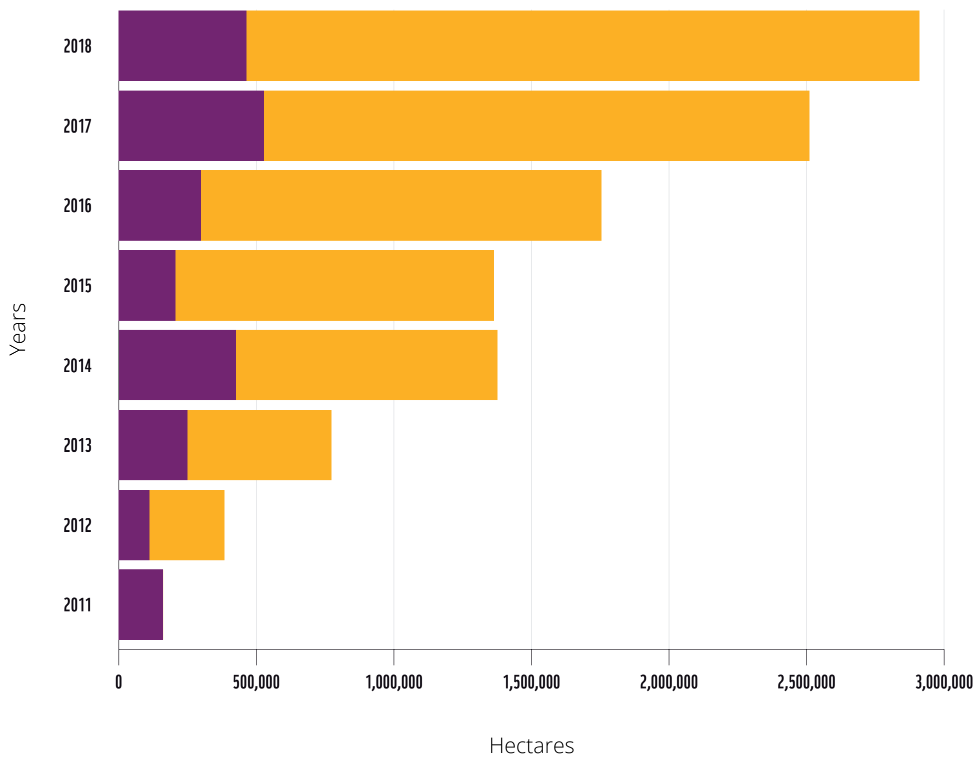
Ninety percent of West Africa's primary forests have been lost. In Ivory Coast alone, 14 Mha of forest were lost between 1960 and 2010[242]. The rate of loss has accelerated over recent years. Between 2011 and 2018, Ivory Coast lost 2.4 Mha of tree cover, an area greater than the size of Wales. This represents an 8.1% decrease in the country's tree cover since 2010[xxxviii] (Fig. 18).

The highest rates of tree cover loss are in Lacs, Lagunes, Montagnes, Sassandra-Marahoué and Woroba districts, each of which lost more than 200,000 hectares of tree cover between 2011 and 2018, with Montagnes alone losing 382,000 hectares over the period. These districts are distributed throughout the country, apart from in the far north (Annex C.2).

FIGURE 18:

CUMULATIVE TREE COVER LOSS IN IVORY COAST BETWEEN 2011 AND 2018

- Total tree cover loss
- Cumulative tree cover loss



Source: Global Forest Watch

xxxviii (tree cover canopy density metric set to 10%) www.globalforestwatch.org/dashboards

50%

EXPANSION OF LAND USED FOR COCOA PRODUCTION IN IVORY COAST BETWEEN 2011 AND 2018

LINKS BETWEEN THE EXPANSION OF COCOA PRODUCTION AND TREE COVER LOSS

Drawing causal links between cocoa production and deforestation/tree cover loss can be difficult due to a general lack of transparency in cocoa supply chains[245]. However, there is little doubt that the cocoa sector is a major driver of deforestation within the country, and there are reported examples of deforestation caused by expanding cocoa production associated with the supply chains of international cocoa traders[243].

The area of land used for cocoa production in Ivory Coast expanded by 50% between 2011 and 2018, from nearly 2.8 Mha in 2011 to 4 Mha in 2018. Production has also risen, but less rapidly, increasing by only 30% over the same period (Fig. 19). This is due in part to a 13% fall in yields per hectare between 2011 and 2018 (Fig. 20).

A number of factors in cocoa production have led to extensive and expanding land use. Firstly, smallholder farmers – who account for more than 90% of cocoa production – are restricted in their ability to increase yields on existing land due to small farm sizes, a lack of training and support to adopt sustainable practices, and a lack of financial resources to replace diseased and aging trees which have limited yield potential. As a result, efforts to increase production are driving expansion into new areas of land[244].

Secondly, while traditional cocoa varieties prefer shaded conditions – thereby encouraging the retention of some standing forest – the vast majority of smallholder farmers in Ivory Coast have moved to full-sun varieties[245], leading to a complete clearance of forest for cocoa production in some areas. The insecurity of land tenure in many cocoa producing areas has contributed to this, as smallholders often focus on short-term profit through maximising planting space, favouring the use of full-sun varieties which often offer higher short-term yields[247]. In the longer term, however, yield levels of full-sun cocoa plantations tend to fall (as shown in Fig. 20), due to the agro-ecological impacts of forest conversion to monoculture plantations, including soil quality deterioration[247]. This decline in yield can in turn encourage further expansion.

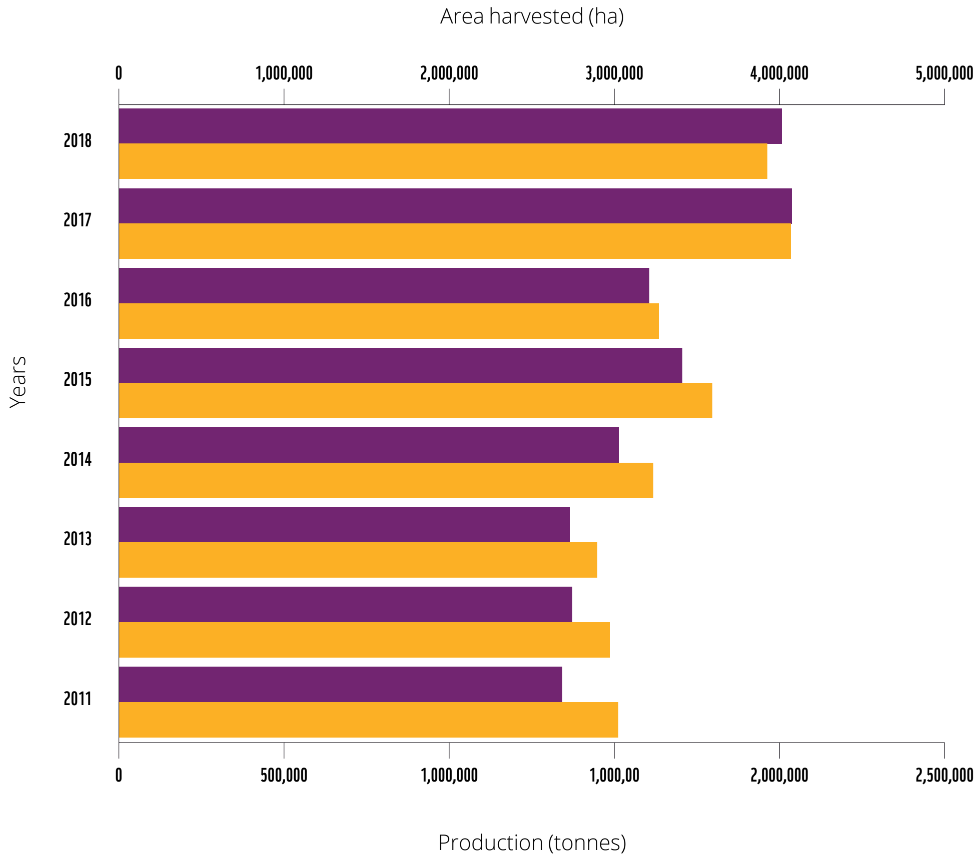
Increasing cocoa yields through the use of improved seed varieties and sustainable agricultural practices could raise smallholder farmers' incomes and help relieve pressure on forests, but not in isolation from other deliberate measures. Narrowly promoting productivity may lead to undesired outcomes in terms of net farmer income[246] (i.e. if it leads to an oversupply and drop in prices, and/or if financial and labour costs increase faster than yields), higher and irresponsible use of agrochemicals[xxxix] and even expansion of planted areas[247]. Any initiatives to improve yields should be conducted in a sustainable, holistic way, integrating a series of other key metrics[248].

In general, there is a strong relationship between the location of cocoa cooperatives and deforestation rates (Annex C.2). For example, the five districts with the highest tree cover loss rates (Lacs, Lagunes, Montagnes, Sassandra-Marahoué and Woroba) are all within the top eight districts in terms of number of cocoa cooperatives.

xxxix A recent report found that in Ivory Coast, "the strongest predictor of higher productivity [is] the use of pesticides". KIT Tropical Forest Institute (2019), Demystifying the Cocoa Sector in Ghana and Côte d'Ivoire, Chapter 10, Production and Yield, www.kit.nl/wp-content/uploads/2018/11/Demystifying-cocoa-sector-chapter10-production-and-yield.pdf

FIGURE 19:
COCOA PRODUCTION AND HARVESTED AREA IN IVORY COAST (2011-18)

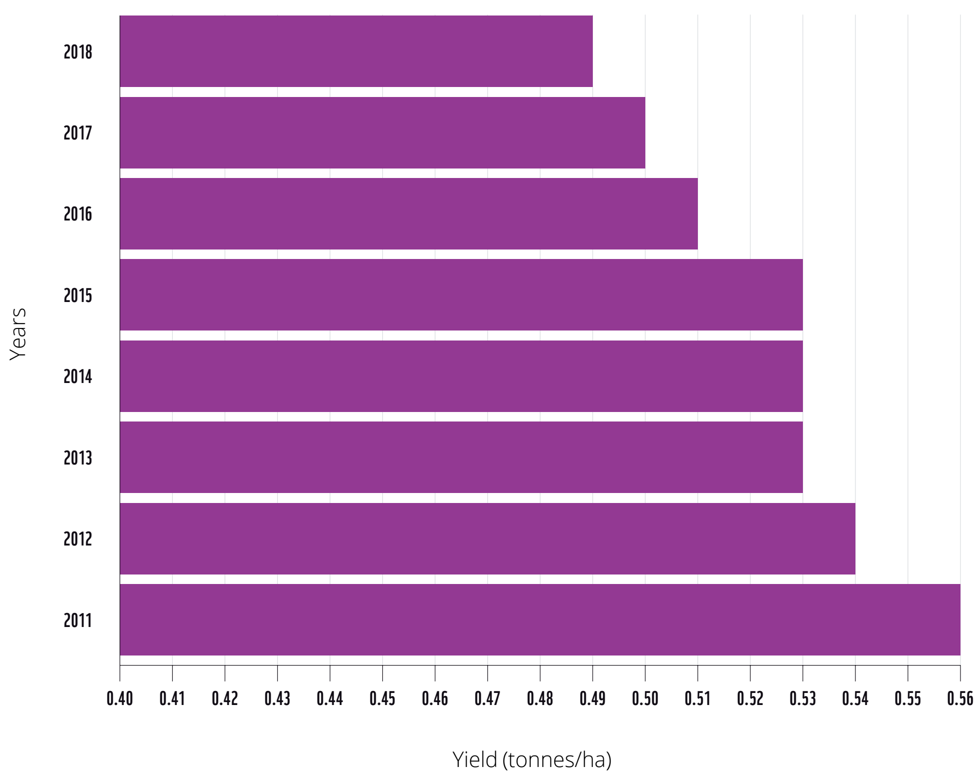
- Area harvested (ha)
- Production (tonnes)



Source: *FAO Data*

FIGURE 20:
COCOA YIELDS IN IVORY COAST (2011-18)

- Yield (tonnes/ha)



Source: *FAO Data*

LINKAGES BETWEEN COCOA PRODUCTION, DEFORESTATION AND THE UK MARKET

Recently published research undertaken by Mighty Earth[xl] assesses potential deforestation risks in certified cocoa cooperatives in Ivory Coast. The report calculates deforestation risk on the basis of forest cover loss within cocoa-related deforestation risk zones. These zones are identified using Global Forest Watch deforestation alerts[249], the cooperative locations, and the mapped road network in Ivory Coast. The cooperatives were selected according to the following criteria: presence of recent deforestation, proximity to a protected area, whether it was located within a known cocoa-producing region, size of cooperative, and topography and landscape.

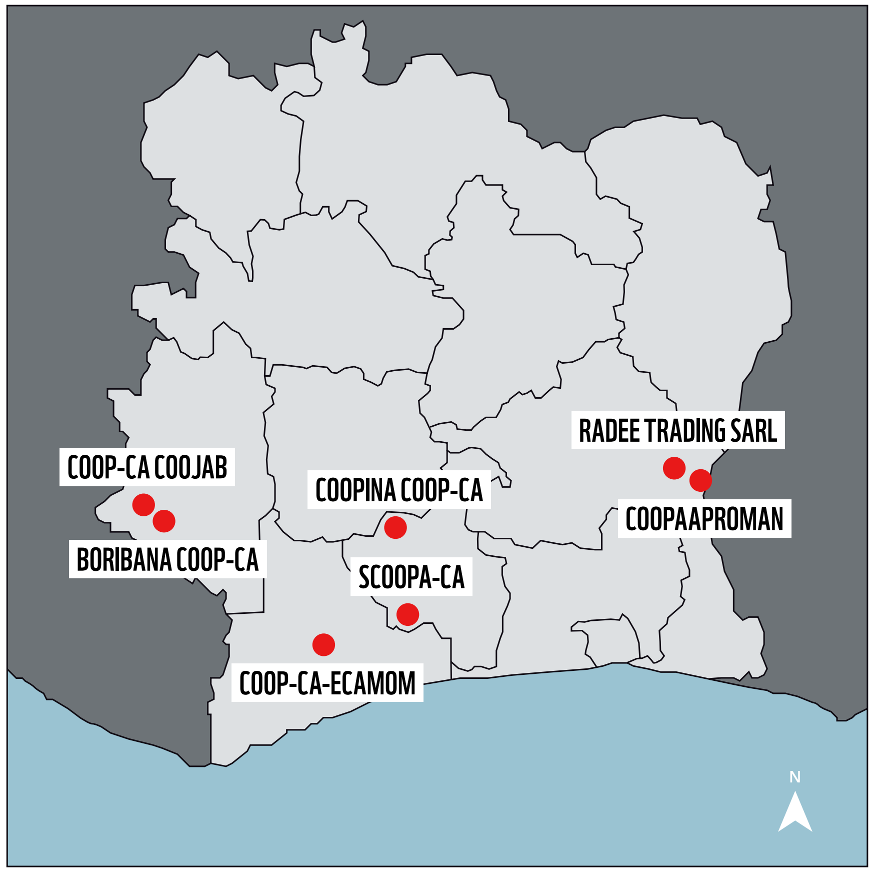
The report found that across the deforestation-risk areas of seven cooperatives certified under Rainforest Alliance/UTZ or Fairtrade – for which locations are available – 21,965 hectares of forest were lost, including within protected areas (Fig. 21)[244].

FIGURE 21:

LOCATION OF SEVEN CERTIFIED COCOA COOPERATIVES IN IVORY COAST THAT HAVE BEEN SHOWN TO BE ASSOCIATED WITH ONGOING DEFORESTATION

Source: Mighty Earth (2020)

Cocoa cooperatives



xl We draw heavily on Mighty Earth's Rapid Response 2020 Report in this section as it is the most recent comprehensive assessment of cocoa and deforestation in Ivory Coast that draws on a range of datasets. It was launched alongside the Cocoa Accountability Map, an interactive map covering nearly 5,000 cooperatives in Ivory Coast. The report can be accessed at www.mightyearth.org/wp-content/uploads/Final_RR-Special-Report-on-Cocoa_English-Version_January-2020.pdf and the Cocoa Accountability Map can be accessed at www.mightyearth.org/cocoa-accountability

74%

OF THE LAND IN PROTECTED AREAS HAD BEEN ILLEGALLY CONVERTED TO COCOA PRODUCTION IN 2015

Deforestation was found to be occurring in areas where agricultural activity consists almost exclusively of cocoa production. Deforestation is ongoing; evidence of forest clearance was recorded as recently as November 2019, shortly before the assessment was published[244].

One cooperative was found to have 458 hectares of deforestation within its cocoa-related deforestation risk area over a two-year period between November 2017 and November 2019. Cémoi, a chocolate manufacturer based in France, is a known buyer of cocoa from this cooperative and is a major cocoa trader, supplying cocoa to the UK, including through its OP Chocolate production unit in Cardiff[250].

Another cooperative which sells to buyers including Cargill, Barry Callebaut (the first and second largest cocoa traders in the world, respectively) and Nestlé (the sixth largest chocolate manufacturer in the world by net sales) – all of which supply cocoa to the UK – was found to have 133 hectares of deforestation within its risk area during the same timeframe. This cooperative is located between two protected areas of forest[244]. The 2019 audit by Rainforest Alliance found that 70% of plantations visited within this cooperative contained less than 10% of native vegetation cover[251]. The Rainforest Alliance Sustainable Agriculture Standard stipulates that farms that grow shade-tolerant crops (of which cocoa is an example) should aim to have at least 15% native vegetation cover, and in the event that they do not, should implement a plan to increase or restore it[252].

Some of the cooperatives reviewed have had their certificates suspended for not meeting the necessary certification requirements, which may have included links to deforestation[244]. This evidence shows that even certified cocoa cooperatives operate with high risks of land clearance and deforestation. The risk is likely to be higher for farms or producers that are not bound to certification standards.

Deforestation due to cocoa cultivation has also reportedly occurred within protected areas of forest[253,244]. Although cocoa production within protected areas is illegal in Ivory Coast, a study in 2015 surveyed 23 protected areas and found that 20 of them contained illegal cocoa plantations; 74% of the land in the 23 protected areas surveyed had been converted to cocoa plantations[233]. Worryingly, an investigation by Mighty Earth found that three major international cocoa traders – Cargill, Olam and Barry Callebaut – were buying cocoa grown illegally in Ivorian protected areas[257]. Over a million people live within protected areas in Ivory Coast, primarily within illegal cocoa villages which often have clinics, schools and cell towers, operating openly in the knowledge of local authorities[250]. Over recent years, government evictions have taken place, often with disregard for basic human rights[254].

GREENHOUSE GAS EMISSIONS

The clearance of forest for cocoa production – especially for full-sun varieties, which often entails the removal of all trees – significantly reduces the above-ground standing carbon stock and carbon storage potential provided by forests[255]. The loss of tree cover in Ivory Coast between 2011 and 2018 has resulted in the emission of 447 Mt CO_2[44]. Given the magnitude of forest clearing caused by agriculture in Ivory Coast, over 50% of the country's carbon emissions may be the result of deforestation and forest degradation[256].

BIODIVERSITY LOSS

Although the global scale of deforestation due to cocoa is modest relative to the four commodities that are considered the largest drivers of deforestation globally – palm oil, soy, cattle and wood products – the impacts are particularly acute as cocoa is highly concentrated in a small number of countries that contain tropical forests with high biodiversity[257]. The lowland forests of Ivory Coast, for example, fall within the Guinean Forests of West Africa Biodiversity Hotspot. At least 936 species of plants and animals found in the hotspot are globally threatened and the region is one of the top global priorities for primate conservation due to high levels of both endemism[xli] and threat[258]. The expansion of smallholder farming is estimated to be the main driver behind the reduction in the extent of the West African Guinean Forest to just 18% of its original area[259].

A 2015 study found that over half of 23 protected areas in Ivory Coast – 20 of which were found to contain illegal cocoa plantations – had lost their entire primate populations[233]. While the decline in primate populations may not be entirely attributed to illegal cocoa production (other factors such as poaching for bushmeat are also prevalent), cocoa production is undoubtedly an important driver of primate habitat loss in Ivory Coast. This demonstrates that the designation of protected areas has not been enough to secure the protection of critical ecosystems in the country.

A 2015 STUDY FOUND THAT OVER HALF OF 23 PROTECTED AREAS IN IVORY COAST – 20 OF WHICH WERE FOUND TO CONTAIN ILLEGAL COCOA PLANTATIONS – HAD LOST THEIR ENTIRE PRIMATE POPULATIONS

Overall, Ivory Coast contains 281 species classified as Vulnerable, Endangered or Critically Endangered, including 33 mammal species and 25 bird species[259], many of which are associated with forest habitats. For example, the Roloway monkey (*Cercopithecus roloway*) was uplisted from Endangered to Critically Endangered in 2019 (Fig. 22). The species is endemic to Ivory Coast and Ghana, existing in forest habitats. Within Ivory Coast, it is now limited to forests in the central coastal and southeast regions (Dassioko Sud and Port Gauthier forest reserves and Tanoe forest). The population is estimated to have fallen more than 80% within the last 30 years and the species is no longer found in most of its historical range. Its decline is linked to deforestation at least in part due to the spread of cocoa farming including illegal cocoa cultivation within protected areas[260,261].

Other wildlife threatened by the loss of forest include the Pel's flying squirrel (*Anomalurus pelii*), the pygmy hippopotamus (*Choeropsis liberiensis*), the giant ground and white-bellied pangolins (*Smutsia gigantea, Phataginus tricuspis*), the leopard (*Panthera pardus*) and the slender-snouted and African dwarf crocodiles (*Mecistops cataphractus, Osteolaemus tetraspis*).

FIGURE 22:
ROLOWAY MONKEY (CERCOPITHECUS ROLOWAY)

FIGURE 22:
(LEFT) PYGMY HIPPOPOTAMUS (CHOEROPSIS LIBERIENSIS)
(RIGHT) GIANT GROUND PANGOLIN (SMUTSIA GIGANTEA)

xli Endemism is defined by Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) as "the ecological state of a species being unique to a defined geographic location, such as an island, nation, country or other defined zone, or habitat type; organisms that are indigenous to a place are not endemic to it if they are also found elsewhere". See https://ipbes.net/endemism

MITIGATION EFFORTS

There have been some actions towards mitigation of the negative impacts of cocoa production in Ivory Coast. For example, the Ivory Coast government is a signatory of the Cocoa & Forests Initiative launched in 2017 by the World Cocoa Foundation (WCF), IDH, the Dutch Sustainable Trade Initiative, and the Prince of Wales' International Sustainability Unit (ISU). This framework aims to prevent further deforestation and support producer livelihoods via three key commitments: forest protection and restoration, sustainable agricultural production and increased farmer incomes, and community engagement and social inclusion. Despite a slight decrease in tree cover loss in 2018 compared with the previous year, annual tree cover loss in Ivory Coast has increased on average since our last analysis (2011-15)[44].

Agroforestry, which is a promising avenue for more sustainable cocoa production systems, is one of the key activities promoted by the Cocoa & Forests Initiative's Joint Framework for Action. In fact, cocoa agroforestry can provide comparable revenues for farmers while preserving elements of forest habitat[265]. The Ivorian regulatory body for the coffee-cocoa sector, the Conseil du Café-Cacao, is implementing a national pilot project to promote agroforestry in cocoa farming, which business signatories of the Cocoa & Forests Initiative have committed to supporting via the distribution and planting of multipurpose trees or indigenous trees on and off cocoa plantations[262].

AGROFORESTRY, WHICH IS A PROMISING AVENUE FOR MORE SUSTAINABLE COCOA PRODUCTION SYSTEMS, IS ONE OF THE KEY ACTIVITIES PROMOTED BY THE COCOA & FORESTS INITIATIVE'S JOINT FRAMEWORK FOR ACTION

Increasing efforts from cocoa traders and buyers – evidenced by the growing prevalence of sustainability certification schemes in cocoa – have so far failed to drive meaningful change in the industry, as cocoa production continues to be linked to deforestation, child labour and farmer poverty, in Ivory Coast and other producer countries. Recent research has shown evidence of widespread child labour and conversion of protected areas[263] in UTZ certified farms in Ivory Coast, raising questions on the effectiveness of certification schemes. Deeper, structural, sector-wide transformation is needed, beyond certification.

There has been positive government action to address deforestation drivers in recent years. In 2018, the governments of Ivory Coast and Ghana signed the 'Abidjan Declaration'[264] in an attempt to coordinate their cocoa sectors and secure more control over their earnings from cocoa production and trade. This is hoped to lead to more stability and sustainability through coordination on production volumes and prices – as well as efforts to enhance local processing, storage and research capacity[265]. In 2019, the governments of Ivory Coast and Ghana announced the launch of a Living Income Differential (LID)[266], whereby they would set a higher minimum price of US$2,600 per tonne for the following season's cocoa, plus charge buyers an additional US$400 per tonne with the intention that this money be passed on to farmers to address poverty in the sector. Although some buyers expressed public support for the initiative at the time[267], 2020/21 cocoa sales dropped substantially[xlii]. To increase the pressure, the Ivorian government announced it would review and possibly halt cocoa buyers' sustainability programmes in Ivory Coast[268]. Ensuing negotiations resulted in the industry accepting paying the LID and the initiative has now inspired similar proposals in other countries[269]. It is too soon to assess its impact on farmer poverty and other sustainability challenges in the cocoa sector, including deforestation and child labour. The focus now needs to be on ensuring effective, transparent implementation[272].

xlii Only 150,000 tonnes had been sold by October 2019 versus 450,000 the same time in 2018. See www.reuters.com/article/us-chocolate-makers-west-africa-sustaina/chocolate-makers-face-ethical-branding-dilemma-idUSKBN1WU1E7

FINAL CONSIDERATIONS AND SPECIFIC RECOMMENDATIONS

NO SINGLE COMPANY OR GOVERNMENT CAN DRIVE THE SCALE OF TRANSFORMATION NEEDED ALONE. AMBITIOUS, LONG-TERM COMMITMENTS AND ACTION FROM THE PRIVATE SECTOR NEED TO BE COMBINED WITH CONTINUED ACTION FROM BOTH PRODUCER AND CONSUMER COUNTRIES

Despite commitments from government, civil society and companies across the cocoa value chain, deforestation and other related critical sustainability challenges remain in cocoa production in Ivory Coast. A strong increase in cocoa production in recent years has contributed to drastic tree cover loss, but also to a price collapse which has intensified farmer poverty – another key driver of deforestation and of child labour, which remains at very high levels in the sector. Chocolate companies' pledges to eradicate child labour started in 2001, nearly 20 years ago – initially with a 2005 deadline, but they have failed year after year. The lack of traceability in cocoa supply chains has contributed to this failure, as it is difficult to identify the exact farms from which companies receive their cocoa, and hence to investigate whether child labour is used[270].

No single company or government can drive the scale of transformation needed alone. Ambitious, long-term commitments and action from the private sector are crucial, and these need to be combined with continued action from the Ivorian government and support from civil society and key consumer countries like the UK.

WE RECOMMEND A SERIES OF ACTIVITIES TO HELP DIRECTLY OR INDIRECTLY ADDRESS COCOA-RELATED DEFORESTATION AND LAND CONVERSION AS WELL AS SOCIAL ISSUES LINKED TO COCOA SUPPLY CHAINS (E.G. CHILD LABOUR) IN IVORY COAST:

- The UK government should push for ambitious action targets, in partnership with Ivory Coast and other key producer and consumer countries of cocoa, to halt cocoa-related deforestation – supporting initiatives like the Cocoa & Forests Initiative and the Living Income Differential (LID), and helping to drive them further.
- The UK government should support the Ivorian government to deliver on the promise of the LID, and to transparently transfer all the LID to farmers.
- UK companies who source cocoa from the country should ensure the higher prices they agreed to pay through the LID are actually reaching cocoa farmers, particularly women.
- UK businesses and government should lead on/participate in well-considered multi-stakeholder efforts to support more sustainable and productive cocoa cultivation systems (including agroforestry) to limit the expansion of planted areas (which might be an undesired consequence of price premiums as the income potential of growing cocoa in larger areas increases[271]); and to promote conditions that help strengthen governance structures, transparency, and monitoring and evaluation mechanisms.
- Cocoa buyers should set robust and time-bound commitments and implementation plans to halt cocoa-related deforestation and publicly report on progress. Collaboration and advocacy for further action among suppliers and other stakeholders across the entire supply chain is critical to achieve outcomes at the scale needed.

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METHODS

Methods are divided into two major sections:

- In the first section, we describe the methods for estimating the country-level figures or what we call the main analysis, i.e. the UK's land footprint overseas and risk analysis.
- In the second section, we describe the methods used for estimating figures in each case study, which focus on specific regions within selected high risk producer countries or a specific producer country.

Note that the methods used in the main analysis and the case studies differ from each other as do the assessments in each case study. Limited data is available at the subnational level and therefore we used different databases and approaches when assessing the UK's land footprint and risks in specific landscapes.

METHODS FOR THE COUNTRY-LEVEL FOOTPRINT ANALYSIS

QUANTIFYING THE UK'S IMPORTS

Import data from the UN Comtrade database[238] was used to estimate the quantity (net weight) of imports for the period from 2011 to 2018. We chose this database because it allows a similar method to be replicated for other countries, giving us a global comparable overview of trade flows.

We examined three routes by which commodities feature within UK supply chains:

- as raw materials (e.g. palm oil, soymeal, beef meat)
- as an ingredient of imported manufactured goods (e.g. natural rubber in imported car tyres, beef in corned beef products)
- embedded within imported products as part of the upstream production process (e.g. soymeal used in pig feed is 'embedded' in imported pork products)

Note that many commodities are used in thousands of different products, and so the data captured was confined to those product categories that are cited in the literature as being major uses of the commodity. The estimates provided are therefore conservative. Where a commodity is imported as an ingredient or is embedded, we only accounted for the weight of the commodity of interest in such a product. For example, car tyres contain many elements including metal, compounds, synthetic rubber and around 14% natural rubber; we then only accounted for the weight of natural rubber. This rule was applied to assess the weight of the main imported goods containing commodities as 'ingredients' and 'embedded'. This was done using conversion factors (see Annexes D.1-D.7) derived from published literature where possible, with a mid-range conversion factor used when the proportion of a commodity within a product is highly variable (e.g. the cocoa content of chocolate, or the pulp content of paper).

ESTIMATING THE PROVENANCE OF THE UK'S IMPORTS

The UN Comtrade database provides information on both the net weight of the commodity imported and the identity of the exporting country. Three situations are generally found:

- **A country is a producer and an exporter of the commodity.** For example, Brazil is a major producer of soy. In such a case, the UK imports can be assigned the provenance of the exporting country without further analysis.
- **A country is a producer, importer and exporter of the commodity.** The origin of its imports was also analysed, and added to its national production. Exports to the UK were then assigned in the same proportion as the total production and imports of such a country. For example, China produces 23% of rubber raw materials itself and imports 43% from Thailand. These percentages were then applied to China's exports to the UK, i.e. 23% of the UK's imports of rubber from China were assumed to originate in China, and 43% were reassigned to Thailand.
- **A country is an importer and exporter of the commodity.** For example, the Netherlands imports and exports soy, but does not produce it at a large scale. In this case, the country's imports were analysed, and the exports to the UK assigned according to the proportion of its imports. For example, the UK imports significant quantities of soy from the Netherlands. As 45% of soy imported into the Netherlands is from Brazil[272], 45% of the Netherlands' soy exports to the UK were assigned Brazilian provenance.

CUT-OFF CRITERIA FOR TRADE VOLUMES

The combination of imports highlighted above means that some commodities are imported from hundreds of countries to the UK, even if the raw commodity is produced in a much smaller number. Given the inevitable need to focus limited research resources, we examined the sourcing locations of more than 80% of the UK's supply, by excluding countries responsible for less than 2% of the UK's imports of a given commodity. This scale of cut-off has been used by other researchers (e.g. de Ruiter et al., 2017[273] used a cut-off of 1.5%). The exception to this rule was for beef & leather – where the method was adjusted to take into account the highly variable pastureland use efficiencies (i.e. the method had to account for cattle systems that require very little pasture, such as in India, up to those that can be very extensive, such as those in Australia and Namibia). If we had excluded some countries that produce less than 2% of UK beef & leather imports but are very land extensive, we would have excluded significant areas of cattle pasture that are required overseas. We therefore included in the footprint analysis countries that contributed to less than 2% of the imports' net weight, but have very extensive systems (i.e. Namibia). Only after the footprint analysis, we excluded all producer countries that contributed to less than 2% of the UK's imported pastureland use (as opposed to net weight imports). We recognise that is an inconsistency in the method, but, given the lack of data availability for beef & leather, it was decided to be the best solution.

ESTIMATING THE FOOTPRINT OF THE UK'S COMMODITY IMPORTS

To make meaningful assessments of the risk of deforestation and ecosystem conversion caused by the UK's imports of the commodities assessed here, we need to understand the land area required to produce the UK's imports of each commodity. This meant that, for each commodity, we had to develop estimates of land use per unit of commodity produced (e.g. hectares of grazing land per kilogram carcass weight beef produced). For some commodities, this was relatively straightforward, e.g. there are freely available country-level statistics on soybean, oil palm, rubber and cocoa yields in primary production[xliii]. The yield for each country, each year, could be used to convert the imported volumes into an estimated land area required for production, i.e. land footprint. However, for commodities such as beef & leather, timber and pulp & paper there were no land productivity databases available, so we had to develop our own estimates. Further details of the methods used for a few specific commodities are detailed in subsequent sections.

For crops that produce co-products (e.g. soybeans are processed into soymeal and soy oil) we allocated land use to co-product fractions. The basis for this allocation is explained in the agricultural crops section below.

It is worth noting that there is a significant gap in global understanding of land productivity – particularly in the case of grazing animals, which use such a significant proportion of global agricultural land. The lack of data is likely due to the challenges of quantifying the productivity of such diverse and often extensive multi-year systems. However, it would be useful to develop more accurate data on this topic.

xliii FAOSTAT. The FAO calculates yield as the national production of the crop divided by area planted each year.

AGRICULTURAL CROPS FOOTPRINT

For those crop commodities (i.e. soy, palm oil, rubber and cocoa) that are commonly imported in different fractions of the harvested crop, we calculated the land footprint based on the proportion that each fraction is derived from the harvested crop. For example, soy is imported as whole soybeans, soymeal and soy oil (or products containing those fractions). In this case, imported goods are first assigned to the fraction of the commodity they contain, and then yield is assigned to that fraction in the same proportion that the fraction is derived from the harvested crop. For example, one tonne of whole soybeans yields 0.82 tonnes of soymeal and 0.18 tonnes of soy oil[xliv]. The area required to supply the UK's imports of whole soybeans (or products containing whole beans or that have whole beans embedded in the production process, once their weights have been converted to soybean equivalent) is estimated by dividing the quantity (weight) of soybeans imported from a given country by the yield; therefore, the land footprint area for products using soymeal is estimated by dividing the quantity of soymeal by its proportion of yield (i.e. 0.82); and the land footprint area for products using soy oil is estimated by dividing the quantity of oil by its respective yield (i.e. 0.18). The land footprint areas for each product analysed are summed to produce a total figure for a certain commodity.

BEEF & LEATHER FOOTPRINT

Unlike agricultural crops, we found no publicly available data on cattle pasture productivity for a cross-section of countries (i.e. carcass weight per hectare of pasture). While individual studies exist for some countries, a variety of methods were used in these reports, and so using a mixture of different sources was not feasible. This is a significant gap in global agricultural data given the significant land use associated with cattle production. To fill this data gap, we adopted a method used by de Ruiter *et al.* (2017) that allocates total country pastureland to different grazing animals based on the relative feed conversion efficiencies and overall sector production. The method apportions the national pasture area between the three main livestock types: beef cattle, milk cattle and sheep/goats. The area assigned to beef cattle is then divided by the national production of beef and leather to give a hectare per tonne estimate.

Given that beef cattle have two products (i.e. meat and leather), we allocated a share of the land footprint to beef and leather co-products on the basis of their mass. Thus, the hide being 15% of the mass of a carcass[274], it was allocated 15% of the land footprint. This was done to avoid the potential double-counting of land where beef and leather were sourced from the same country. There are limitations to this method (explored in detail by de Ruiter *et al.*, 2017) – for example we assume similar feed conversion rates and pasture use in all countries. However, given the lack of data on this topic, it was felt to be a reasonable approach to estimating sector-level grazing use for beef cattle.

This calculation showed significant variation between countries – including some countries that appear to have very extensive systems, e.g. Namibia (>5,000 m² per kg of carcass weight equivalent – CWE) and Australia (800 m² per kg of CWE). It is also worth noting that India appears to have a very high pasture stocking rate; however, we suspect this is because cattle often graze waste land, common land, urban areas and on waste by-products (e.g. rice husks). Hence a large cattle population is supported by a relatively small amount of grazing pasture.

TIMBER, PULP & PAPER FOOTPRINT

As trees are an intermittently harvested perennial crop, with variable management systems, there is no straightforward measurement of 'yield' that can be used to estimate the land required to produce a given amount of timber in the way that there is for agricultural crops. We therefore used the net annual increment (NAI), which is defined as the average annual volume of gross increment over the given reference period less that of natural losses on all trees, measured to minimum diameters as defined for 'growing stock'[275]. In simpler terms, this is the net increase in the volume of wood in a forest per hectare per year, which in effect accounts for the area of forest needed to produce a given amount of wood in a year. For example, if the NAI were one cubic metre per hectare per year, it would take 10 hectares to produce 10 cubic metres of wood in a year (equally, one hectare would produce the same amount in 10 years)[xlv].

xliv US Soybean Export Council conversion table, see: https://ussec.org/resources/conversion-table

xlv Note that due to the large variation in NAI according to forest type and management system, the use of country-level NAI could lead to significant over- or under-estimates of land footprint if the UK's imports from a particular country are highly specific (e.g. a particular species, or from a particular plantation). However, it does provide a reasonable first order estimate.

The UK's timber and pulp & paper import volumes were converted from tonnes of imports to wood raw material equivalent (WRME). This conversion adjusts for the wood content of manufactured products (e.g. plywood contains both wood and resin) and results in a volume metric that is broadly equivalent to the usable volume of a harvested tree. Most conversion factors used were from the UK Forestry Commission (see Annex D.1)[xlvi] and where no conversion factor is available, the closest available estimate was used (e.g. for the import category 'cartons and boxes of paper and paperboard' the conversion factor for 'other paper and paperboard' was applied). Then, the area of forest required to produce the total imported volume of WRME, i.e. the land footprint for timber or pulp & paper, was estimated by dividing the total WRME imported by the producer country's NAI (Annex D.2)[xlvii].

LAND FOOTPRINT ESTIMATES REVISED

As we updated our analysis on land footprint, we repeated the assessment for the period of the previous analysis (2011-15) to ensure consistency when comparisons were made between the two time periods and when data is reported for the entire eight years (2011-18). In this process, we spotted inconsistencies in the data previously reported for two of the seven commodities (cocoa and pulp & paper), due to changes in national indicators that occurred after the release of our report. In fact, the land footprints for cocoa and pulp & paper were larger for the period 2011-15 than previously thought: 884,000 ha and 5 Mha, respectively. Therefore, the overall UK land footprint was larger (18.5 Mha or 77% the area of the UK).

ASSIGNING A RISK SCORE TO PRODUCER COUNTRIES

A risk-based approach was used to illustrate the potential association of the UK's imports of commodities with negative socio-environmental impacts. To achieve this, we assigned a risk rating to each exporting country according to indicators of deforestation and ecosystem conversion (i.e. the area of tree cover loss and percentage of natural forest loss) and social risks (i.e. rule of law and labour rights) in the recent past years (see more details below). The land footprint of the UK's imports was then apportioned to risk categories based on the country of production.

This risk-based approach was preferred to other ways of assessing deforestation, ecosystem conversion and social exploitation associated with the commodity trade, for the following reasons:

- **Remote sensing has been used to estimate the amount of deforestation and conversion associated with the production of commodities**[xlviii] (although not the trade with specific countries). This presents a rigorous approach but has the disadvantages of excluding the social dimensions of the commodities' impacts and being comparatively expensive if repeated for different importing countries. It also often assumes a linear approach to deforestation or conversion (i.e. the plantation or farm in an area that was forested sometime in the past is the cause of deforestation), whereas deforestation is often a multi-stage process with several underlying drivers.
- **Coupled economic land-use models have been used to estimate the EU's contribution to deforestation**[276]**.** Again, this is a rigorous method but, similar to remote sensing, it is relatively computationally intensive, does not include social dimensions and has coarse (national-level) assumptions about land use (e.g. that an increase in the planted area of a crop in a country is responsible for the same area of deforestation in that country).

Given the necessity to develop a robust approach that could be repeated in the UK in the future and in other countries, a risk-based approach allows a broader set of potential impacts to be considered across multiple

xlvi Conversion to WRME underbark: Tools and Resources: Conversion Factors. UK Forestry Commission www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2016- introduction/sources/timber/conversion-factors

xlvii Data was obtained from FAO (2016) Global Forest Resource Assessment 2015: Desk Reference. FAO, Rome. The FAO does not provide NAI for all of the UK's major exporters. NAI for Brazil was calculated as the average of estimates given in Alder, D., et al. (2012). The cohort-empirical modelling strategy and its application to forest management for Tapajós Forest, Pará, Brazilian Amazon. Bois et Forets Des Trop, 314; Valle,D., et al. (2006). Identifying bias in stand-level growth and yield estimations: A case study in eastern Brazilian Amazonia. For Ecol and Manag, 236 (2–3), 127–135 (both Amazon); and www.fao.org/3/a-ac121e.pdf (Brazilian pine plantations). NAI for Canada was the midpoint from Canadian Council of Forest Ministers data (www.ccfm.org/ci/prog_cr23_e.pdf). NAI for Portugal was from the European Forest Institute, Long-term European forest resources assessment (http://dataservices.efi.int/ltfra/). The average NAI of all major countries was applied to that portion of UK's imports that were from countries with less than 2% of imports ('Other and unassigned').

xlviii For example, Vijay, V., Pimm, S.L., Jenkins, C.N. and Smith, S.J., (2016). The impacts of oil palm on recent deforestation and biodiversity loss. PloS one. 11(7). Available from: doi: 10.1371/journal.pone.0159668

commodities without making assumptions about the mechanisms of deforestation or conversion. Note that our analysis does not envisage measuring impact (e.g. number of hectares cleared to produce the commodity volumes exported to the UK). Rather, this analysis indicates a risk that there might be a link between commodity production due to UK trade and impacts on the ground. This risk should, therefore, be examined and mitigated.

RISK RATING IN DETAIL

The following four factors were used to indicate deforestation, ecosystem conversion and social risks in producer countries:

- **Extent of tree cover loss.** This provides an indication of the total extent of deforestation and conversion of natural ecosystems (with ≥10% tree cover) in producer countries. It uses remote sensing data from Global Forest Watch (GFW) that does not distinguish between vegetation types, and is only looking at the area of loss, not the balance between loss and gain. The data used is the area of land with a minimum of 10% tree cover that has lost tree cover for the years between 2011 and 2018[44].
- **Rate of deforestation.** This is a measure of the proportion of change in net natural forest area (i.e. loss + gain) in each producer country between 2010 and 2015 (FAO)[277]. The use of this second deforestation indicator helps to balance out the risk weighting, as large countries will tend to score high on the first indicator, whereas countries that are losing a large proportion of their small remaining forest extent score highly on rate of deforestation. Note that FAO's definition of forest refers to an ecosystem with a minimum of 10% tree cover, which allows us to use this indicator to assess the rate of loss of other natural woody ecosystems.
- **Rule of law.** No single global dataset is available that captures the range of social problems that have been associated with production of the commodities analysed here, which include land grabs, forced labour, child labour, and terms and conditions of labour below international norms. The World Bank's Rule of Law governance indicator (2018) is used as a proxy for the likelihood of the range of social issues within a producer country. This provides a score for each country on the perceptions of the extent to which citizens, government officials and enterprises have confidence in and abide by the rules of society[278]. This indicator is commonly used in global analysis of social issues, including other assessments of deforestation (e.g. the Forest 500[279]).
- **Labour standards.** The International Trade Union Confederation (ITUC) documents violations of internationally recognised labour rights by governments and employers and uses these records to score countries, providing a measure of the likelihood of serious workers' rights violations, including forced labour, violence and the denial of the right to free association[280]. Note that Papua New Guinea was not assessed by the ITUC and so was nominally scored as 'medium' in this research.

The value of each indicator in each country was scored on a three-point scale (high = 3 to low = 1) according to the thresholds described in Table 7. These thresholds were selected according to the data range of producer countries that export to the UK to clearly distinguish between high and low impact. For example, Brazil lost over 13 Mha of vegetation with >10% tree cover between 2016 and 2018, compared with Ireland's 24,000 hectares – these are scored 'high' and 'low', respectively.

TABLE 7:
RISK INDEX FRAMEWORK

			Scoring		
Factor	**Description**	**Rationale**	**High risk (=3)**	**Medium risk (=2)**	**Low risk (=1)**
Deforestation extent	Area of tree cover loss >10% (GFW)	Amount of deforestation and land conversion (ha)	≥ 200K ha per year	100–199K ha per year	<100K ha per year
Deforestation rate	Percentage change (%) in natural forest area 2010-15 (FAO)	Net rate of change of natural forest	≤-1%	0% to -1%	>0%
Labour rights	Labour standards score (ITUC)	Scoring based on reports of violations of labour rights	≥5	3 to 4	<-2
Rule of law	Rule of Law score — World Bank	Perception of how good laws are and how well they are implemented	<-0.3	-0.3 to 1	≥1

Finally, an overall country risk score was calculated by summing the scores for the individual indicators. This score was used to develop five risk categories, as follows:

Risk category	Score
Very high risk	≥11
High risk	9-10
Medium risk	7-8
Medium-low risk	5-6
Low risk	4

LIMITATIONS OF THIS ASSESSMENT

There are significant challenges and constraints inherent in assessing commodity data and direct links between production and environmental or social impacts. Our analysis focuses on capturing the majority of the trade in each commodity, not the whole, and makes conservative assumptions where possible. If anything, the results are likely to be underestimated.

There are four overarching challenges when assessing the environmental and social risks of the global commodity trade:

- **Deforestation or ecosystem conversion processes are varied.** In some instances, natural vegetation may be directly converted to plantations or farms. However, the process is often non-linear, and making attribution of conversion to a single commodity is difficult. For example, deforestation may progress via degradation caused by logging, with farmers then using logging tracks to claim land and set up farms; consolidation of these settlements into larger landholdings can result in additional deforestation (e.g. for cattle ranching), and then further change into a 'final' commodity production (e.g. soy production). Assigning deforestation to a specific commodity in such a chain of events is, thus, somewhat arbitrary.
- **Lack of global data on the conversion of natural ecosystems beyond forests.** Many natural ecosystems, with high relevance in terms of biodiversity and GHG mitigation potential among other benefits, are not as well studied as forests (e.g. savannahs, grasslands, wetlands). For example, there is a lack of global databases that allow monitoring of annual conversion of these ecosystems at the global scale. With our definition of deforestation (see Terminology), we could provide some estimates of the risks to woody ecosystems with at least 10% tree cover. However, we were unable to assess risks due to conversion of grasslands or other ecosystems with a lower tree density.
- **Social impacts are extremely complex and non-linear.** It is hard to measure direct impacts on social dimensions driven by commodity production, especially when focusing on a limited period of time. There has been some progress in trying to relate commodity production to social impacts but there are neither well-established indicators nor a global database currently available.
- **Traceability.** It is rarely possible to know which farm or plantation a particular end-product comes from, and hence whether its production has occurred directly on recently cleared land or not. Although advanced modelling and remote sensing can provide greater insights, these approaches are not available for all commodities in all producer countries or for most commodities due to the lack of transparency in supply chains.

In addition to these overarching challenges, specific challenges within the constraints of this study are as follows:

- **The diversity of products using a commodity.** For example, rubber has thousands of end-uses, from automobile tyres to rubber balls, medical equipment and engineering applications. The approach taken was to focus only on the major uses of each commodity; therefore, the estimated imports and land footprints are likely to be conservative.
- **Poor data on typical commodity use in products.** For example, one of the major import categories of cocoa is 'chocolate and other food preparations containing chocolate'. This includes a huge range of foods, containing vastly differing proportions of cocoa. The conversion factors used to estimate the commodity content are therefore only first-order approximations.
- **Complex/long supply chains.** For example, the UK imports leather bags from China, which also imports leather and leather bags. The estimation of provenance when a reassignment is required (see above) is for some products no more than a first-order estimate.
- **Need to cover multiple commodities and jurisdictions.** This means that key sub-national patterns in production, export and ecosystem conversion are not detected. This could lead to overestimations of risk if, for example, deforestation and production of a commodity are occurring in different parts of the same country. Equally, risk could be underestimated if a particular commodity was more tightly associated with deforestation than the national average land-use change.

- **Variability in agricultural productivity and land efficiency.** For example, cattle system productivity is known to be highly variable between systems, countries and producers (e.g. feedlot production in the US compared with extensive pasture-based systems in Brazil). We have used national yield and productivity assumptions; however, it is conceivable that the UK could source from a niche system with a different level of productivity from the country average.
- **The lack of consistent, high quality and up-to-date data.** There is a lack of data on deforestation, conversion and social risks associated with each commodity in each major producer country.
- **The lack of readily available data on the UK's imports of certified commodities.** Credible certification is one of the major ways of reducing the risk that an imported item has been associated with deforestation or conversion, poor social practices or illegality. However, there is limited data available on the proportion of the UK's imports that is certified. The exceptions are palm oil and timber, which is largely the result of the UK's commitments to report on certified palm oil imports and tackle illegal logging, respectively.
- **Deforestation and forest definitions differs from those of the Accountability Framework initiative (AFi)[281].** Even though AFi's definitions of forest and deforestation are more accurate, we decided not to use them to ensure comparability with the previous study and allow an eight-year trend (2011-18). FAO's definition is still widely accepted globally and reflects best the current indices used in our risk analysis. Moreover, FAO's definition allows the assessment of conversion of woody vegetation, such as savannahs and woody grasslands – ecosystems that are highly impacted by commodity production worldwide.
- **No inclusion of 2019 and 2020 data in the main analysis.** Given that the data available in the UN Comtrade database was up to 2018 at the time of our assessment, we were unable to include deforestation/land conversion data for 2019 and 2020. Therefore, our assessment does not consider the large increase of deforestation/conversion rates in a few major producer countries (e.g. Brazil) in these years.

This report provides a useful guide to the overall need for action, relative levels of risk between commodities and an indication of where the UK government, businesses, financial institutions and citizens might best target their efforts in order to reduce the negative impacts of the country's land footprint overseas. There are uncertainties in the specific figures calculated using this methodology, but the index approach allows for an interpretation of the figures that is simple, useful and adequate to drive action.

METHODS FOR ESTIMATING GREENHOUSE GAS EMISSIONS

We used the Direct Land Use Change Assessment Tool (Blonk Consultants)[282] to estimate a commodity-specific per-hectare CO_2e emissions factor. Three GHG emissions scenarios were generated for each commodity and the weighted average was used to estimate final emissions equivalent to the UK's land footprint per year in each country from 2011 to 2018, for cocoa, palm oil, rubber and soy.

To estimate the commodity-specific per-hectare CO_2e emissions, the tool offers three approaches. Here, we use the approach for when the country of origin for the imports is known, but the exact parcel of land used to produce the crop is unknown. This matches the level of detail of our provenance calculations which is determined by the available data. For this scenario, the tool uses an indirect approach to calculating emissions from land-use change (LUC), based on the relative rates of crop expansion at the expense of different previous land uses in a country. It uses FAO data on direct LUC (i.e. deforestation, conversion and crop-to-crop change) associated with a crop in a certain country and divides by the total expansion of the same crop in the country, assigning a rate of LUC (and therefore GHG emissions) per hectare of crop expansion.

Crop expansion is calculated for each year by comparing the average harvested area of the crop in the three most recent years for which data is available to the average of three years 20 years ago. For each subsequent year, this 'baseline' will therefore shift or move up by a year and data on LUC in a specific year is not counted in subsequent years. The associated emissions per hectare are then calculated based on methods and reference outlined by the Intergovernmental Panel on Climate Change (IPCC)[283] and in the PAS 2050-1 framework[284] including 'amortisation' so that the total emissions from the 20-year period of the land-use change are apportioned equally over the 20 years (see tool's methodology for further details).

The commodity-specific per-hectare CO_2e emissions (weighted average) was then multiplied by the UK's land footprint per commodity in each country to estimate the GHG emissions associated with LUC per country, for each crop per year. Note that the GHG emissions presented in this report are conservative estimates since they only consider emissions from direct aboveground LUC, and therefore ignore other carbon flows from belowground compartments or emissions following deforestation and conversion, which can be considerable. Though the model considers emissions from land converted from one crop to another crop, these are usually small compared with emissions from deforestation or land conversion of grasslands and savannahs.

In addition, the method does not allow for GHG estimates for specific parcels of land, due to the lack of primary data at the necessary level of detail. The Direct Land Use

Change Assessment Tool methodology is specifically designed to address this lack of primary data, through its indirect calculation method. The figures used are therefore averaged for entire countries, meaning it is not possible to distinguish regional variations in emissions or assign deforestation to a specific piece of land. It might be that the UK is sourcing from specific regions within a country that have been cleared years ago, which cannot be distinguished by this method. The values are therefore an indication of the risks of deforestation/land conversion and GHG emissions associated with the UK's imports of such commodities.

The Direct Land Use Change Assessment Tool is one of the most comprehensive tools for estimating GHG emissions from direct LUC with global coverage, and is based on the widely used IPCC and PAS 2050 methodologies for calculating emissions from LUC. However, there are still significant data gaps. For example, there is no data available for forest products nor livestock. Therefore, no GHG emissions estimates were made for beef & leather, timber and pulp & paper. In addition, in this analysis we lack data on GHG emissions from major producer countries that have not reported LUC data, or even that reported no deforestation/conversion rates – notably Malaysia (especially relevant for palm oil) and Ivory Coast (cocoa and rubber). Given no modelling was done to estimate the contributions of such countries to GHG emissions, GHG emissions reported here are significantly underestimated for these commodities.

METHODS FOR ESTIMATING IMPACTS ON BIODIVERSITY

We used data from the IUCN Red List[75] to calculate the total number of globally threatened species of all taxa (animals, plants and fungi) that are potentially exposed to the UK land footprint overseas, in terms of pressures from the production of key agricultural and forest commodities in the riskiest countries highlighted in this report.

A search on the IUCN Red List was performed to identify Vulnerable, Endangered and Critically Endangered species that may be under pressure from UK commodity trade. A search was undertaken in the countries classified in this report as very high and high risk, i.e. Argentina, Australia, Brazil, China, Ivory Coast, Indonesia, Malaysia, Nigeria, Papua New Guinea, Paraguay and Russia. We searched for species for which forests, savannahs, shrublands or grasslands were listed as level 1 suitable habitats (i.e. the species occurs in the habitat regularly), and with annual and perennial non-timber crops, wood and pulp plantations, livestock farming and ranching, and logging and wood harvesting listed as level 1 or 2 threats[285]. Note that assessments of threat levels are based on published material and expert knowledge, according to factors such as scale and extent of the threat, likely level of stress placed on the species, and assessment of likely future impact.

The total count of species identified in these searches was adjusted to account for species that occur in multiple countries. We then repeated these searches and filtered to identify the species for which the current population trend was classified as 'decreasing' (this classification is determined by a mixture of information which depends on availability of resources to gather data – this can range from precise quantitative trends based on structured surveys to less certain trends gathered from anecdotal reports). The IUCN aims to have each species on the Red List reassessed at least once every 10 years, and ideally every five years if resources permit. Hence the findings from our searches should be accurate within the past decade.

METHODS FOR THE CASE STUDIES

METHODS FOR 'SOY FROM MATO GROSSO' CASE STUDY

For the 'Soy from Mato Grosso' case study, we used two freely available databases: TRASE and Global Forest Watch (GFW). Specifically, TRASE data was used to assess soy exports (volumes), and associated deforestation risk and CO_2 emissions, trade links with the UK (actors and volumes), and infrastructure for soy production, processing and trade in Mato Grosso. GFW's data was used to report tree loss during the period of study.

ESTIMATING EXPORTS AND IMPORTS

TRASE data provides information on the direct trade flows of soybeans, soy oil and soymeal from producer regions (country, subnational jurisdictions) to consumer countries or regions by using a supply chain mapping model based on the SEI-PCS model[286].

Commodity volumes (in all forms considered) are presented in tonnes of soybean equivalent. Note that this method differs from that of our global assessment presented in our main analysis, and therefore volumes cannot be directly compared. The method does not account for the volumes of commodity embedded in imported products nor does it include provenance reassignment (imports from a third region), so it is likely that traded volumes from a specific region are even higher. Nevertheless, it is currently the most comprehensive database of supply chain data (including subnational data) for a few major producer countries, including Brazil. Therefore, this case study provides a good indication of the magnitude of the UK's trade and associated risks in the region.

Of the total volumes from Mato Grosso that were imported to the UK, about 15% could not be assigned to the municipality level due to lack of data. These are referred to in the text as 'Unknown municipalities'.

ESTIMATING ENVIRONMENTAL RISKS

TRASE provides indicators of risks and impacts due to commodity trade. We used the following:

- **Land use:** to indicate the area used to produce the commodity volume exported to the UK, similar to land footprint.
- **Soy deforestation risk:** to indicate the risks of UK imports in contributing to the deforestation and land conversion in a specific exporting jurisdiction, based on the average for the past five years.
- **CO_2 emissions risk from soy deforestation:** to indicate the risks of UK imports in contributing to the CO_2 emissions from deforestation and land conversion in a specific exporting jurisdiction, based on the average for the past five years.

For a more detailed description of each indicator, refer to TRASE's methodology[287].

Note that due to the fact that 15% of the total export volume from Mato Grosso to the UK cannot be tracked down to the municipality level, we corrected the indicators of land use, risk of deforestation and CO_2 emissions to reflect such gaps when presenting them by municipality.

SOY FACILITY DATA

TRASE's soy facilities database[288] was used to demonstrate the large infrastructure created for soy processing and trade in Mato Grosso and to demonstrate links with the UK market. The ownership of the facilities, mostly owned by large traders, was used as a proxy to indicate links with the UK, given many of these traders are major importers to the UK market.

In our assessment, we included 384 storage facilities, 13 crushing facilities and three refining facilities. As much as possible, we included those facilities operating in 2016 and 2017 to represent the latest information on facilities operating currently. However, as most storage facilities were not dated, we included all 378 undated storage facilities in addition to the six dated from either 2016 or 2017.

METHODS FOR 'PALM OIL FROM WEST KALIMANTAN' CASE STUDY

LINKING PALM OIL MILLS TO MAJOR UK TRADERS

Due to limited transparency in palm oil supply chains, there is no up-to-date data on the volumes of palm oil coming from sub-national jurisdictions of palm oil producer countries into the UK market. For example, the latest TRASE dataset for palm oil traded volumes from Indonesia is for 2015, and since the turnover of mills supplying an international trader can be approximately 25% per year, this provides limited guidance of more current supply chains.

In the absence of up-to-date and reliable data, the approach we have taken is to analyse the published mill lists of major importers of palm oil, palm kernel oil, and palm oil derivatives and fractions into the UK market. We assumed that if mills from West Kalimantan are contributing to the global supply base of a UK importer, then there is a reasonable likelihood that some of the material they import is reaching the UK market. While this will not always be the case (e.g. at least one of the major traders supplies its UK operations from just two companies, one Malaysian and one Indonesian, rather than from its global stable of supplying mills), it provides a first-order estimate of the likely supply chain links between West Kalimantan and the UK, in the absence of greater transparency from supply chain actors.

Two types of data were used to assess the potential linkages between palm oil produced in West Kalimantan and UK consumption. Firstly, GFW provides a near-complete list of palm oil mills for Indonesia (for 2019), with additional data on the corporate ownership of each mill. This is important, because many mills in Indonesia are individual companies, but are often owned by a larger group, and there are well-established strategic and ownership relationships between some palm oil trading companies and large producers. Secondly, most major palm oil traders produce lists of the mills that supply them, with varying degrees of information, in varying formats and updated with different frequencies. These lists provide the most up-to-date information available on which mills are supplying the traders' global palm oil operations. We acquired the mill lists for the major palm oil importers into the UK: AAK, ADM, Bunge and Cargill. For each of these companies, the most recent publicly available list of mills was analysed. For AAK, this was December 2013, for ADM[289] 2018, for Bunge[290] 2019 and for Cargill[291] it was the third quarter of 2019. Two other major importers (New Britain Palm Oil and Olenex) have different, more vertically integrated supply chains, and consequently our assessment was based on ownership of mills in West Kalimantan using GFW's mill list. For ADM, the mill list supplied has a greater number of mills in the province than listed by GFW; however, we could not find any duplicate geolocations amongst ADM's list, suggesting that this figure may be correct.

UK FINANCE TO COMPANIES IN WEST KALIMANTAN

Potential financial linkages between palm oil companies operating in West Kalimantan and UK financial institutions were assessed using data from Forest and Finance[292]. Corporate group names mentioned in the Forest and Finance database were cross-referenced against GFW's palm oil mills list.

TREE COVER LOSS IN WEST KALIMANTAN

The rates of tree cover loss in West Kalimantan from GFW's data (2011-18) were used to assess deforestation and conversion in the region. Due to West Kalimantan's prominent forest cover, this refers mostly to deforestation. Information from the IUCN Red List database[75] was used to highlight the number of species under threat.

METHODS FOR 'COCOA FROM IVORY COAST' CASE STUDY

LINKING COCOA PRODUCTION TO THE UK

The majority of cocoa entering into Europe and the UK is imported by a small number of traders, including Barry Callebaut, Cargill, Olam and Cémoi. There is very limited transparency on global cocoa supply chains. Traders do not produce publicly available lists of the cooperatives that they source from, even though many do hold this information privately and most of the major cocoa traders have commitments to traceability of their supply chains. There are no independent platforms providing granular information on the trade of cocoa from Ivory Coast to destination countries. The main source of publicly available information on the location of cocoa producers within the country is the painstakingly collated Cocoa Accountability Map created by Mighty Earth[251]. While this data may not be comprehensive, it is the best available information on where cocoa is produced within Ivory Coast.

In the absence of up-to-date and reliable supply chain data, the approach we have taken is to relate district-level data on tree cover loss (from GFW) with the number of cocoa producer cooperatives in each district taken from Mighty Earth's Cocoa Accountability Map database. Our case study draws heavily on Mighty Earth's 2020 *Rapid Response* report published alongside their Cocoa Accountability Map, in which cocoa-related deforestation risk is calculated for each of the seven cooperatives assessed using spatially explicit data. The report does not state that the cooperatives in question are directly responsible for specific cases of deforestation, but the risk is assessed on the assumption that the size of a cooperative is correlated with the average distance travelled by cacao. This methodology has limitations: road access, topography and buying price all affect the distance travelled from production area to cooperative in practice but were not included in the assessment.

We assume that – in the absence of published lists of suppliers – any cooperative in Ivory Coast could potentially be supplying the UK market. In addition, we also assumed that any cooperative could be supplying the major global traders that import cocoa into the UK, whether or not that material enters the UK market. This approach provides a first-order estimate of the likely supply chain links between districts within Ivory Coast and the UK, in the absence of greater transparency from supply chain actors.

COCOA PRODUCTION AND RISKS TO BIODIVERSITY

Information on species under threat in Ivory Coast was obtained from the IUCN Red List database, and various sources used to illustrate the linkages between cocoa production and deforestation.

ESTIMATING CO_2 EMISSIONS

We report CO_2 emissions from GFW, which refer to gross CO_2 emissions from aboveground woody biomass loss. For further details, please refer to GFW's methodology[293].

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Herd of cattle on Transpantaneira highway MT-60, Pantanal. Poconé, State of Mato Grosso, Brazil.

GLOSSARY

AD - Amsterdam Declarations
ADM - Archer Daniels Midland
AFi - Accountability Framework initiative
CAR - Cadastro Ambiental Rural (Brazilian National Environmental Registry of Rural Properties)
CBD - Convention on Biological Diversity
CEPA - Comprehensive Economic Partnership Agreement
CGF - Consumer Goods Forum
COP - Conference of the Parties
CO_2 - Carbon dioxide
CO_2e - Carbon dioxide equivalent
CR - Critically Endangered
CWE - Carcass weight equivalent
DEFRA - Department for Environment, Food and Rural Affairs
DFID - Department for International Development
EN - Endangered
EU - European Union
EUTR - European Union Timber Regulation
FAO - Food and Agriculture Organization of the United Nations
FEFAC - European Feed Manufacturers' Federation
FLEGT - Forest Law Enforcement, Governance and Trade
FSC - Forest Stewardship Council
FTA - Free trade agreement
GBS - Government Buying Standards
GCF - Green Climate Fund
GFW - Global Forest Watch
GHG - Greenhouse gas
GIZ - Deutsche Gesellschaft für Internationale Zusammenarbeit
GPSNR - Global Platform for Sustainable Natural Rubber
GRI - Global Resource Initiative
HCS - High carbon stock
HCV - High conservation value
HWE - Hide weight equivalent
ICF - International Climate Fund
IDH - The Sustainable Trade Initiative
IP - Identity Preserved
IPOP - Indonesian Palm Oil Pledge
IRSG - International Rubber Study Group
ISPO - Indonesian Sustainable Palm Oil
ISU - Prince of Wales' International Sustainability Unit
ITUC - International Trade Union Confederation
IUCN - International Union for Conservation of Nature
LID - Living Income Differential
LUC - Land-use change
Mha - Million hectares
MP - Member of Parliament
Mt - Million tonnes
Mt CO_2e - Million tonnes of carbon dioxide equivalent
NAI - Net annual increment
NDC - Nationally determined contribution
NDPE - No deforestation on peatlands and no exploitation
NGO - Non-governmental organisation
NHS - National Health Service
NYDF - New York Declaration on Forests
ODA - Official Development Assistance
PCI - Produce, Conserve and Include Strategy
PEFC - Programme for the Endorsement of Forest Certification
PKE - Palm kernel expeller
PKO - Palm kernel oil
POTC - Palm Oil Transparency Coalition
RSPO - Roundtable on Sustainable Palm Oil
RTRS - Round Table on Responsible Soy
SARS - Severe Acute Respiratory Syndrome
SDGs - Sustainable Development Goals
SNR-i - Sustainable Natural Rubber Initiative
SPOTT - Sustainability Policy Transparency Toolkit
TPP - Timber Procurement Policy
UK - United Kingdom
UKTR - United Kingdom Timber Regulation
UMSEF - Unidad de Manejo del Sistema de Evaluación Forestal (Forest Evaluation System Management Unit from Argentina)
UN - United Nations
UNFCCC - United Nations Framework Convention on Climate Change
US - United States
UTZ - UTZ certified
VPAs - Voluntary partnership agreements
VU - Vulnerable
WCF - World Cocoa Foundation
WRME - Wood raw material equivalent

ANNEXES

ANNEX A (SOY CASE STUDY)

INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE (IUCN) RED LIST OF ANIMALS AND PLANTS IN MATO GROSSO, BRAZIL

Source: www.iucnredlist.org

Scientific name	Common name	Kingdom	IUCN Red List category	Population trend
Cereus saddianus		Plantae	Critically Endangered	Decreasing
Lagothrix cana	Geoffroy's Woolly Monkey	Animalia	Endangered	Decreasing
Ateles chamek	Black Spider Monkey	Animalia	Endangered	Decreasing
Ateles marginatus	White-Whiskered Spider Monkey	Animalia	Endangered	Decreasing
Erythrodiplax ana		Animalia	Endangered	Stable
Ficus aripuanensis		Plantae	Endangered	
Manilkara paraensis		Plantae	Lower Risk/ Conservation Dependent	
Canthon corpulentus		Animalia	Vulnerable	Unknown
Astyanax trierythropterus		Animalia	Vulnerable	Decreasing
Alouatta discolor	Red-Handed Howling Monkey	Animalia	Vulnerable	Decreasing
Myrmecophaga tridactyla	Giant Anteater	Animalia	Vulnerable	Decreasing
Priodontes maximus	Giant Armadillo	Animalia	Vulnerable	Decreasing
Swietenia macrophylla	Big-Leaf Mahogany	Plantae	Vulnerable	
Bertholletia excelsa	Brazil-Nut Tree	Plantae	Vulnerable	
Pouteria macrocarpa		Plantae	Vulnerable	
Amburana acreana		Plantae	Vulnerable	
Manilkara excela		Plantae	Vulnerable	
Nectandra matogrossensis		Plantae	Vulnerable	
Pouteria microstrigosa		Plantae	Vulnerable	
Sarcaulus Inflexus		Plantae	Vulnerable	
Arachis hoehnei		Plantae	Vulnerable	Unknown
Platythelys paranaensis		Plantae	Vulnerable	Decreasing
Cedrela fissilis		Plantae	Vulnerable	Decreasing
Rhipsalis russellii		Plantae	Vulnerable	Decreasing
Tovomita calophyllophylla		Plantae	Vulnerable	Unknown

ANNEX B (SOY CASE STUDY)

SOY FROM MATO GROSSO EXPORTED DIRECTLY TO THE UK BY MUNICIPALITY, TREE COVER LOSS AND ESTIMATED CO_2 EMISSIONS DUE TO SOY IMPORTS

	Soy exports to the UK (2015-17)				
Municipality in Mato Grosso state*	Total (tonnes)	Average (tonnes)	Average annual soy land area (hectares)	Total tree cover loss‡ (hectares)	Total CO_2 emissions§ (tonnes)
'Unknown'	143,676	47,892	-	-	-
Sapezal	132,999	44,333	14,570	53	6,285
Ipiranga do Norte	69,542	23,181	7,909	20	5,130
Sinop	60,463	20,154	6,636	34	12,031
Comodoro	56,791	18,930	5,941	16	3,766
Campo Novo do Parecis	48,812	16,271	5,281	8	609
Campos de Júlio	45,281	15,094	4,884	58	5,398
Tabaporã	38,489	12,830	4,056	31	10,796
Primavera do Leste	30,426	15,213	3,568	12	659
São José do Xingu	29,200	9,733	2,927	0	0
Porto dos Gaúchos	24,000	24,000	2,577	15	4,881
Tangará da Serra	21,670	7,223	2,236	27	2,993
São Félix do Araguaia	20,285	10,142	2,099	8	1,129
Nova Ubiratã	18,658	6,219	1,743	16	3,378
All municipalities below 2% threshold	152,680	1,348	16,386	85	16,701
Total	**892,973**	**297,657**	**92,935†**	**442†**	**84,824†**

Notes:
* *Municipalities that were responsible for 2% or more of the total soy volume exported to the UK from Mato Grosso between 2015 and 2017.*
‡ *Refers to the estimated total tree loss from soy production (soy deforestation risk five-year average) allocated to the UK, due to soy imports between 2015 and 2017.*
§ *Refers to the estimated total CO_2 emissions from tree loss (soy deforestation risk 5-year average) allocated to the UK, due to soy imports between 2015 and 2017.*
† *Totals for soy land area, tree cover loss and CO_2 emissions were corrected to account for imports from 'unknown' municipalities (estimated as 15% higher).*

Source: TRASE

ANNEX C (COCOA CASE STUDY)

ANNEX C.1. NUMBER OF COCOA COOPERATIVES IN IVORY COAST, BY DISTRICT

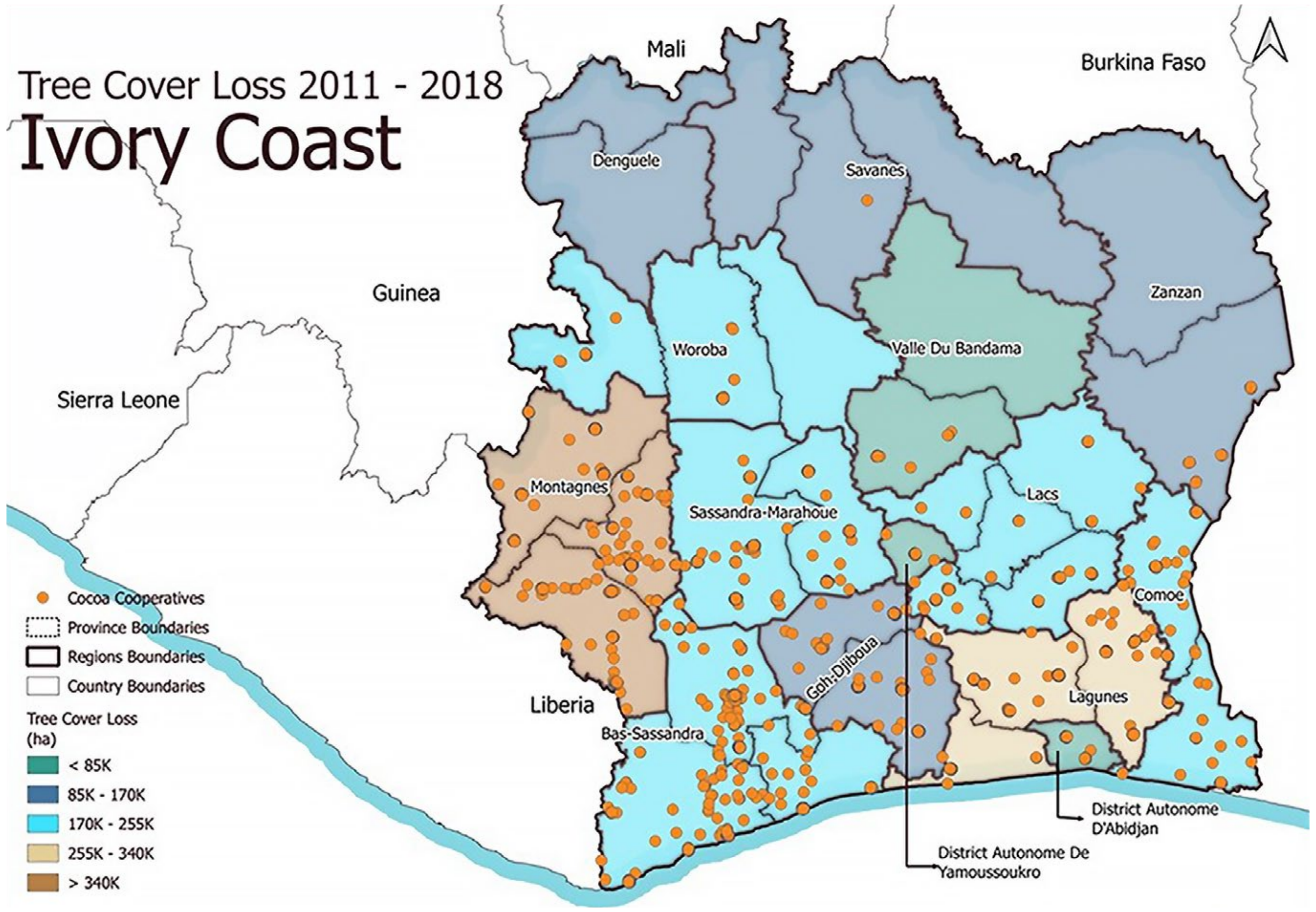
Source: Mighty Earth.

District	Number of cooperatives
Bas-Sassandra	867
Montagnes	690
Sassandra-Marahoué	548
Gôh-Djiboua	488
Lagunes	318
Comoé	215
Lacs	80
Woroba	54
Abidjan	42
Zanzan	18
Yamoussoukro	17
Vallée du Bandama	13
Savanes	1
Denguélé	(no data)
Total	**3,351**

ANNEX C (COCOA CASE STUDY)

ANNEX C.2. TREE COVER LOSS IN IVORY COAST 2011-18 (HECTARES) BY DISTRICT

Source: Tree cover loss – Global Forest Watch; boundaries data – World Bank https://datacatalog.worldbank.org/dataset/cote-divoire-administrative-boundaries-2016



ANNEX D (CONVERSION FACTORS)

ANNEX D.1. HS CODES AND CONVERSION FACTORS USED FOR TIMBER AND PULP & PAPER PRODUCTS IN THIS STUDY

HS Code	Short description	Factor	Notes
4401	Fuelwood	1.2	
4402	Charcoal	6	
4403	Wood in the rough	1	
4404	Hoopwood	1.8	Conservative factors for sawnwood used: average of softwood (1.099) and hardwood (2.5)
4405	Wood wool	1.8	Conservative factors for sawnwood used: average of softwood (1.099) and hardwood (2.5)
4406	Railway sleepers	2.26	
4407	Wood sawn lengthwise	1.8	Average of softwood (1.099) and hardwood (2.5) sawn wood factors
4408	Veneer sheets	3.45	
4409	Shaped wood	2.5	'Other manufactured wood' in Forestry Commission factors
4410	Particle board	2.5	'Other wood based panels' in Forestry Commission factors
4411	Fibreboard	2.5	
4412	Laminates	2.5	
4415	Wooden packing cases and pallets	2	
4417	Tools and tool handles	2.5	'Other manufactured wood' in Forestry Commission factors
4418	Builders joinery	2.5	'Other manufactured wood' in Forestry Commission factors
4419	Wooden tableware	2.5	
4420	Wood marquetry	2.5	
4421	Other articles of wood	2.5	'Other manufactured wood' in Forestry Commission factors
4413	Densified wood	2.5	'Other manufactured wood' in Forestry Commission factors
4414	Wooden frames	2.5	'Other manufactured wood' in Forestry Commission factors

HS Code	Short description	Factor	Notes
4416	Wooden casks and barrels	2.5	'Other manufactured wood' in Forestry Commission factors
940161	Wooden seats (upholstered)	2.5	'Other manufactured wood' in Forestry Commission factors
940169	Wooden seats, not upholstered	2.5	'Other manufactured wood' in Forestry Commission factors
940330	Wooden office furniture	2.5	'Other manufactured wood' in Forestry Commission factors
940340	Wooden kitchen furniture	2.5	'Other manufactured wood' in Forestry Commission factors
940350	Wooden bedroom furniture	2.5	'Other manufactured wood' in Forestry Commission factors
940360	Other wooden furniture	2.5	'Other manufactured wood' in Forestry Commission factors
940390	Wooden furniture parts	2.5	'Other manufactured wood' in Forestry Commission factors
4703	Chemical wood pulp, soda or sulphate	4.5	Bleached sulphate pulp is converted at 6.00, unbleached at 4.50. The more conservative factor is used.
4801	Newsprint	2.8	
4802	Uncoated paper and paperboard	2.8	
4804	Uncoated kraft paper	2.5	Conversion factor used is for 'other paper and paperboard'
4805	Other uncoated paper	2.5	Conversion factor used is for 'other paper and paperboard'
4810	Paper and paperboard, coated with kaolin	2.5	Conversion factor used is for 'other paper and paperboard'
4811	Paper and paperboard, surface-decorated or printed	2.5	Conversion factor used is for 'other paper and paperboard'
4819	Cartons and boxes of paper and paperboard	2.5	Conversion factor used is for 'other paper and paperboard'

ANNEX D (CONVERSION FACTORS)

ANNEX D.2. NET ANNUAL INCREMENT (NAI) VALUES PER COUNTRY, USED IN TIMBER AND PULP & PAPER PRODUCTS FOOTPRINT CALCULATIONS

Country	NAI (m³/ha/year)	Source
Austria	7.1	NAI from FAO Global Forest Resources Assessment (GFRA) 2015 Desk Reader
Belgium	7.7	NAI from FAO GFRA 2015 Desk Reader
Brazil	10.3	(source: see *Risky Business* Belgium report)
Canada	1.4	(from: www.ccfm.org/ci/prog_cr23_e.pdf)
China	3.6	NAI from FAO GFRA 2015 Desk Reader
Finland	4.4	NAI from FAO GFRA 2015 Desk Reader
France	5.5	NAI from FAO GFRA 2015 Desk Reader
Germany	11.2	NAI from FAO GFRA 2015 Desk Reader
Ireland	11.5	NAI from FAO GFRA 2015 Desk Reader (2010 data is the most recent)
Italy	3.2	NAI from FAO GFRA 2015 Desk Reader
Latvia	6.6	NAI from FAO GFRA 2015 Desk Reader
Netherlands	7.3	NAI from FAO GFRA 2015 Desk Reader
Norway	2.3	NAI from FAO GFRA 2015 Desk Reader
Poland	8	NAI from FAO GFRA 2015 Desk Reader
Russian Federation	1.3	NAI from FAO GFRA 2015 Desk Reader
Sweden	3.2	NAI from FAO GFRA 2015 Desk Reader
USA	2.9	NAI from FAO GFRA 2015 Desk Reader
Others (timber)	6.8	Average of other NAIs
Others (pulp & paper)	5.1	Average of other NAIs

ANNEX D (CONVERSION FACTORS)

ANNEX D.3. HS CODES AND CONVERSION FACTORS USED FOR COCOA PRODUCTS IN THIS STUDY

HS code	Short description	% cocoa	Source		
1801	Cocoa beans	100%			
1802	Cocoa shells	100%			
180310	Cocoa paste	100%			
180320	Defatted cocoa paste	100%			
1804	Cocoa fats	100%			
1805	Cocoa powder	100%			
180610	Sweetened cocoa product	25%	The Cocoa and Chocolate Products (England) Regulations 2003, see: www.legislation.gov.uk/uksi/2003/1659/made		
			Based on average of underlying Combined Nomenclature (CN) code conversion ratios:		
			18062010	31%	Lower limit in CN code description
			18062030	25%	Lower limit in CN code description
180620	Bulk chocolate product	18%	18062050	18%	Lower limit in CN code description
			18062070	9.9%	Average cocoa content of different chocolate crumbs, see: meadowfoods.co.uk/chocolate-crumb-the-unsung-hero-of-british-chocolate/
			18062080	16%	The Cocoa and Chocolate Products (England) Regulations 2003, see: www.legislation.gov.uk/uksi/2003/1659/made
			18062095	10%	Best estimate
180631	Filled chocolate product	41%	Based on shop research for WWF-UK *Risky Business*		
180632	Chocolate product	41%	Based on shop research for WWF-UK *Risky Business*		
180690	Other chocolate product	18%	Based on average of underlying Combined Nomenclature (CN) code conversion ratios:		
			18069011	20%	Best estimate
			18069019	20%	Best estimate
			18069031	20%	Best estimate
			18069039	20%	Best estimate
			18069050	2%	Best estimate
			18069060	7.4%	Based on shop research
			18069070	41%	Based on shop research
			18069090	10%	Best estimate

ANNEX D (CONVERSION FACTORS)

ANNEX D.4. HS CODES AND CONVERSION FACTORS USED FOR PALM OIL PRODUCTS IN THIS STUDY

HS code	Short description	% palm oil	Source
120710	Palm nuts and kernels	100%	
151110	Crude palm oil	100%	
151190	Refined palm oil	100%	
151321	Crude palm kernel oil	100%	
151329	Refined palm kernel oil	100%	
1517	Margarine	24%	Based on estimate stated in a research report of the UK Department for Food, Environment and Rural Affairs on the palm oil supply chain, see: randd.defra.gov.uk/Document.aspx?Document=EV0459_10154_FRA.pdf
1806	Chocolate	5.15%	Based on estimate stated in a research report of the UK Department for Food, Environment and Rural Affairs on the palm oil supply chain, see: randd.defra.gov.uk/Document.aspx?Document=EV0459_10154_FRA.pdf
190510	Crispbread	2.37%	Based on palm oil content of toast products that are sold in France: sample of three products; content of total product minus fat content in other main ingredients. Number is halved to correct for products that use different vegetable oils, blends or butter:

Product	*Total fat (g/100g)*	*Wheat flour content*	*Fat in wheat flour*	*Fat due to wheat*	*Fat due to palm*
Biscotte Heudebert	7.4	96.4%	1.66	1.60	5.80
Narvik Pain Grillé	6.5	86%	1.66	1.43	5.07
Toast brioches	5	No info	1.66	1.66	3.34

HS code	Short description	% palm oil	Source
190520	Gingerbread	1.00%	Best estimate, based on palm oil content of gingerbread products that are sold in France: sample of multiple products indicates that there is often no palm oil in these products but rapeseed oil and butter. Example products (sources in hyperlinks): Pain d'epice – Bjorg; Pain d'epice – Carrefour; Pain d'epice - Bonne Maman

HS code	Short description	% palm oil	Source
190530	Sweet waffles and wafers	10.49%	Based on palm oil content of waffles/wafers that are sold in France: sample of three products; content of total product minus fat content in other main ingredients. Number is halved to correct for products that use different vegetable oils, blends or butter:

Product	*Total fat (g/100g)*	*(Soft) wheat flour content*	*Fat in (soft) wheat flour*	*Egg content*	*Fat in egg*	*Fat due to wheat and egg*	*Fat due to palm*
Lotus Gaufres de Liège	21.7	50%	1.95	5%	9.51	1.45	5.80
Gaufres moe-lleuses	24	33%	1.95	13%	9.51	1.86	5.07
Gaufres au miel	21	28%	1.66	N/A		0.46	3.34

HS code	Short description	% palm oil	Source
190531	Biscuits	9.35%	Based on palm oil content of biscuits that are sold in France: sample of three products; content of total product minus fat content in other main ingredients. Number is halved to correct for products that use different vegetable oils, blends or butter:

Product	*Total fat (g/100g)*	*Wheat flour content*	*Fat in wheat flour*	*Oat content*	*Fat in oat*	*Fat due to oat and egg*	*Fat due to palm*
Biscuits Thé	14	67.9%	1.66	N/A		1.13	12.87
Palmito L'original	30.5	58.9%	1.66	N/A		0.98	29.52
Good Morning Nature - McVitie's	16.7	33.7%	1.66	34.4%	7.03	2.98	13.72

HS code	Short description	% palm oil	Source
190532	Waffles and wafers	10.49%	See conversion for HS code 190530
190540	Toasted bread products	2.37%	See conversion for HS code 190510
190590	Other bakers' wares	1.00%	Best estimate (very variable)
2105	Ice cream	10.00%	Based on estimate stated in a research report of the UK Department for Food, Environment and Rural Affairs on the palm oil supply chain, see: randd.defra.gov.uk/Document.aspx?Document=EV0459_10154_FRA.pdf
230660	Palm kernel meal	100%	
291570	Palmitic acid, stearic acid, their salts & esters	100%	
3401	Soap	75%	Based on estimate stated in a research report of the UK Department for Food, Environment and Rural Affairs on the palm oil supply chain, see: randd.defra.gov.uk/Document.aspx?Document=EV0459_10154_FRA.pdf
3826	Biodiesel	102%	Calculations are based on an article by Mekhilef et al. (2011); Renewable and Sustainable Energy Reviews 15

ANNEX D (CONVERSION FACTORS)

ANNEX D.5. HS CODES AND CONVERSION FACTORS USED FOR SOY PRODUCTS IN THIS STUDY

Category	HS code	Short description	% soy	Source
Soy	120110	Soya seed	100%	
	120190	Soya beans	100%	
	120810	Flours and meals of soya beans	100%	
	150710	Crude soya oil, whether or not degummed	100%	
	150790	Soya bean oil and its fractions	100%	
	210310	Soya sauce	20%	Wilson, L. A. (1995) "Soy foods." Practical handbook of soybean processing and utilization. 428-459.
	230400	Oil cake and other solid residues of soya bean	100%	
	010210	Live breeding animals	18%	
	010221	Live pure-bred breeding animals	18%	
Beef	010229	Live cattle	18%	WWF Soy Report Card, see: d2ouvy59p0dg6k.cloudfront.net/downloads/soyreportcard2014.pdf
	010290	Live animals except pure breeding	18%	
	020110	Fresh carcasses	18%	
	020120	Fresh beef meat cuts with bone	18%	
	020130	Fresh boneless beef meat	18%	
	020210	Frozen carcasses	18%	
	020220	Frozen meat cuts with bone	18%	
	020230	Frozen boneless meat	18%	
	020610	Fresh edible offal	18%	
	020621	Tongues	18%	
	020622	Livers	18%	
	020629	Other frozen offal	18%	
	021020	Preserved beef meat	18%	
	160250	Other preserved beef meat, offal or blood	18%	

Category	HS code	Short description	% soy	Source
Poultry	020711	Fresh whole chicken	57.5%	WWF Soy Report Card, see: d2ouvy59p0dg6k.cloudfront.net/downloads/soyreportcard2014.pdf
	020712	Frozen whole chicken	57.5%	
	020713	Fresh chicken cuts	57.5%	
	020714	Frozen chicken cuts	57.5%	
Swine	0203	Fresh or frozen swine meat	26.3%	WWF Soy Report Card, see: d2ouvy59p0dg6k.cloudfront.net/downloads/soyreportcard2014.pdf
	021011	Preserved swine hams and shoulders	26.3%	
	021012	Preserved swine bellies	26.3%	
	021019	Other preserved swine meat	26.3%	
	160241	Prepared swine hams	26.3%	
	160242	Prepared swine shoulders	26.3%	
	160249	Other prepared swine meat	26.3%	
Eggs	040711	Eggs for incubation	30.7%	WWF Soy Report Card, see: d2ouvy59p0dg6k.cloudfront.net/downloads/soyreportcard2014.pdf
	040721	Fresh eggs	30.7%	
	040891	Dried egg	30.7%	
	040899	Preserved egg	30.7%	
Biodiesel	3826	Biodiesel	1,026%	(i.e. 10.26 tonnes of soy are required to produce one tonne of biodiesel). Calculations are based on publication of the University of Arkansas, see: www.uaex.edu/publications/PDF/FSA-1050.pdf

Category	HS code	Short description	% soy	Source
Dairy	040110	Low fat milk/cream	1.65%	Correct conversion factor for litre of milk > soy (0.017 — see: www.responsiblesoy.org/contribute-to-change/know-your-soy-print/?lang=en) for the weight of a litre of milk (1.03 kg / litre — see: hypertextbook.com/facts/2002/AliciaNoelleJones.shtml
	040120	Semi-skimmed milk/cream	1.65%	See conversion for HS code 40110
	040130	Medium fat milk/cream	1.65%	See conversion for HS code 40110
	040140	Full fat milk/cream	1.65%	See conversion for HS code 40110
	040150	Full cream milk/cream	1.65%	See conversion for HS code 40110
	040210	Low fat milk/cream powder	14.03%	Use same conversion factor as for milk products but multiplied by 8.5 as 8.5 litres of milk are used to produce 1 kg of powdered milk (see: www.quora.com/How-much-milk-is-required-to-produce-1-kilogram-of-powdered-milk)
	040221	Milk/cream powder	14.03%	See conversion for HS code 40210
	040229	Milk/cream powder (other)	14.03%	See conversion for HS code 40210
	040291	Unsweetened concentrated milk/cream	3.30%	Use same conversion factor as for milk products but multiplied by two as the double amount of milk is used to produce 1 kg of condensate milk (general info)
	040299	Sweetened concentrated milk	3.30%	See conversion for HS code 40229
	040310	Buttermilk	1.65%	Use same conversion factor as for milk products as this processing limitedly changes milk quantities in the product
	040390	Buttermilk (other)	1.65%	Use same conversion factor as for milk products as this processing limitedly changers milk quantities in the product
	0404	Whey	1.65%	Use same conversion factor as for milk products as this processing limitedly changers milk quantities in the product
	040610	Fresh cheese	8.01%	Use same conversion factor as for milk products but multiplied by five as five litres of milk are used to produce 1 kg of fresh cheese (see: 3wheeledcheese.wordpress.com/2012/01/19/indian-cottage-cheese-paneer-raw-milk-indian-family-200-years-of-cheese-making)
	040620	Grated/powdered cheese	14.42%	Use same conversion factor as for milk products but multiplied by nine as 8-10 litres of milk are used to produce 1 kg of cheese (see: cheeseforum.org/forum/index.php?topic=4475.0)
	040630	Processed cheese	14.42%	See conversion for HS code 40620
	040640	Blue cheese	14.42%	See conversion for HS code 40620
	040690	Other cheese	14.42%	See conversion for HS code 40620

ANNEX D (CONVERSION FACTORS)

ANNEX D.6. HS CODES AND CONVERSION FACTORS USED FOR NATURAL RUBBER PRODUCTS IN THIS STUDY

HS code	Short description	% rubber	Source
4003	Reclaimed primary rubber	19.6%	Best estimate, based on average of natural rubber estimate of compounded (20.2%) and vulcanised (19.1%) rubber. Note: this HS code most likely comprises of a mixture of scrapes of compounded and vulcanised rubber and synthetic and natural.
4005	Compounded unvulcanised rubber	20.2%	Best estimate, based on general formula of rubber compounding, see: https://www.tut.fi/ms/muo/vert/8_processing/2.3.htm. The rubber industry uses a special unit for expressing the components of a rubber mixture: parts per hundred rubber (phr), to calculate rubber content from phr values the phr rubber value is divided by SUM(rubber + compounding agents (carbon black and oil)); in this example 100/180. This number is corrected for the proportion of natural (36%) vs. synthetic (64%) rubber in France's imports.
4006	Unvulcanised rubber articles	20.2%	See conversion for HS code 4005
4007	Vulcanised rubber threads	19.1%	Best estimate, based on general formula of rubber vulcanisation, see: https://www.tut.fi/ms/muo/vert/8_processing/2.3.htm. The rubber industry uses a special unit for expressing the components of a rubber mixture: parts per hundred rubber (phr), to calculate rubber content from phr values the phr rubber value is divided by SUM(all phr values); in this example 100/190. This number is corrected for the proportion of natural (36%) vs. synthetic (64%) rubber in France's imports. Note: vulcanised rubber contains highly variable rubber contents as different degrees of vulcanisation are used for different purposes so this is a best estimate.
4008	Vulcanised rubber	19.1%	See conversion for HS code 4008
4009	Vulcanised rubber pipes and hoses	19.1%	See conversion for HS code 4008
4013	Rubber inner tubes	19.1%	See conversion for HS code 4008
4014	Vulcanised rubber hygienic articles	19.1%	See conversion for HS code 4008
4016	Other vulcanised rubber articles	19.1%	See conversion for HS code 4008
4017	Hard rubber articles	19.1%	See conversion for HS code 4008
5604	Textile covered threads	19.1%	See conversion for HS code 4008
400110	Latex	100.0%	
400121	Smoked sheets	100.0%	
400122	TSNR	100.0%	
400129	Other natural rubber	100.0%	

HS code	Short description	% rubber	Source
400400	Rubber waste and scrap	19.6%	Best estimate, based on average of natural rubber estimate of compounded (20.2%) and vulcanised (19.1%) rubber. Note: this HS code most likely comprises of a mixture of scrapes of compounded and vulcanised rubber and synthetic and natural.
400610	Camel-back strips	19.6%	See conversion for HS code 400400
401110	Car tyres	14.0%	Based on information that 14% of passenger car tyre is natural rubber, see: http://infohouse.p2ric.org/ref/11/10504/html/intro/tire.htm
8703	Cars	0.51%	Based on the number of imported cars (not weight): assumes that each imported car has five tyres, at an average weight of 7.3 kg and a natural rubber content of 14%
401120	Lorry tyres	27.0%	Based on information that 27% of truck tyre is natural rubber, see: http://infohouse.p2ric.org/ref/11/10504/html/intro/tire.htm
401130	Aircraft tyres	27.0%	Based on natural rubber estimate of lorry tyres (27%)
401140	Motorcycle tyres	14.0%	Based on natural rubber estimate of car tyres (14%)
401150	Bicycle tyres	14.0%	Based on natural rubber estimate of car tyres (14%)
401161	Tractor tyres	27.0%	Based on natural rubber estimate of lorry tyres (27%)
401211	Retreated car tyres	14.0%	Based on natural rubber estimate of car tyres (14%)
401212	Retreated lorry tyres	27.0%	Based on natural rubber estimate of lorry tyres (27%)
401213	Retreated aircraft tyres	27.0%	Based on natural rubber estimate of lorry tyres (27%)
401219	Other retreated tyres	20.5%	Based on average of natural rubber estimate of car (14%) and lorry tyres (27%)
401220	Used tyres	20.5%	Based on average of natural rubber estimate of car (14%) and lorry tyres (27%)
401290	Other tyres	20.5%	Based on average of natural rubber estimate of car (14%) and lorry tyres (27%)
401511	Surgical gloves	19.1%	See conversion for HS code 4008
401519	Other rubber gloves	19.1%	See conversion for HS code 4008
401590	Rubber accessories	19.1%	See conversion for HS code 4008

ANNEX D (CONVERSION FACTORS)

ANNEX D.7. HS CODES AND CONVERSION FACTORS USED FOR BEEF & LEATHER PRODUCTS IN THIS STUDY

Category	HS code	Short description	Conversion carcass weight equivalent	Source
Beef	0102	Live cattle	0.62	Holland, R., Loveday, D. & Ferguson, K. (n.d.). How much meat to expect for a beef carcass. UT Extension PB 2822. University of Tennessee.
	0201	Fresh or chilled beef	0.66	Holland, R., Loveday, D. & Ferguson, K. (ibid)
	0202	Frozen beef	0.66	Holland, R., Loveday, D. & Ferguson, K. (ibid)
	020610	Fresh or chilled bovine offal	0.47	Agriculture and Horticulture Development Board (2014). AHDB Beef Yield Guide. AHDB, Kenilworth, Warwickshire, UK. http://www.qsmbeefandlamb.co.uk/books/beef-yield-guide/files/assets/common/downloads/beef-yield-guide.pdf
	021020	Salted or dried beef	0.66	Holland, R., Loveday, D. & Ferguson, K. (op. cit.)
	0504000	Beef and veal tripe	0.03	Agriculture and Horticulture Development Board (2014). (op. cit.)
	160210	Homogenised meat preparations	0.66	Holland, R., Loveday, D. & Ferguson, K. (op. cit.)
	160250	Prepared beef	0.66	Holland, R., Loveday, D. & Ferguson, K. (op. cit.)
	160300	Meat extract	2.98	Estimate: assumes any (edible) part of carcass can be used, based on Holland, R., Loveday, D. & Ferguson, K. (op. cit.) and is concentrated to approximately 20% of original weight
	210410	Meat broths and soups	0.05	Estimate: products will include other ingredients

Category	HS code	Short description	Hide equivalent	Source
Leather	4101	Preserved bovine hides	1.000	Holland, R., Loveday, D. & Ferguson, K. (n.d.). How much meat to expect for a beef carcass. UT Extension PB 2822. University of Tennessee.
	4104	Tanned bovine hides	0.255	Source: http://leatherpanel.org/sites/default/files/publications-attachments/mass_balance.pdf
	410711	Tanned prepared bovine hides	0.255	Source: http://leatherpanel.org/sites/default/files/publications-attachments/mass_balance.pdf
	4115	Composition leather	0.128	European Committee For Standardization published EN 15987:2011 'Leather — Terminology — Key definitions for the leather trade' to stop further confusion about bonded leather. The minimum amount of 50% in weight of dry leather is needed to use the term 'bonded leather'.
	420211	Leather cases	0.230	Estimate, assumed 90% of the weight of the product is leather
	420221	Leather handbags	0.230	Estimate, assumed 90% of the weight of the product is leather
	420231	Leather wallets and purses	0.230	Estimate, assumed 90% of the weight of the product is leather
	420291	Other articles of leather	0.230	Holland, R., Loveday, D. & Ferguson, K. (op. cit.)
	420310	Leather apparel	0.230	Estimate, assumed 90% of the weight of the product is leather
	420321	Leather sports gloves	0.230	Estimate, assumed 90% of the weight of the product is leather
	420329	Leather gloves	0.230	Estimate, assumed 90% of the weight of the product is leather
	420330	Leather belts	0.230	Estimate, assumed 90% of the weight of the product is leather
	6403	Leather shoes	0.084	Assumes that approximately one third of the weight of a pair of shoes is leather, that 0.28 kg of leather is used per pair: https://leatherpanel.org/sites/default/files/publications-attachments/structure_of_production_costs_in_footwear_manufacture.pdf
	940120	Car seats	0.001	Estimated from proportion of leather used globally in car seats: https://leatheruk.org/
	940161	Upholstered seats (wooden frames)	0.022	Estimated from proportion of leather used globally in upholstery: https://leatheruk.org/
	940171	Upholstered seats (metal frames)	0.022	Estimated from proportion of leather used globally in upholstery: https://leatheruk.org/
	8703	Cars and other vehicles	0.006	Estimated from proportion of leather used globally in car seats: https://leatheruk.org/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An aerial photograph of the Uatumã Biological Reserve in the state of Amazonas in Brazil.
Uatumã Biological Reserve is part of the Amazon Region Protected Areas (ARPA).

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