

January 2020



## Risky Business:

The risk of corruption and forest loss in Denmark's imports of soy, timber, pulp and paper

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# 1 Executive summary

Since humans started cutting down forests, 46% of the world's trees have been felled.<sup>1</sup> Between 1990 and 2015 alone, the world lost 129 million hectares of forest.<sup>2</sup> While the production of commodities such as soy, timber, pulp and paper has provided income and livelihoods for many, it has also caused significant deforestation as well as social exploitation through, for example, land grabs and unfair working conditions.

Denmark imports many commodities with supply chains that are associated with deforestation and social challenges overseas. This report focuses on just three commodities – soy, timber, pulp and paper – since this is assumed to be where the greatest impact and risk is. This report therefore gives a good insight into, but not the whole picture of, the deforestation and social impact of Danish commodity imports.

Denmark imports significant quantities of soy, timber, pulp and paper – consuming them, processing them, and trading them with other countries. This links Denmark to deforestation and social exploitation that is happening overseas. This research determines the extent of Denmark's role in the trade of these commodities, and the risks posed by this trade. For Danish soy, timber, pulp and paper imports, it estimates the quantity, value, land footprint, and social and deforestation risks from each country of import. This analysis focuses on those countries from which Denmark imports a larger than 2% share of its total imports for the commodity. Imports are then compared to production and exports to work out the extent to which Denmark consumes these commodities or trades them further.

The land required to grow Denmark's imports of soy, timber, pulp and paper each year is 3.56 million hectares<sup>3</sup> or 35,551 square kilometres. This is the equivalent to 84% of the total land area of Denmark or five times the land area of Zealand. Broken down by commodity, 56% of this is for timber (1,995,000 hectares), 25% for soy (898,000 hectares) and 19% for pulp and paper (662,000 hectares). In comparison to the land area of Denmark, the timber import land footprint is almost half the total land area of Denmark, whereas the soy import land footprint is greater than the combined land area of Zealand and Lolland. and the pulp and paper import land footprint is more than twice the land area of Funen.

Most of this land footprint is for imports that are consumed within Denmark, but some is for products that are exported from Denmark, such as swine meat. The Danish domestic consumption rate for soy, timber, pulp and paper imports and production are 69%, 80% and 67% respectively – the remainder is exported. When applying these consumption rates to import land footprints, we get an overall consumption land footprint of 620,560.76 hectares for soy (slightly more than the combined area of Funen and Lolland), 1,598,00 hectares for timber (greater than twice the area of Zealand) and 443,000 hectares for pulp and paper (as with soy, greater than the combined land area of Funen and Lolland). See Figure A.

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<sup>1</sup> Crowther, T., Glick, H., Covey, K. *et al.* (2015) Mapping tree density at a global scale. *Nature* **525**, 201–205 (2015) doi:10.1038/nature14967

<sup>2</sup> FAO (2016) Global Forest Resource Assessment 2015

<sup>3</sup> This is the average amount of land required for the years 2014-2018.

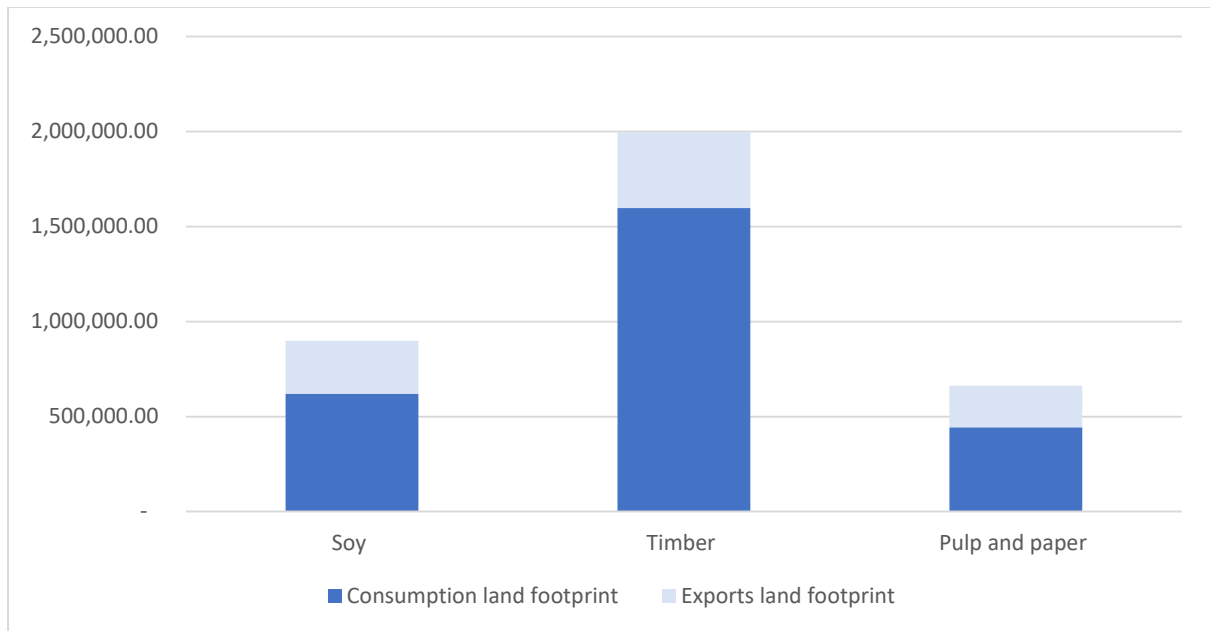


Figure A: Land footprint of Danish imports of soy, timber, pulp and paper in hectares, broken down by domestic consumption and export land footprints. This is estimated by applying Danish consumption rates for each commodity to the commodity import land footprints.

Commodity imports are rarely traceable back to individual farms or plantations, and so the exact contribution of Denmark's imports to deforestation, forest degradation, habitat conversion and social problems is unknown. It remains, however, a very real risk.

This study estimates this risk by evaluating the rate and extent of deforestation, the perceived level of corruption, and the labour rights conditions in the countries within which Denmark has a footprint.

Of Denmark's total land footprint, 31% is in countries that are high or very high risk on deforestation and social indicators, and only 6% is in low risk countries (Figures B and C).

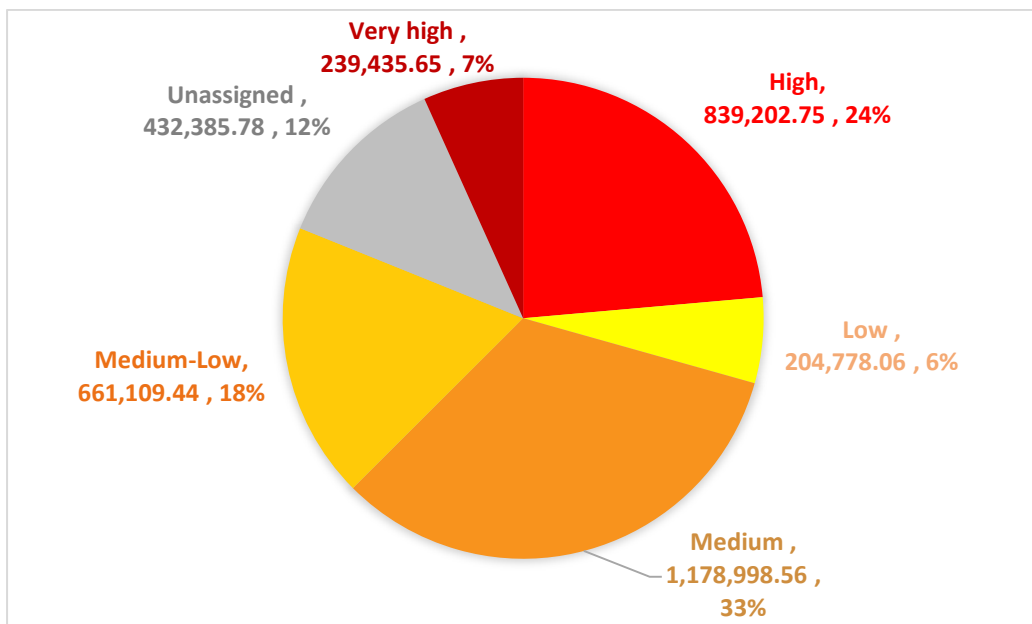
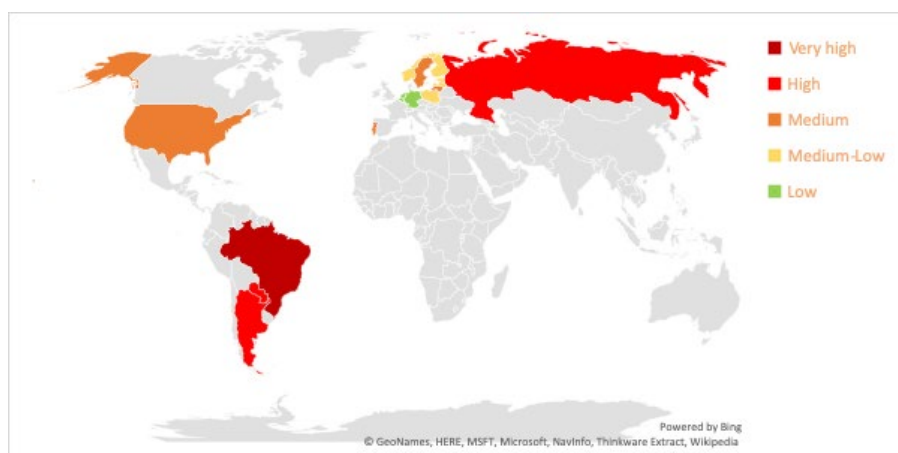


Figure B: The land footprint of Danish imports of soy, timber, pulp and paper, classified as very high to low risk based on the risk rating of the country of provenance.

Denmark's total land footprint in countries that are high or very high risk is 1.08 million hectares. Over half of this (54%) is soy imports from Brazil, Argentina and Paraguay, and the remaining 46% is timber imports from Russia (of which 91% are fuelwood). The high proportion of FSC certification in Danish fuelwood imports from Russia significantly mitigates this risk, however.

Soy presents the highest risk commodity import, accounting for 65% of Denmark's land footprint in countries that are high or very high risk, followed by timber, where it is 25% (or 3% if you exclude Russian fuelwood). For pulp and paper, no country that accounts for greater than 2% of Denmark's imports is high or high risk, making it the least risky commodity import that we investigated.



*Figure C: Social and deforestation risk profile of countries from where Denmark imports over 2% of soy, timber, pulp and paper. an average year between 2014-2018*

In all of these commodity sectors, there are companies and certification schemes that produce commodities responsibly, and companies that show diligence in excluding deforestation and social exploitation from their supply chains. The EU, the Danish Government, businesses, NGOs and the public have taken action to address some of these issues through initiatives such as the EU Timber Regulation, purchase of sustainably certified timber, and the Consumer Goods Forum zero net deforestation commitments.

Yet the problems of deforestation, forest degradation, habitat conversion and social exploitation persist, and there are opportunities for all stakeholders to act in order to break the link between Denmark's imports of commodities and deforestation and social exploitation.

The research presented in this report is intended to underpin WWF Denmark's recommendations for policy makers, businesses, investors, and consumers.

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## 2 Introduction

Forests are home to more than 80% of all terrestrial species, deliver ecosystem services such as flood protection and reduction in atmospheric carbon dioxide levels,<sup>4</sup> and provide a livelihood for forest-dependent communities, including the 60 million indigenous people who live in forests. Between 1990 and 2015, the world lost 129 million hectares of forest.<sup>5</sup>

Whilst the production and trade of forest commodities such as soy, timber, pulp and paper provide a livelihood for millions of people, they have also been associated with deforestation and negative social impacts, including land grabs, forced labour, and terms and conditions of employment that are below international standards.

In December 2015, Denmark – alongside France, Germany, the Netherlands and the UK – signed the Amsterdam Declaration Towards Eliminating Deforestation from Agricultural Commodity Chains with European Countries.<sup>6</sup> Taking note of related initiatives and global agreements such as the New York Declaration on Forests, the Sustainable Development Goals, and the global climate agreement reached at UNFCCC COP 21 - the Paris Agreement - the Amsterdam Declaration aims to support private sector and public initiatives to halt deforestation from the production of agricultural commodities by no later than 2020. The EU has proposed a target of halting global forest cover loss by 2030 and reducing gross tropical deforestation by at least 50% by 2020 compared to current levels.<sup>7</sup> European governments and the European Parliament have called on the Commission to develop an action plan on deforestation to deliver this goal, with French, Danish, German, Dutch and United Kingdom delegations to the Environment Council of March 2018 requesting that the Commission propose *'as soon as possible...an ambitious Commission strategy to combat imported deforestation'*.<sup>8</sup> The Commission has published a feasibility study on options for the EU to combat deforestation.<sup>9</sup>

As an importer, consumer, exporter and, in some cases, producer of forest commodities, Denmark has a role in decoupling the production of these commodities from further deforestation and social exploitation – see Box 1.

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<sup>4</sup> WWF (2018) Living Planet Report - 2018: Aiming Higher. Grooten, M. and Almond, R.E.A.(Eds). WWF, Gland, Switzerland

<sup>5</sup> FAO (2016) Global Forest Resource Assessment 2015

<sup>6</sup> Ministry of Foreign Affairs (2015) Amsterdam Declaration: Towards Eliminating Deforestation from Agricultural Commodity Chains with European Countries

<https://www.euandgvc.nl/documents/publications/2015/december/7/declarations>

<sup>7</sup> Commission of the European Communities (2008). Addressing the challenges of deforestation and forest degradation to tackle climate change and biodiversity loss. Communication from the Commission to the European Parliament, the Council, the European Economic and Social committee and the Committee of the Regions. Brussels, 17.10.2008. Last accessed 28 November 2018: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52008DC0645>

<sup>8</sup> Council of the European Union (2018). NOTE From: General Secretariat of the Council To: Delegations Subject: Amsterdam Declarations – Combating imported deforestation - Information from the French, Danish, German, Netherlands and United Kingdom delegations. Brussels, 26 February 2018. Last accessed 27 November 2018 <http://data.consilium.europa.eu/doc/document/ST-6528-2018-INIT/en/pdf>

<sup>9</sup> COWI (2018). Feasibility study on options to step up EU action against deforestation Inventory of existing EU policies, legislation and initiatives addressing the drivers of deforestation and forest degradation. FINAL REPORT. European Union, Luxembourg. ISBN 978-92-79-80498-4 Available at: [http://ec.europa.eu/environment/forests/pdf/feasibility\\_study\\_deforestation\\_kh0218321enn\\_interventions.pdf](http://ec.europa.eu/environment/forests/pdf/feasibility_study_deforestation_kh0218321enn_interventions.pdf)

### **Box 1: Imported deforestation**

The notion of imported deforestation (or ‘embodied deforestation’) refers to the deforestation associated with an imported, produced, traded, or consumed product, good, commodity or service. The concept is now widely accepted and has been enshrined within high-level policy commitments such as the Amsterdam Declaration Towards Eliminating Deforestation from Agricultural Commodity Chains with European Countries,<sup>10</sup> and global agreements such as the New York Declaration on Forests, the Sustainable Development Goals, and the global climate agreement reached at UNFCCC COP 21 (the Paris Agreement).

Over the period 1990-2008, the EU28 imported from other regions nine million hectares of deforestation embodied in crop and livestock products. This is almost 36% of the total deforestation that was embodied in crop and livestock products traded globally during that period.<sup>11</sup>

## **2.1 About this report**

The overarching purpose of the research presented here is to inform ongoing efforts to reduce the negative environmental and social impacts of Denmark’s imports of commodities. The specific research objectives are:

- To assess the quantity, value, land footprint, consumption and provenance of Denmark’s imports of soy, timber, pulp and paper.
- To generate a risk score that illustrates the risk of deforestation and social problems that Denmark’s imports of these commodities may create.

Soy, timber, pulp and paper have been chosen as the key commodities to assess in this report. It is assumed that these commodity imports have the greatest impact and deforestation risk overseas. This report therefore gives a good insight into, but not the whole picture of, the deforestation and social impact of Danish commodity imports.

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<sup>10</sup> Ministry of Foreign Affairs (2015) Amsterdam Declaration: Towards Eliminating Deforestation from Agricultural Commodity Chains with European Countries  
<https://www.euandgvc.nl/documents/publications/2015/december/7/declarations>

<sup>11</sup> European Union (2013). The impact of EU consumption on deforestation: Comprehensive analysis of the impact of EU consumption on deforestation. Technical Report 2013-063.



### 3 Methods

The general approach to data analysis is outlined in this section. The analysis is based on methods developed for a UK study that was commissioned by WWF UK and RSPB for the UK's imports of deforestation- and conversion-risk commodities.<sup>12</sup> The intent of that study was to develop a robust and transparent approach that could be replicated in other countries, and to provide evidence to guide action. The same approach has also been used for France and Belgium.

#### 3.1 Quantifying Denmark's imports

The quantity (net weight) and value (in US\$) of Denmark's imports of each commodity were extracted from the UN COMTRADE database for the years 2014-18. The UN COMTRADE database is preferred to national data as it contains comparable data for all countries, which facilitates additional calculations for export countries, and cross-checking of results. Unless otherwise stated, all trade data is derived from this database. The economic value of imported goods was converted from US\$ to Euros, using historical annual conversion rates.<sup>13</sup>

We examined three routes by which commodities feature within Denmark's supply chains:

1. As **raw materials** (e.g., soybeans);
2. As a **component or ingredient** of imported manufactured goods (e.g., soy in soy sauce);
3. **Embedded** within the production process of imported goods (e.g., soy used to feed imported chicken)

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 (see Appendices for lists of the product codes used). The estimates of imports do not include all possible imports of each commodity and are therefore conservative. However, we are confident that the HS codes used capture the majority of the imported volumes.

#### 3.2 Estimating the provenance of the Denmark's imports

When assessing the countries from which Denmark imports the selected commodities, three general situations are found:

1. **A country is a producer and exporter.** Denmark's imports can be assigned the provenance of the exporting country without further analysis (e.g., Brazil's production of soy).
2. **A country is an importer and exporter.** For example, the Netherlands imports soy and exports it to Denmark, but does not produce it domestically. In this situation, Denmark's imports of soy from the Netherlands are therefore assigned to the soy producer countries from which the Netherlands imports from.

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<sup>12</sup> WWF and RSPB (2017). Deforestation and Social Risks in the UK's Commodity Supply Chains. This report, and the summary report 'Risky Business', are available at <https://www.wwf.org.uk/riskybusiness>

<sup>13</sup> Historic exchange rates from Statista <https://www.statista.com/statistics/412794/euro-to-u-s-dollar-annual-average-exchange-rate/>

3. **A country is a producer, importer and exporter.** For example, China produces, imports and exports large quantities of timber. In this situation, the origin of major exporter's imports was analysed and added to its national production. Exports to Denmark were then assigned in the same proportion as their relative contributions to the total of the domestic production plus imports. Thus, if Country A produces one million tonnes of a commodity domestically, and imports 0.5 million tonnes from Country B, two thirds of Denmark's imports from Country A would be assigned to Country A, and one third to Country B.

To make this re-assignment feasible, we focused on estimating provenance for countries that are responsible for at least 2% on Denmark's imports – by weight of product in commodity (see Section 3.1).

### 3.3 Estimated consumption

Denmark is an importer, exporter, consumer and in some cases a producer of the commodities investigated. We provide an estimate of the quantity of each commodity consumed within Denmark to allow separation of Denmark's role as a consumer from its role as a trader.

Consumption is calculated by deducting exports from the sum of imports plus Denmark's domestic production. Domestic production is zero for soy, but is significant for timber, pulp and paper

$$\text{(Danish production + Danish imports) – Danish exports = Danish consumption}$$

The quantity of exports is estimated using UN COMTRADE data, utilizing the same HS codes (unless otherwise stated) and conversion factors used to estimate imports. Denmark's production data is from FAOSTAT.

### 3.4 Estimating the footprint of Denmark's imports of commodities

Deforestation is measured by the area of land that has lost forest cover, and if we are to make meaningful assessments of the risk of deforestation caused by Denmark's imports of commodities, we need to understand the land area required to produce Denmark's imports.

Estimating the land area required to supply Denmark's imports is a two-step process, followed by an additional step that depends on the commodity.

Firstly, the imported net weight of products needs to be converted into the quantity of harvested commodity that they contain. For raw materials (e.g., whole soybeans) no conversion is required. Where the commodity is a component of the imported goods, or embedded within it, a conversion factor is applied to the imported net weight. Details on conversion factors are given in the Appendices.

Secondly, the land area required to produce the quantity of imported commodity is estimated. This is done by applying a yield to the estimated quantity of harvested commodity. FAO yield data,<sup>14</sup> specific to each commodity for each country and year.

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<sup>14</sup> FAO STAT. The FAO calculate yield as the national production of the crop divided by area planted each year.

### 3.4.1 Additional footprint methods for soy

Soy is commonly imported in different fractions of the harvested crop. For example, soy is imported as whole soybeans, soy meal, 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 meal and 0.18 tonnes of soy oil<sup>15</sup>. The area required to supply Denmark's imports of whole soy beans (or products containing whole beans or that have whole beans embedded in the production process, once their weights have been converted to soy bean equivalent) is estimated by dividing the quantity of beans by the yield; the area for products using soy meal is estimated by dividing the quantity of meal by the yield \* 0.82; and the area for products using soy oil is estimated by dividing the quantity of oil by the yield \* 0.18.

### 3.4.2 Additional footprint methods for timber, pulp and paper

As trees are an intermittently harvested perennial crop, with hugely variable management systems, there is no straightforward measurement '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. The approach taken was therefore to use the annual increment, which is the increase in the volume of timber in a forest per hectare per year,<sup>16</sup> and which in effect accounts for the area of forest needed to produce a given amount of timber in a year. For example, if the increment were one cubic metre per hectare per year, it would take ten hectares to produce 10 cubic metres of timber in a year (equally, one hectare would produce the same amount in ten years).<sup>17</sup>

Denmark's timber, pulp and paper imports 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 useable volume of a harvested tree. The conversion factors used were from the UK Forestry Commission (see Appendix 2)<sup>18</sup>. 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). The area of forest required to produce this volume of WRME was estimated by dividing the WRME by the exporting country's Net Annual Increment (NAI, see Appendix 3).<sup>19</sup>

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<sup>15</sup> U.S. Soybean Export Council conversion table, see: <https://ussec.org/resources/conversion-table>.

<sup>16</sup> Technically, the increment measure used was 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'. Source: FAO (2012). FRA 2015 Terms and Definitions. FAO, Rome.

<sup>17</sup> 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-estimate of land footprint if Denmark'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.

<sup>18</sup> Conversion to WRME underbark: Tools and Resources: Conversion Factors. UK Forestry Commission <https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2016-introduction/sources/timber/conversion-factors/>

<sup>19</sup> Net Annual Increment (NAI) data was obtained from FAO (2016) Global Forest Resource Assessment 2015: Desk Reference. Food and Agriculture Organization of The United Nations, Rome. The FAO does not provide NAI for all of Denmark's major exporters. NAI for Brazil was calculated as the average of estimates given in D. Alder, J.N.M Silva, JOP de Ca Carvalho, J. do C. Lopes, A.R. Ruschel (2012). The cohort-empirical modelling strategy and its application to forest management for Tapajós Forest, Pará, Brazilian Amazon. Bois et Forêts Des Tropiques, 314; D. Valle, M. Schilze, E. Vidal, J. Grogan & M. Sales (2006). Identifying bias in stand-level growth

### 3.5 Risk index

The land footprint of a commodity is an estimate of how much land is required to grow imports. However, the likelihood of these imports being associated with deforestation and social exploitation depends on the production systems in the countries in which they were produced. For example, production of a commodity in a country that has strong and well-implemented labour laws is less likely to be associated with labour problems than the same commodity produced in a country with poorly implemented and weaker regulations.

A risk-based approach is used to illustrate the potential association of Denmark's commodity imports with social problems and deforestation. A risk-based approach is favoured because there are two over-arching challenges when assessing the environmental and social risks of the global trade in commodities:

- **Deforestation processes are varied.** In some instances, natural forest may be directly converted to plantations or farms. However, the process is often non-linear, and making attribution of conversion to a single commodity difficult. For example, deforestation may progress via degradation caused by logging, with farmers then using logging tracks to claim land and farm, consolidation of these settlements into larger landholdings with 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.
- **Traceability.** It is rarely possible to know which forest or plantation a particular end-product comes from, and hence whether its production has occurred directly on recently deforested land or not. Although advanced modelling and remote sensing are beginning to provide greater insight, these approaches are not available in all producer countries or for most commodities.

We developed a risk index by assigning a risk rating to each exporting country according to indicators of deforestation and social risk. The inclusion of indicators for both deforestation and social exploitation reflects the focus and commitments of many actors (private sector and NGOs) to make supply chains free from deforestation and exploitation.

Four factors were used to indicate deforestation and social risk in producer countries:

1. **Tree cover loss.** This provides an indication of the total extent of the deforestation problem in producer countries. The data used is the area of land with > 10% forest cover lost between 2014-18.<sup>20</sup> Using the low threshold of land with > 10% forest cover<sup>21</sup> means that this indicator takes into account loss of tree-savannah type vegetation, such as the Brazilian *Cerrado*, as well as high forest.

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and yield estimations: A case study in eastern Brazilian Amazonia. *Forest Ecology and Management*, Volume 236, Issues 2–3, pp 127–135 (both Amazon); and <http://www.fao.org/3/a-ac121e.pdf> (Brazilian pine plantations). The average NAI of all major countries was applied to that portion of Denmark's imports that were from countries with less than 1% of imports by value ('Other and unassigned').

<sup>20</sup> Global Forest Watch. <http://data.globalforestwatch.org/>

<sup>21</sup> Readers interested in interrogating patterns of tree cover loss can use Global Forest Watch's interactive mapping tool at <http://data.globalforestwatch.org/>

2. **Rate of deforestation.** This is a measure of the proportion of change in net natural forest area (excluding plantations) in each producer country between 2010-15. Use of this second deforestation indicator helps to balance out the bias towards large countries of the previous indicator, whereas countries that are losing a large proportion of their small remaining area of natural forest score highly on this indicator.<sup>22</sup>
3. **Perception of corruption.** No single global data set is available that captures the range of social problems that have been associated with the production of commodities. These issues include land grabs, forced labour, child labour, and terms and conditions of labour below international norms. Transparency International's Corruption Perception Index is used as a proxy for the likelihood of the range of social and governance issues within an exporting country.<sup>23</sup>
4. **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.<sup>24</sup>

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 1. These thresholds were selected according to the data range of producer countries that export to Denmark to clearly distinguish between high and low impact. For example, Brazil lost 18.5 million hectares of forest with >10% tree cover between 2014-18 compared with the Netherland's 6,021 hectares. These countries score 'high' and 'low' respectively.

Table 1: Indicators and scoring used to indicate risk of deforestation and social issues with Denmark's imports of commodities

| Indicator                    | Description  | Scoring   |                 |          |
|------------------------------|--|-----------|-----------------|----------|
|                              |  | High risk | Medium risk     | Low risk |
| <b>Tree cover loss</b>       | Global Forest Watch assessment of the area of forest cover loss 2014 -18                                 | ≥1M ha    | 500K to 1 M ha, | <500K ha |
| <b>Deforestation rate</b>    | Percentage change in natural forest 2010-15 (FAO)  | ≤-1%      | -1% to 0%       | >0%      |
| <b>Labour Standards</b>      | ITUC Labour Standards score 2019 based on reported violations of labour rights published in 2019         | ≤5        | 3 to 4          | ≥2       |
| <b>Corruption Perception</b> | Index of the perceived levels of public sector corruption published in 2018 (Transparency International) | ≤36       | 37-72           | >72      |

<sup>22</sup> FAO FLUDE data

<sup>23</sup> Transparency International (2018). Corruption Perceptions Index 2018. <https://www.transparency.org/cpi2018>

<sup>24</sup> ITUC (2019). Global rights index: the world's worst countries for workers. International Trade Union Confederation, <https://www.ituc-csi.org/IMG/pdf/2019-06-ituc-global-rights-index-2019-report-en-2.pdf>

An overall country risk rating was calculated by summing the scores for the individual indicators. This score was used to develop five risk categories: very high, high, medium, medium-low and low.

Denmark's import footprint is then apportioned to risk categories based on which partners they trade with, to illustrate the deforestation and social risks of the commodities that are the focus of this study.

### 3.6 Data limitations

There are significant challenges and constraints inherent in assessing commodity data and the link between production and deforestation. Our analysis focuses on capturing the majority of the trade in the selected commodities, not the whole, and makes conservative assumptions throughout. If anything, the results are likely to be underestimates.

Specific challenges within the constraints of this study are:

- **The diversity of products.** Many commodities have thousands of end uses. For example, the uses of timber, pulp and paper include construction, electricity generation, furniture, and stationery. The approach taken was to focus only on the major uses of each commodity.
- **Poor data on typical commodity use in products.** Commodities are combined with other components in many imported items. For example, soy is combined with other oil seeds in biodiesel. The proportions vary depending on the specific end product and price of different ingredients at the time of processing. The conversion factors used to estimate the commodity content are therefore only first order approximations.
- **Complex/long supply chains.** There are often multiple stages of processing and manufacturing, and export can occur after any of these. This means that there is – at the level of individual items – little traceability on which country, let alone forest or farm, a particular product has come from. The estimation of provenance (see above) is for some products no more than a first order estimate.
- **Need to cover multiple jurisdictions.** Sub-national patterns in production, export and deforestation are not detected in this analysis because of the need to cover multiple jurisdictions, which in turn means that the analysis of provenance is only practical at a national level. This could lead to overestimations of risk if, for example, deforestation is occurring in a different part of the country from that in which a commodity is produced. Equally, risk could be underestimated if a production of particular commodity was closely associated with deforestation.
- **Variability in productivity.** As described above, we have used national productivity (yield) assumptions. However, it is conceivable that some of Denmark's imports are sourced from a niche system with a productivity different from the country average.
- **The lack of readily available data on the Denmark'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, poor social practices, or illegality. However, there is limited data available on the proportion of Denmark's imports that are certified.

This report provides a useful guide on the overall need for action, relative levels of risk for commodities coming from different countries, and an indication of where the Danish

government, businesses and civil society might target their efforts in order to have most impact in reducing the deforestation risk of Denmark's overseas commodity footprint. There are uncertainties in the specific figures calculated using this methodology, but the index approach allows for an interpretation of the figures that is intended to be simple, transparent, and adequate to drive action.

## 4 Timber

### 4.1 Production, uses and sustainability

#### 4.1.1 Production systems

There are two major production systems for wood: plantations and natural forest. According to the most recent FAO Global Forest Resource Assessment in 2015, the bulk of the world's forest is natural, with an estimated 3.7 billion hectares in 2015. Around 31% of the world's forests, almost 1.2 billion hectares, are designated as production forest, with a further 28% (over 1 billion hectares) designated as multiple use, i.e., serving multiple functions including timber production.<sup>25</sup> The area of planted forest has increased by over 105 million hectares since 1990, and now there is an estimated 291 million hectares of plantations, which vary in the intensity of production.

Denmark has an estimated forest cover of 608,078 hectares, covering 14.1% of its land area.<sup>26</sup> In 2018, Denmark produced 7.12 million cubic meters of timber and 1.35 million cubic meters of paper and pulp. Denmark is a net importer of timber, pulp and paper products, with a combined trade deficit of 6.57 million cubic meters in 2018.

#### 4.1.2 End uses

The key product types within the timber sector are sawnwood, plywood, particleboard, furniture, fuelwood and pulp and paper. Wood is extremely versatile and has a wide variety of end uses, including:

- **Fuel:** Globally, 49% of harvested wood is used for fuel.<sup>27</sup> Timber is mostly used as fuel in developing countries, but increasingly so in some EU countries too.<sup>28</sup>
- **Construction:** Timber is widely used as a construction material in house frames, flooring (solid wood; laminate or parquet blocks), window frames, doors and doorframes, skirting, decking, garden buildings, telegraph poles, fencing, boat building, railway sleepers, etc.
- **Furniture:** Varying from softwood furniture (e.g. pine) and plywood/laminate flat pack furniture, to luxury hardwood (e.g., mahogany, teak).
- **Various:** Musical instruments, tool handles, decorative items, packaging (e.g. pallets), etc.
- **Industrial processes:** Wood is used in electricity generation, principally in the form of wood pellets, and in food processing (smoking), etc.
- **Paper and paperboard:** (see Section 1)

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<sup>25</sup> FAO (2016) Global Forest Resource Assessment 2015: How are the world's forests changing? Food and Agriculture Organization of The United Nations, Rome.

<sup>26</sup> Ministry of Environment and Food of Denmark <https://eng.mst.dk/trade/forestry/>

<sup>27</sup> FAO (2016) Global Forest Resource Assessment 2015: How are the world's forests changing? Food and Agriculture Organization of The United Nations, Rome.

<sup>28</sup> For example, the UK (see <https://www.wwf.org.uk/riskybusiness>) and France (<https://www.wwf.fr/deforestation-importee>).



### 4.1.3 Environmental and social issues associated with timber production

Unsustainable harvesting of timber has been cited as a major driver of deforestation,<sup>29</sup> forest degradation, habitat destruction, and species loss in some of the most biodiverse and ecologically important places in the world.<sup>30</sup> Other reported negative environmental impacts include increased vulnerability to natural disasters such as erosion, siltation, landslides, flooding and forest fires. Whilst the production of commercial timber provides a livelihood for millions of people, it has also been associated with negative social outcomes, including land grabs, forced labour, working conditions that are below international norms, and corruption, with knock-on effects for social infrastructure and human well-being in the countries concerned.

The illegal timber trade was estimated to be worth between US\$ 30 and US\$ 100 billion in 2012, or 10–30% of global wood trade.<sup>31</sup> This illegal trade loses governments revenue through the non-payment of taxes, revenue that could contribute to poverty reduction, health care or education. It is estimated that 62–86% of all suspected illegal tropical wood entering the EU and US arrives in the form of paper, pulp or wood chips.<sup>32</sup>

### 4.1.4 Certification

Trees are a renewable resource, and there are alternatives to unsustainable and illegal timber. Responsible forest management can maintain the ecological and social benefits that forests provide, whilst achieving economically viability and contributing to the national economy of producer countries. There are two internationally recognised systems for the certification of sustainable forestry management and its supply chain – the Forest Stewardship Council (FSC) and the Programme for the Endorsement of Forest Certification (PEFC). FSC has just under 300 million hectares certified globally<sup>33</sup> (of which 98.2 million hectares are in Europe). PEFC similarly has 300 million hectares certified globally.<sup>34</sup>

Both the FSC and PEFC systems include similar basic components:

- Forest management and chain of custody standards that include requirements for sustainable forest management and the tracking of certified materials from forest to end product/sale.
- The use of a trademark (scheme logo) in conjunction with information on the certification process (e.g. a certificate number) at point of sale to provide assurance to buyers/consumers.
- Independent third-party certification audits conducted by accredited certification bodies to ensure that the requirements of these standards are being met.

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<sup>29</sup> We use the FAO's definition of deforestation throughout this report: 'The conversion of forest to other land use or the permanent reduction of the tree canopy cover below the minimum 10 percent threshold.' FAO (2015). Global Forest Resource Assessment 2015: Terms and Definitions. Rome.

<sup>30</sup> Boucher, D., Elias, P., Lininger, K., May-Tobin, C., Roquemore, S. & Saxon, E. (2010). The root of the problem: what's driving tropical deforestation today? The Union of Concerned Scientists.

<sup>31</sup> Nellemann, C., INTERPOL Environmental Crime Programme (eds). (2012) Green Carbon, Black Trade: Illegal Logging, Tax Fraud and Laundering in the Worlds Tropical Forests. A Rapid Response Assessment. United Nations Environment Programme, GRIDArendal. [www.grida.no](http://www.grida.no) ISBN: 978-82-7701-102-8

<sup>32</sup> Nellemann, C., Henriksen, R., Raxter, P., Ash, N., Mrema, E. (Eds) (2014) The Environmental Crime Crisis – Threats to Sustainable Development from Illegal Exploitation and Trade in Wildlife and Forest Resources. A UNEP Rapid Response Assessment. United Nations Environment Programme and GRID-Arendal, Nairobi and Arendal, [www.grida.no](http://www.grida.no) ISBN: 978-82-7701-132-5

<sup>33</sup> FSC (2019) FSC Facts & Figures [https://www.fsc.org/sites/fsc.org/files/2019-06/Facts\\_and\\_Figures\\_2019-01-03.pdf](https://www.fsc.org/sites/fsc.org/files/2019-06/Facts_and_Figures_2019-01-03.pdf)

<sup>34</sup> PEFC. Source: <https://www.pefc.org/discover-pefc/what-is-pefc/what-we-do-and-why>

- Independent accreditation of certification bodies to ensure that they have the right systems, processes, skills, expertise and local knowledge to conduct an audit effectively.

Both schemes are working towards the implementation of sustainable forest management practices around the world, and both provide purchasers with assurance against some of the worst excesses of the timber trade, including illegality. However, they have chosen different routes and approaches to get there:

- The FSC continues to enjoy support from major environmental NGOs, including WWF.
- The limited evidence from independent, direct comparisons suggest that the FSC certification system is stronger, more transparent and more consistently applied than the PEFC system.
- The FSC standard is considered to possess stricter safeguards on aspects such as biodiversity conservation and workers' rights.

One significant technical difference is that the FSC has more stringent controls on the origins of the non-certified portion of products that contain both certified and non-certified material. The requirements of the PEFC chain of custody standard mean that such 'mixed' products could contain wood from areas where traditional and civil rights are violated, or where poor forest management threatens areas of high conservation value. However, even the 'FSC mix' is open to criticism, as shown by Greenpeace's campaign against Essity (the producer of Lotus toilet tissue).<sup>35</sup> In March 2018, Greenpeace did not renew its FSC membership, citing a need for FSC to improve its transparency by publishing the mapped boundaries of sourcing areas and assessment reports to allow monitoring and input.<sup>36</sup>

Certification is very well advanced in Denmark. In 2019, 214,859 hectares in Denmark was FSC certified with 306 Danish enterprises holding FSC Chain of Custody certificates. Of the Danish forest area, around 20% is certified according to FSC and 40% to PEFC, with the major share being state forest.<sup>37</sup>

#### **4.1.5 The EU and Denmark's response to illegal and unsustainable timber**

Illegality within the international trade in timber has received significant attention within the EU. The EU's Forest Law Enforcement, Governance and Trade (FLEGT) Action Plan was established in 2003. The Action Plan sets out a range of measures available to the EU and its member states to tackle illegal logging in the world's forests. The measures include supporting timber-producing countries, promoting trade in legal timber, promoting environmentally and socially beneficial public procurement policies, supporting private-sector initiatives, financing and investment safeguards, using existing or new legislation (the EUTR), and addressing the problem of conflict timber. A key aspect of the Action Plan is the creation of Voluntary Partnership Agreements (VPAs) between the EU and timber-producing countries. A VPA aims to improve forest governance and, ultimately, provide a guarantee

<sup>35</sup> Greenpeace. Source: <https://www.greenpeace.org.uk/velvets-claim-protecting-forests-flushed-away/>

<sup>36</sup> Greenpeace. Source: <https://www.greenpeace.org/international/press-release/15589/greenpeace-international-to-not-renew-fsc-membership/>

<sup>37</sup> Larsen et al (2019) Implementation of voluntary verification of sustainability for solid biomass—a case study from Denmark. *Energy, Sustainability and Society* <https://link.springer.com/content/pdf/10.1186%2Fs13705-019-0209-0.pdf>

that timber and timber products exported to the EU are legal. Cameroon, Central African Republic, Ghana, Indonesia, Liberia and Republic of Congo are currently listed as implementing VPAs with the EU.<sup>38</sup>

The EU Timber Regulation (EUTR) came into effect in all countries in the EU on 3 March 2013. The Regulation prohibits the placing of illegally harvested timber (i.e., violating the laws of the country of harvest) on the European market, and covers both imported and domestically produced timber and timber products. The scope of the regulation includes solid wood products, flooring, plywood, pulp and paper (the complete list is given in the Appendix 1: HS codes under EUTR scope<sup>39</sup>) but does not include all wood products. For example, those products that have completed their lifecycle, and would otherwise be disposed of as waste are excluded, as are some specific import categories, such as upholstered seats and kitchenware. Timber or timber products that carry a valid FLEGT licence or Convention on Illegal Trade in Endangered Species (CITES) permit are automatically considered to comply with the requirements of the Regulation. VPA and CITES are the only licenses that are recognised in this way by the EUTR; e.g. certified timber cannot be used on its own as evidence of compliance.

EU Member States are obliged to determine penalties for non-compliance with the EUTR, establish authorities that will be able to check for compliance of the design and implementation of an operator's (the actor placing wood products on the EU market) Due Diligence System (DDS), recognize a monitoring organisation (in Denmark this is The Danish Environmental Protection Agency), check for their compliance with the EUTR, and provide assistance to operators in implementing the EUTR. In 2016, The Danish Environmental Protection Agency carried out 46 checks.<sup>40</sup> Any Danish companies found breaching the EUTR can receive up to one year of detention. In March 2017, it issued injunctions against a number of companies for failing to exercise due diligence to minimize the risk of importing illegally harvested timber from Myanmar, and issued a warning that timber coming from Myanmar is at high risk of illegality.<sup>41</sup>

Legality is, of course, no guarantee of sustainable production, and certification is the pre-eminent market-based mechanism for guaranteeing that production is economically, socially and environmentally responsible within the sector.

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<sup>38</sup> FLEGT. Source: <http://www.flegtlicence.org/vpa-countries>

<sup>39</sup> European Commission. Source: [http://ec.europa.eu/environment/forests/timber\\_regulation.htm](http://ec.europa.eu/environment/forests/timber_regulation.htm)

<sup>40</sup> Client Earth (2017) Info-brief: EUTR enforcement in Denmark. <https://www.documents.clientearth.org/wp-content/uploads/library/2017-03-28-eutr-enforcement-in-denmark-ce-en.pdf>

<sup>41</sup> Ibid.

## 4.2 Global trade in timber products

In 2016, the global export of timber products accounted for € 198 billion, including raw timber, manufactured products such as plywood, and finished wooden articles (e.g., wooden furniture).<sup>42</sup> The Russian Federation has the largest share of world exports of timber by quantity, accounting for 12% of the tonnage in 2016 (Figure 1a). However, by value, the Russian Federation ranked only eighth, with China (€ 36 billion, 18% of global trade), Canada (€ 14 billion, 7%), Germany (€ 14 billion, 7%), USA (€ 12 billion, 6%), and Poland (€ 10 billion, 5%) being the top five ranked countries (Figure 1b). The disparity between China's leading position in value and its lower proportion of the quantity of timber exports reflects the degree of value addition that China gains on timber products through manufacturing.

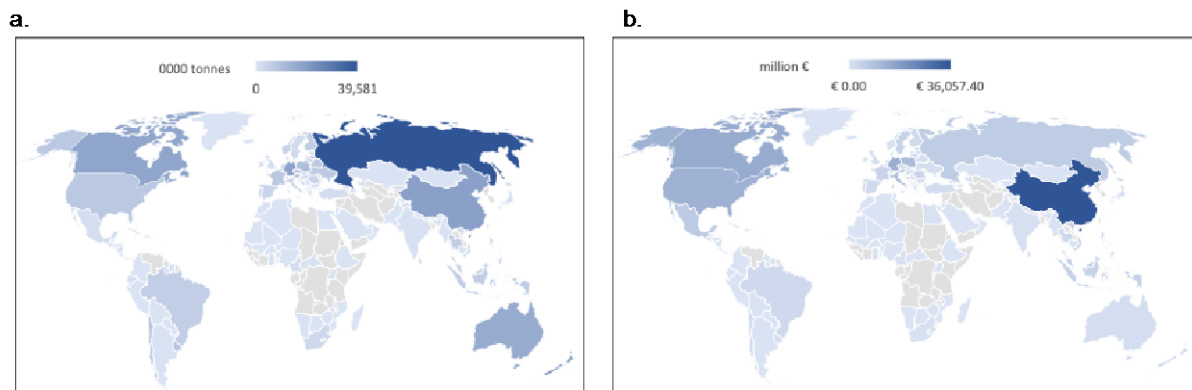


Figure 1: Global exports of timber products in 2016: a. quantity (thousand tonnes), and b. value (million Euro)

## 4.3 Danish timber imports

### 4.3.1 Value of timber imports

The average annual value of Danish timber product imports over the five years assessed is € 2.37 billion - or 17.7 billion Danish kroner - per year. There is a yearly upward trend in the value of timber imports into Denmark which accelerates between 2017-2018, and dips slightly in 2016. At its lowest, the value is €2.17 billion in 2014, rising to €2.78 billion in 2018 – a 28% increase. Two timber product imports stand out in the analysis as increasing the most over the five years assessed – fuel wood imports increased by € 0.25 billion, and wooden furniture imports by € 0.14 billion (Figure 2).

<sup>42</sup> UN Comtrade data

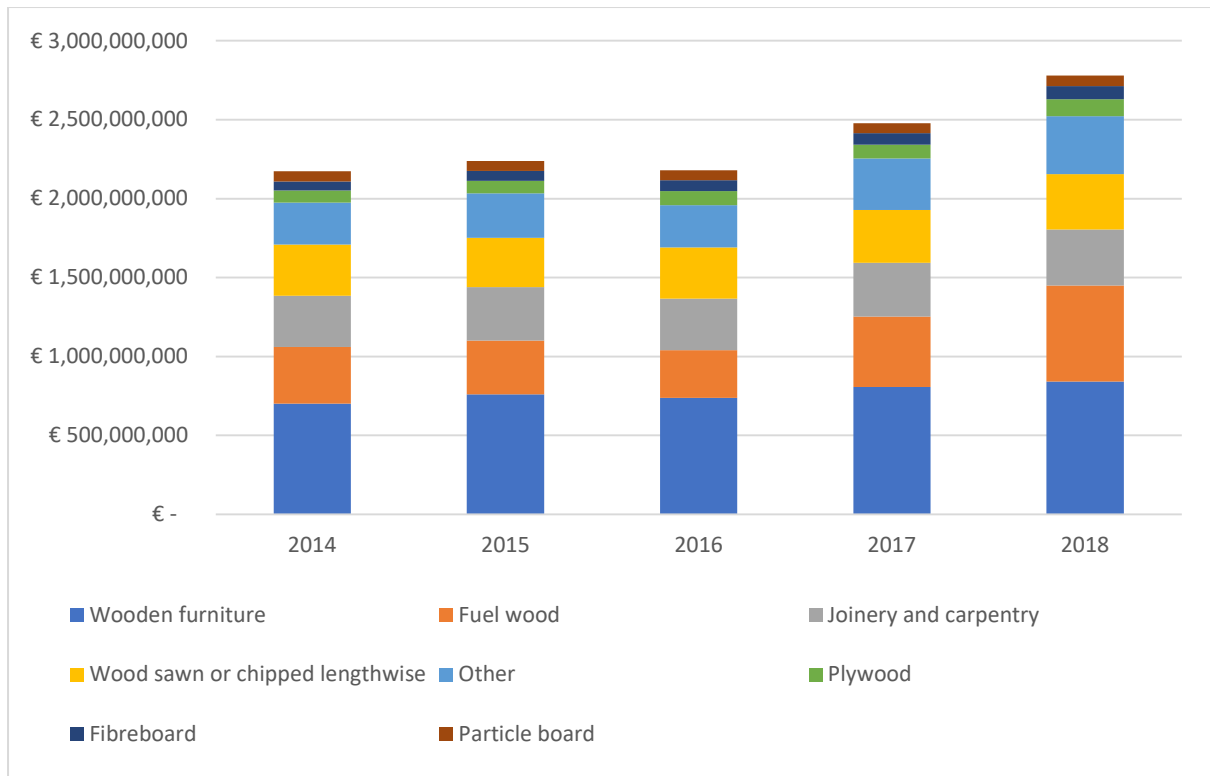


Figure 2: Value of Danish timber imports 2014-2018

The major timber products imported are wooden furniture, which on average accounted for one third of the value of these imports (32.48%), followed by fuel wood (17.36%), and joinery and carpentry (14.21%). See Figure 3.

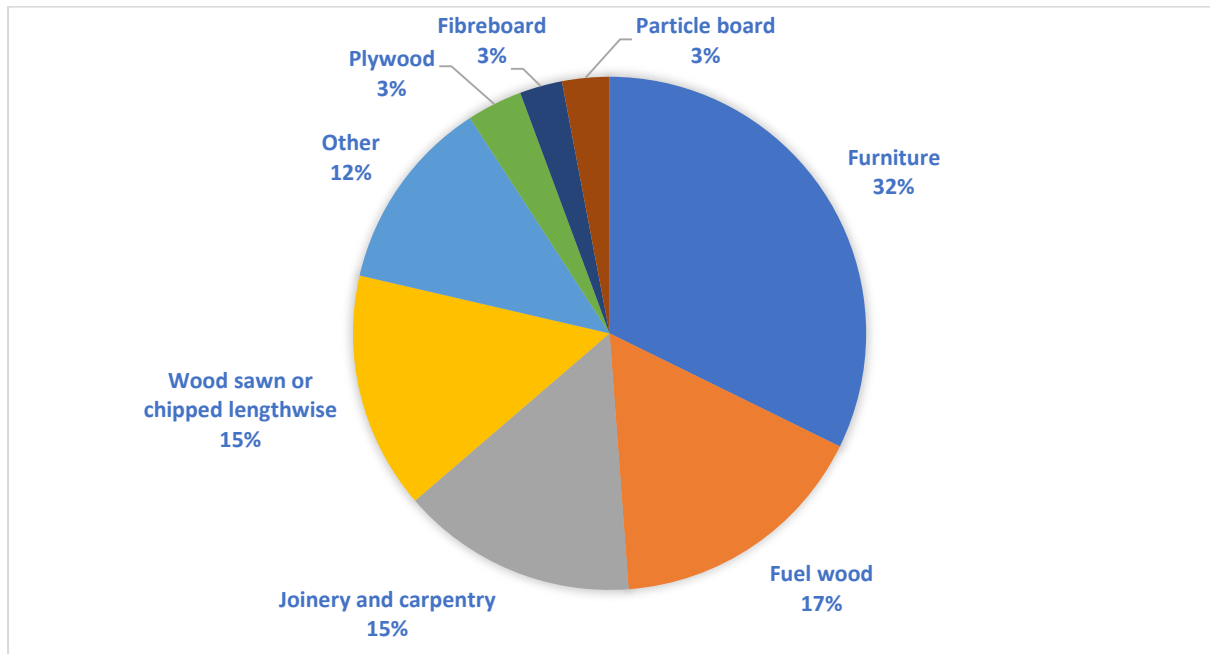


Figure 3: Value of Danish timber imports, as a percentage of the total. Average of totals from the years 2014 – 2018.

### 4.3.2 Quantity of timber imports

Denmark's imports of timber were converted from tonnes into wood raw material equivalent (WRME), which indicates the volume of wood (in m<sup>3</sup>) needed to produce one unit of a final product.<sup>43</sup>

When timber products are converted to establish the total volume of just the wood in products, Denmark imports on average 8.46 million m<sup>3</sup> wood raw material equivalent (WRME) per year. The year with the highest total value is 2018 at 9.97 billion WRME m<sup>3</sup> and the lowest is 2015 at €7.38 billion WRME m<sup>3</sup>. Much of this increase is due to increasing volumes of fuel wood being imported – 2.2 million WRME m<sup>3</sup> more was imported in 2018 than in 2014 (Figure 4).

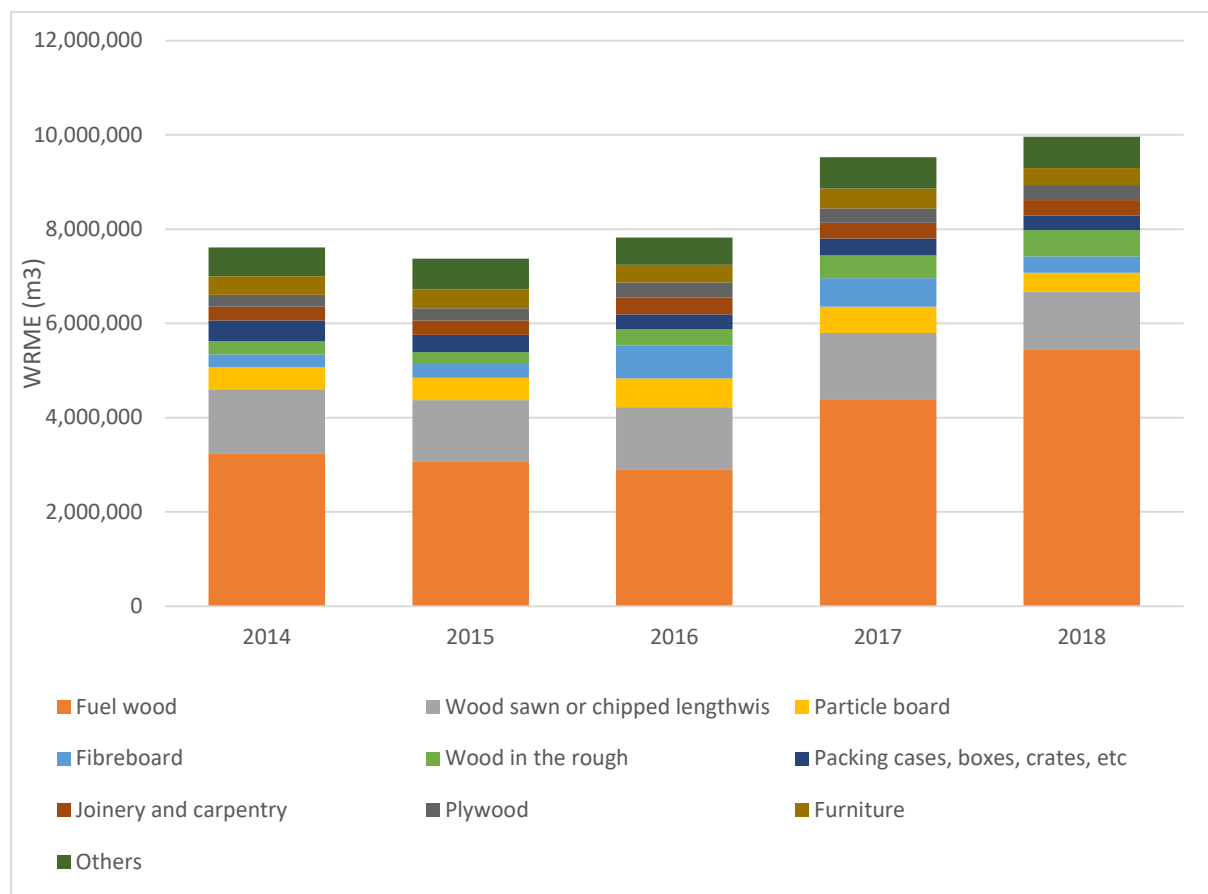


Figure 4: Quantity of Danish timber imports 2014 – 2018.

Overall, the major timber products imported in terms of volume are fuel wood (45%), wood sawn or chipped lengthways (16%), particle board (6%), fibreboard (5%), wood in the rough (5%), packaging cases (4%) and builder's joinery and carpentry (4%). See Figure 5.

<sup>43</sup> Conversion factors to Wood Raw Material Equivalent underbark were obtained from the UK Forestry Commission <https://www.forestry.gov.uk/website/forstats2009.nsf/0/8b4784e90b2a535480257361005015c6>

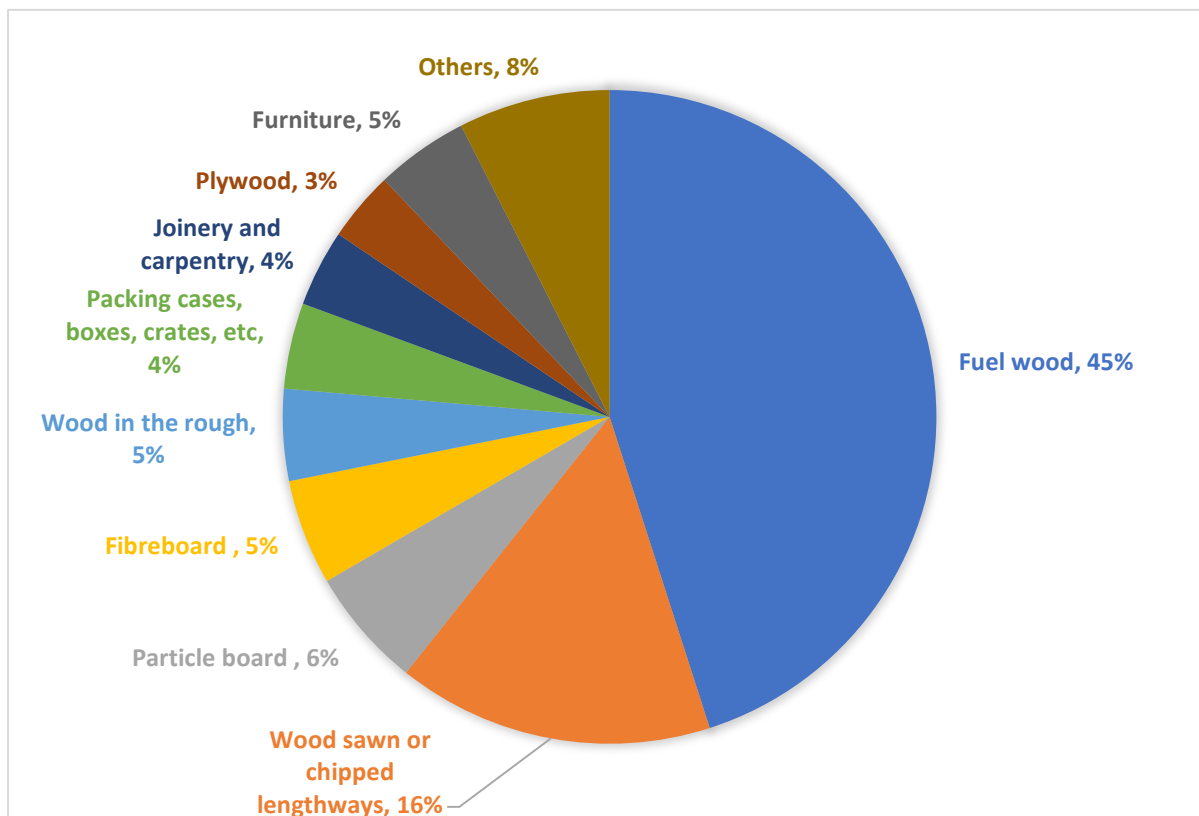


Figure 5: Quantity of Danish timber imports as percentage of whole.

An interesting observation when comparing total Danish timber import's value with quantity is that timber products that make up a significant proportion of the value of timber imports don't necessarily translate into having an equal equivalent proportion of the quantity. We see this with wooden furniture (32.48% of total value compared with just 5% of total quantity), joinery and carpentry (14.21% of total value compared to 4% of total quantity), and fuel wood (17% of the value compared to 42% of the weight).

### 4.3.3 Provenance of timber products imported

Denmark imported timber from 148 countries in total, however, most imported timber comes from a smaller group of countries – just 11 countries' exports represent a greater than 2% portion of Denmark's timber imports, by quantity. There is a general increase in imports over the period, with the Baltic countries in particular exporting an increasing volume of timber to Denmark (Figure 6).

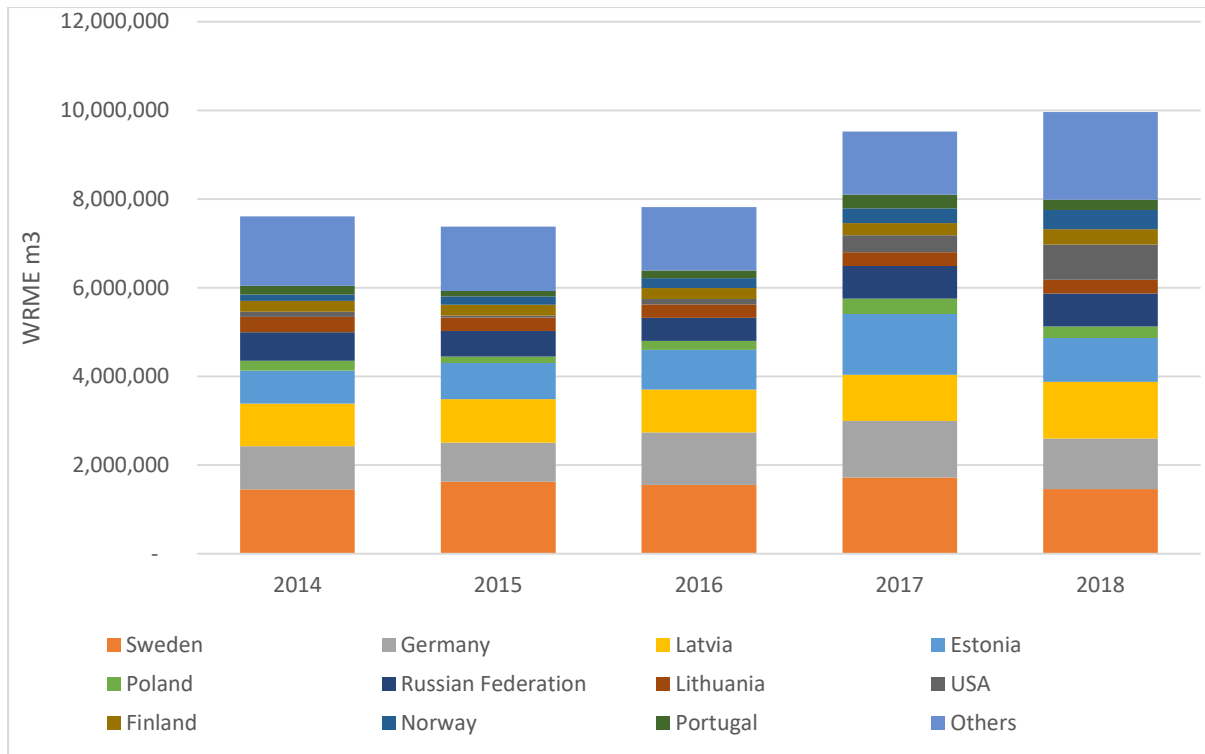


Figure 6: Danish imports of timber products from 2013-2018 by country

We conducted a provenance reassignment on the data to account for the fact that many countries exporting timber to Denmark are not producers of timber but are instead processors or traders. After the reassignment, our data found there to be five major countries in which timber is grown for the Danish market - Sweden (18.49% of Denmark's timber imports) Germany (12.87%), Latvia (12.38%), Estonia (11.36%) and Russia (7.62%). See Figure 7.

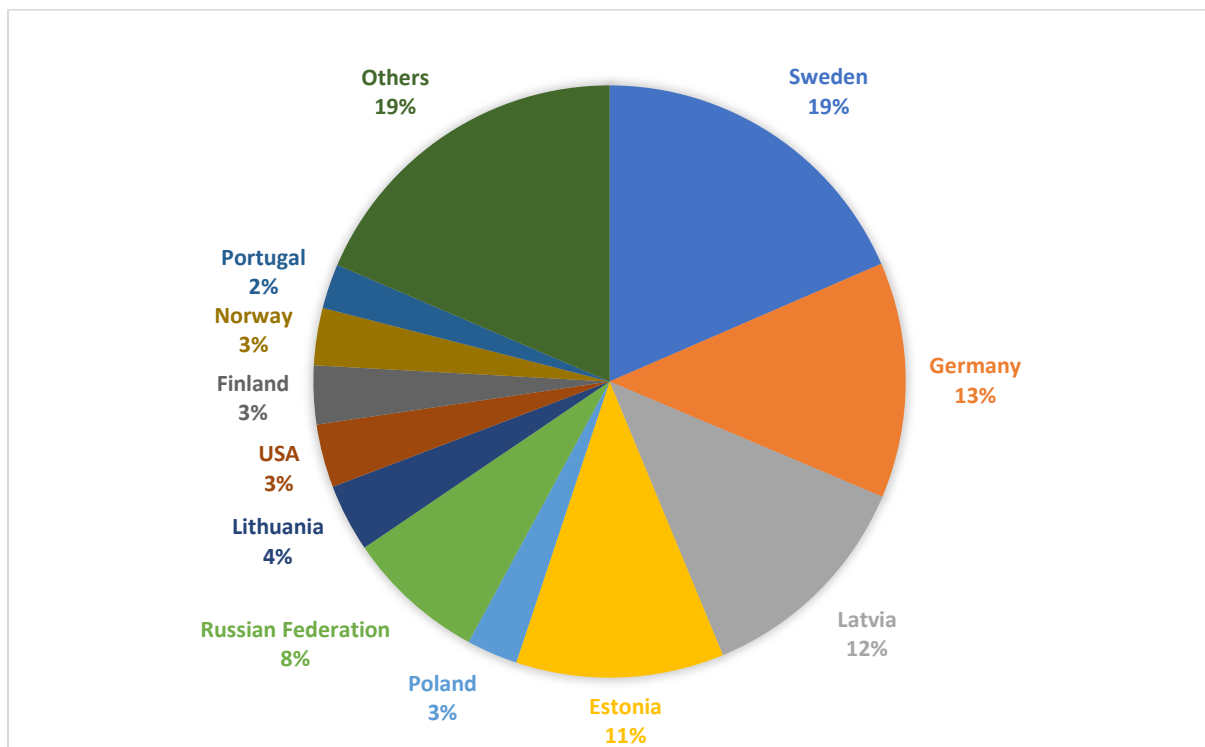


Figure 7: Danish imports of timber, by country, by quantity in WRME average between 2014-2018



#### 4.3.4 Denmark's consumption of timber

Denmark's consumption of timber products was calculated as follows:

$$(\text{Danish production} + \text{Danish imports}) - \text{Danish exports} = \text{consumption}$$

$$(7.22\text{m}^3 + 8.46\text{m}^3) - 3.12\text{m}^3 = 12.56\text{m}^3 \text{ (in millions of WRME)}$$

Imports plateau from 2014-2016, before rising in 2017 and 2018 (Figure 8). Rising consumption was met largely by an increase in imports, rather than an increase in production. On average, Denmark consumes 80% of the timber products that it produces and imports. From 2014 – 2016, Denmark produced similar quantities of timber to that what it imported, but from 2016, imports began to rise above consumption. The rise of imports where predominantly due to increasing quantities of fuelwood (Figure 4).

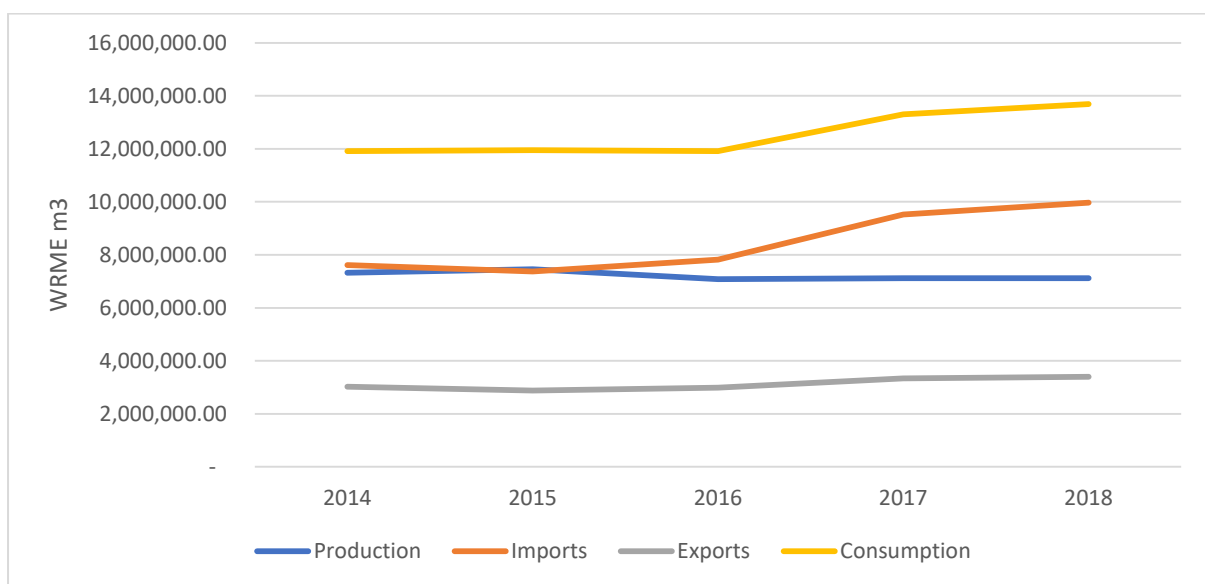


Figure 8: Production, imports, exports and consumption of timber products (converted to WRME m³)

#### 4.3.5 Danish imports of timber versus exports

Broadly similar products make up over 2% of timber imports and 2% of timber exports. Two commodities where we see starkly different import quantities compared to export quantities are fuel wood (45% of imports but 19% of exports) and wooden furniture (5% of imports but 32% of exports). See Figure 9.

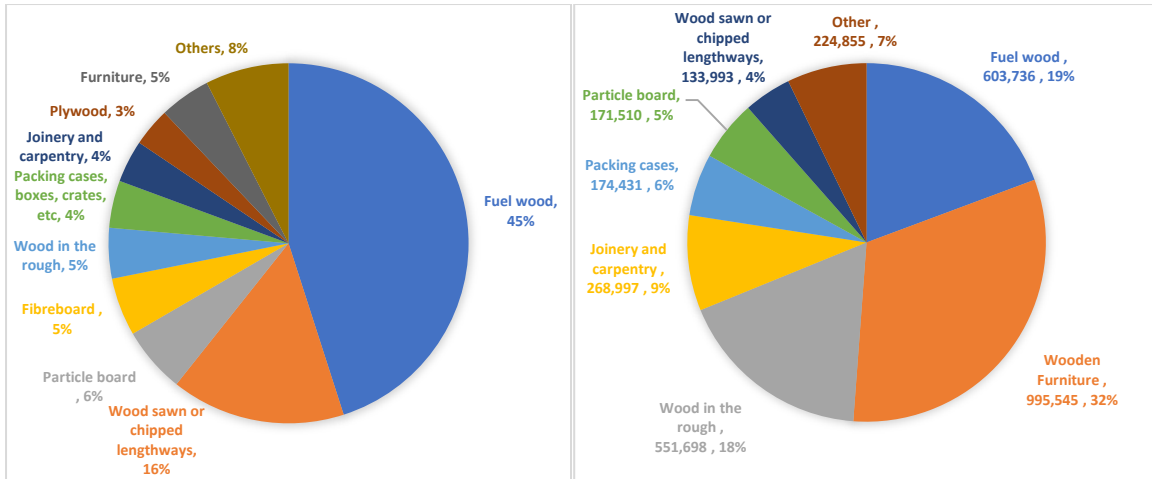


Figure 9: Danish imports (left) versus exports (right) of timber, in WRME m3, as an average between 2014-2018

### 4.3.6 Footprint on Denmark's timber imports

To establish Denmark's land footprint for timber products, the below equation is performed for each country whose timber exports account for a greater than 2% share of Denmark's timber imports (by volume in WRME). These quantities are then summed together to establish Denmark's total overseas land footprint, in hectares.

$$\text{Average annual volume of timber imports from country X} / \text{Net Annual Increment of country X} = \text{Denmark's land footprint in country X}$$

$$\text{Denmark's land footprint} = \text{Land footprint in country X} + \text{Land footprint in country Y} \dots \text{etc.}$$

The Russian Federation and Sweden dominate the land footprint of Denmark's imports, with nearly 500,000 of forested land required in each country each year to supply Denmark (Figure 10).

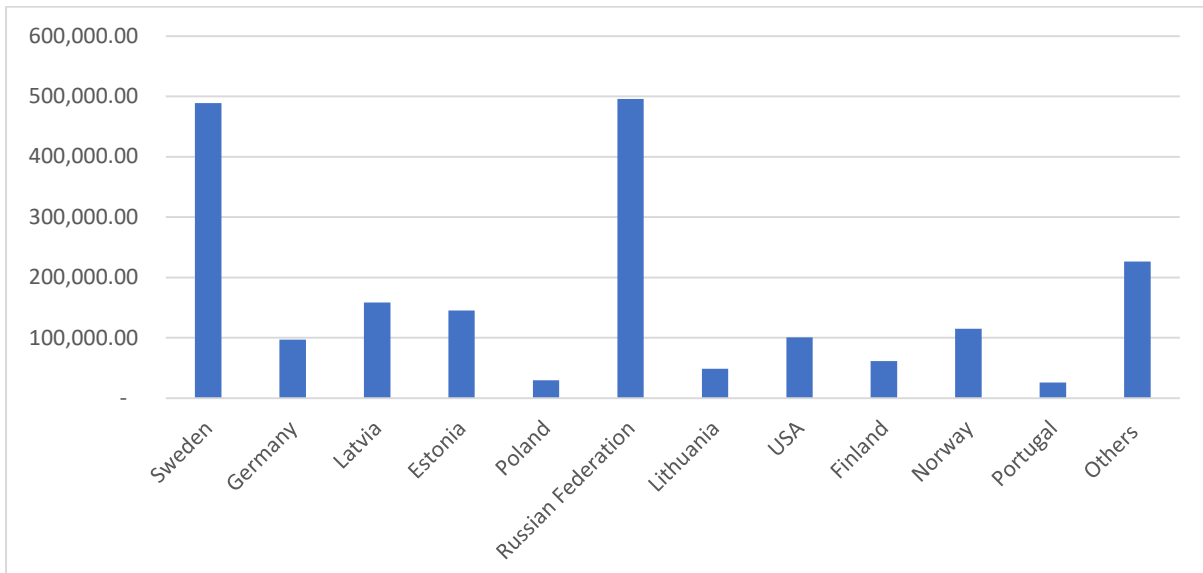


Figure 10: The average annual land footprint from Danish imports, by hectares per country.

On average, the forested total land area required to produce Danish timber imports each year is 1,995,000 hectares. This is 56% of the total Danish import land footprint of timber,

soy, pulp and paper combined, and it equivalent to just under half the total land area of Denmark.

The overall trend in forested land area required to grow Denmark’s timber imports increases over the five years assessed, with the largest increase being between 2016-2018. The land area required to grow timber imports is at its lowest in 2015 at 1,748,000 hectares and rises to 2,412,000 hectares in 2018 – an increase of 38%. Forested land area increased in all major countries contributing over 2% of Danish imports, with the exception of Lithuania. The biggest forested land area increase was from the USA, from 15,000 hectares in 2015 to 275,000 in 2018 (Figure 11).

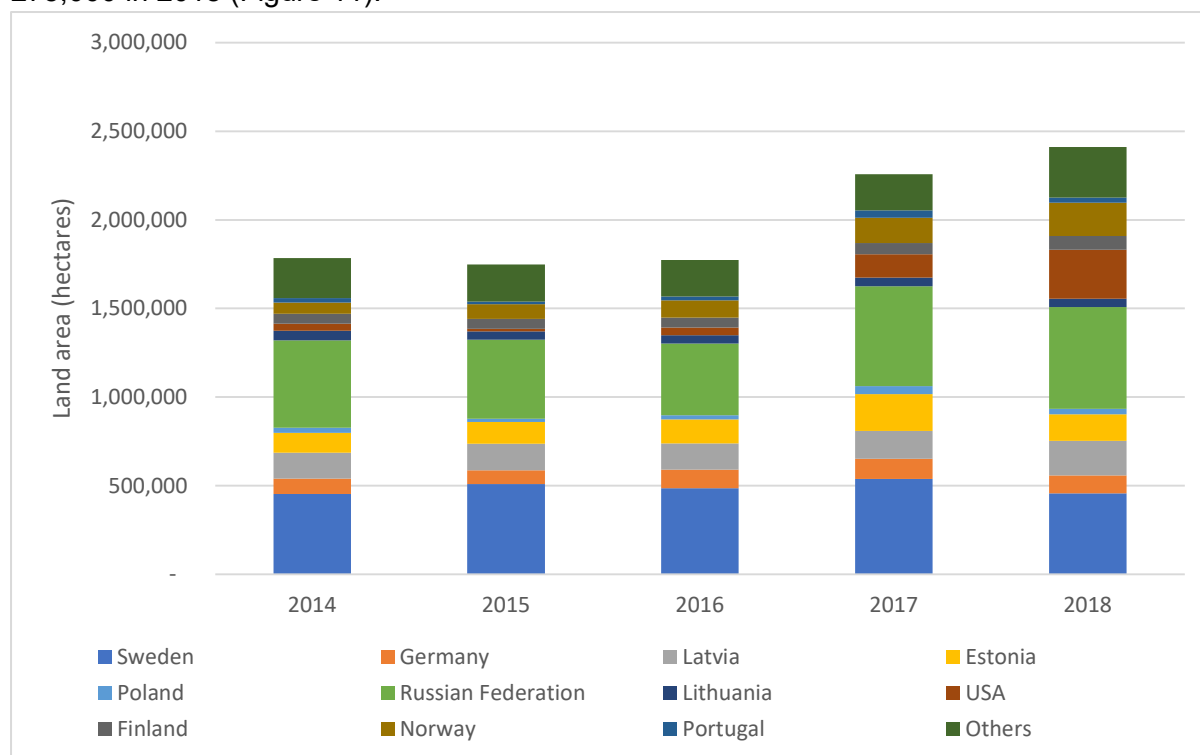


Figure 11: The land area (in hectares) required to produce Danish timber imports, by country

#### 4.3.7 Risks associated with Denmark’s timber imports

Danish timber imports require a total forested land area of 1,995,000 hectares in an average year. Around a quarter of this land is in Russia, which is flagged high risk in terms of social and deforestation indicators, and only 5% of the land area is in low risk countries. Nearly two-thirds (59%) of Danish timber imports are grown in countries that are medium or medium-low risk (Figure 12). See Table 2 for the risk rating list of all significant import countries, and Figure 13 for this displayed on a global map. Note that due to the absence of comprehensive data on the proportion of certified timber products imported by Denmark, the risk rating is produced using national-level indicators, not sector-specific ones. Thus, for example, Sweden’s rate of forest loss is high, giving the country a medium risk rating, although forestry in Sweden – much of which is FSC certified – is may not be a major driver of this forest loss.

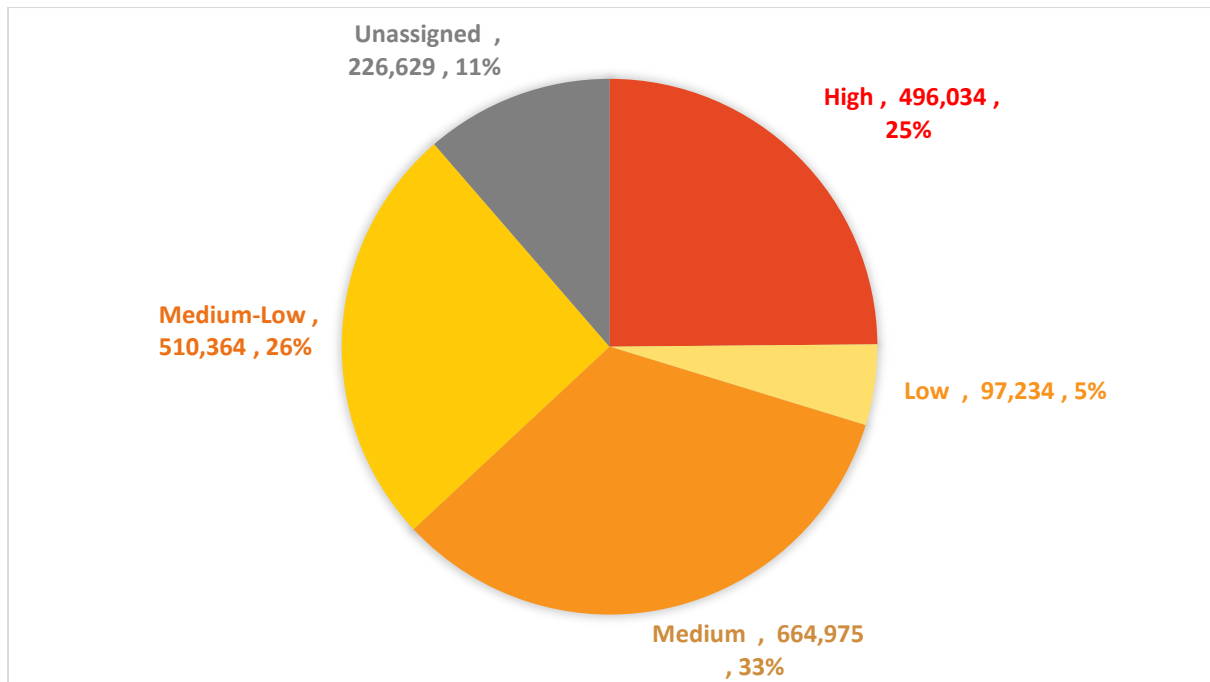


Figure 12: Danish timber imports land areas in countries from which it sources more than 2% of imports categorised according to country risk category

Table 2: Danish import land hectares in countries that supply a greater than 2% share of Danish imports of timber, rated from very high to low according to performance across four deforestation and social indicators. Hectares are an average year between 2014-2018

| Country            | Timber (annual land footprint in hectares) | Tree cover change (ha) | Deforestation Rate | Labour standards | Corruption perception | Performance Indicators |                    |                  |                  | Overall score | Rating     |
|--------------------|--|------------------------|--------------------|------------------|-----------------------|------------------------|--------------------|------------------|------------------|---------------|------------|
|                    |  |                        |                    |                  |                       | Tree cover change (ha) | Deforestation Rate | Labour standards | Corruption Index |               |            |
| Estonia            | 145,577.66                                 | 165296                 | -0.10%             | 2                | 73                    | 1                      | 2                  | 1                | 1                | 5             | Medium-Low |
| Finland            | 61,502.70                                  | 1215990                | 0.00%              | 1                | 85                    | 3                      | 1                  | 1                | 1                | 6             | Medium-Low |
| Germany            | 97,234.40                                  | 148283                 | 0.08%              | 1                | 80                    | 1                      | 1                  | 1                | 1                | 4             | Low        |
| Latvia             | 158,717.08                                 | 203739                 | 0.66%              | 2                | 58                    | 1                      | 1                  | 1                | 2                | 5             | Medium-Low |
| Lithuania          | 48,862.70                                  | 104097                 | -1.83%             | 2                | 59                    | 1                      | 3                  | 1                | 2                | 7             | Medium     |
| Norway             | 114,996.90                                 | 255316                 | -0.53%             | 1                | 84                    | 1                      | 2                  | 1                | 1                | 5             | Medium-Low |
| Poland             | 29,569.98                                  | 384295                 | 5.75%              | 3                | 60                    | 1                      | 1                  | 2                | 2                | 6             | Medium-Low |
| Portugal           | 26,247.40                                  | 559461                 | -3.50%             | 2                | 64                    | 2                      | 3                  | 1                | 1                | 7             | Medium     |
| Russian Federation | 496,034.06                                 | 25053781               | -0.05%             | 3                | 28                    | 3                      | 2                  | 2                | 3                | 10            | High       |
| Sweden             | 488,920.85                                 | 1401296                | -7.56%             | 1                | 85                    | 3                      | 3                  | 1                | 1                | 8             | Medium     |
| USA                | 100,943.72                                 | 113612363              | 0.20%              | 4                | 71                    | 3                      | 1                  | 2                | 1                | 7             | Medium     |
| Unassigned         | 226,628.55                                 | n/a                    | n/a                | n/a              | n/a                   | n/a                    | n/a                | n/a              | n/a              | n/a           |            |

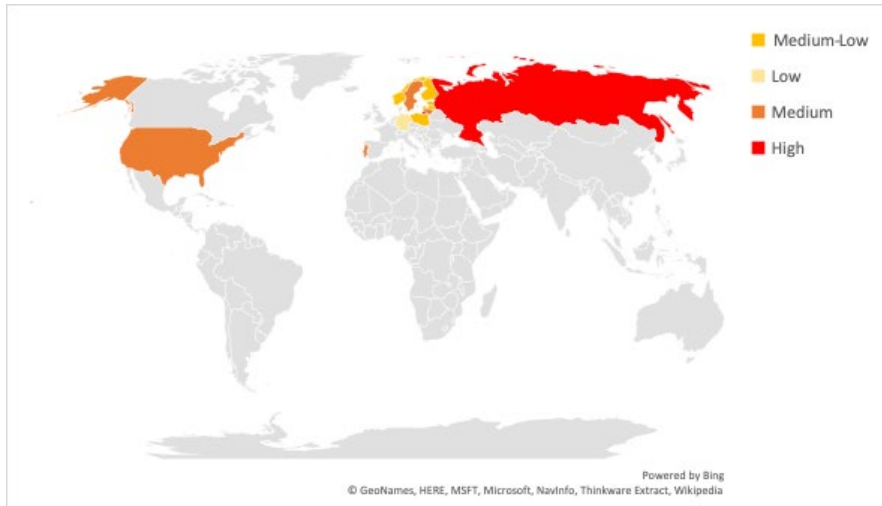


Figure 13: Social and deforestation risk profile of countries from where Denmark imports over 2% of timber in an average year between 2014-2018

However, since FSC certification is believed to have a high penetration rate in Danish imports of fuelwood from Russia, the risk illustrated in Figure 12 can be considered substantially mitigated. Figure 14 shows the risk graph excluding the land footprint of Russian fuelwood. Since 9% of Denmark's timber land footprint in Russia is associated with products other than fuelwood, there is still an overall 3% high risk land footprint area in Russia.

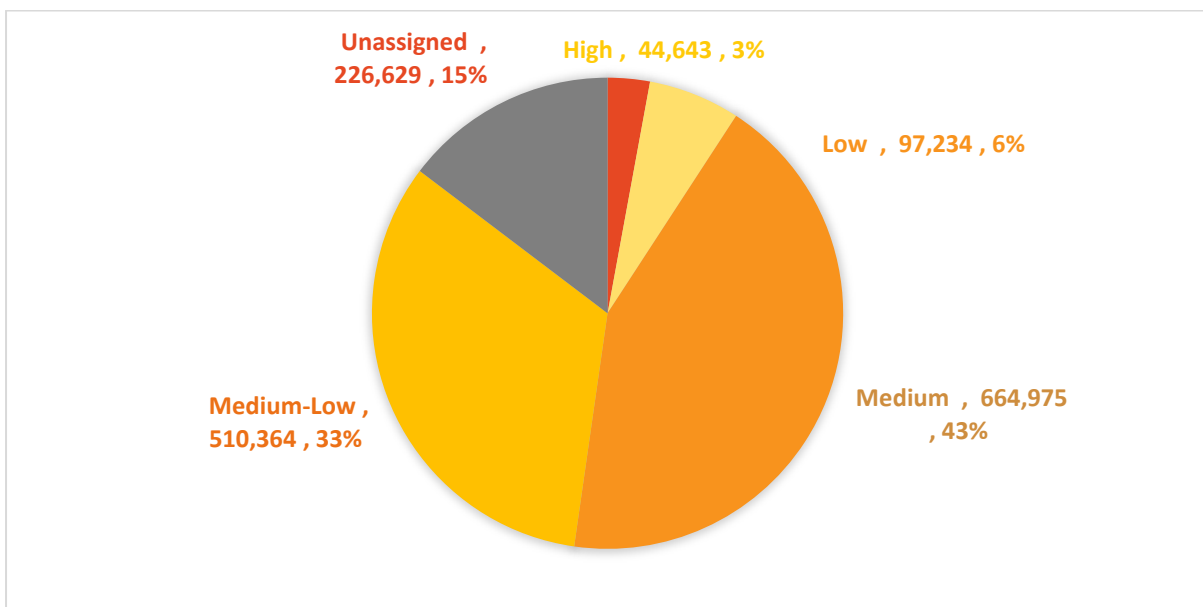


Figure 14: Excluding Russian fuelwood, Danish timber imports land areas in countries from which it sources more than 2% of imports categorised according to country risk category

### 4.3.8 EUTR and Denmark's timber imports

The European Union Timber Regulation (EUTR) aims to counter illegal logging and associated trade in timber and timber products in the member states of the European Union, and ultimately contribute to sustainable management of forests and reduced emissions from deforestation and forest degradation beyond EU borders. It essentially requires the first importer of timber into the EU to prove that it has not been procured illegally (this doesn't necessarily mean it is sustainable or free from deforestation). While the legislation covers most timber products, some are not covered by the regulation (Table 3).

The majority of Danish timber imports are covered by the EUTR timber legislation. By volume of Danish timber imports, 96% is covered by the EUTR, leaving 4% (with a value of € 350 million per year) that is not.

Table 3: Danish imports of commodities not covered by the EUTR, in WRME meters cubed, and as a percentage of total Danish non-EUTR imports

| Type of non-EUTR timber commodity imports   | Quantity of imports 2014-2018 (WRMW m <sup>3</sup> ) | Percentage of total non-EUTR Danish imports |
|---|--|---|
| <b>Buildings; prefabricated, of wood</b>  | 6,066.2615   | 2%  |
| <b>Hoopwood; split poles; piles, pickets, stakes of wood, pointed, not sawn lengthwise; wooden sticks, roughly trimmed, not turned, bent, etc., suitable for walking sticks, umbrellas, tool handles, etc.</b>  | 30,010.68324   | 9%  |
| <b>Seats; with wooden frames, not upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)</b>  | 17,155.318   | 5%  |
| <b>Seats; with wooden frames, upholstered, (excluding medical, surgical, dental, veterinary or barber furniture)</b>  | 98,708.311   | 28%   |
| <b>Tableware and kitchenware, of wood</b>   | 6,849.822  | 2%  |
| <b>Tools, tool bodies, tool handles, broom or brush bodies and handles, of wood; boot or shoe lasts and trees, of wood</b>  | 1,462.351  | 0%  |
| <b>Wood charcoal (including shell or nut charcoal), whether or not agglomerated</b>   | 78,784.1988  | 23%   |
| <b>Wood marquetry and inlaid wood; caskets and cases for jewellery or cutlery, and similar articles of wood; statuettes and other ornaments of wood; wooden articles of furniture not falling in chapter 94</b> | 7,994.6375   | 2%  |
| <b>Wood wool; wood flour</b>  | 9,412.38   | 3%  |
| <b>Wooden articles n.e.c. in heading no. 4414 to 4420</b>   | 93,310.0325  | 27%   |
| <b>Total</b>  | <b>349,753.9955</b>                                  | <b>100%</b>                                 |

Danish imports of non-EUTR products are mostly seats with wooden frames (of total non-EUTR Danish imports, 28% are upholstered seats and 5% are not upholstered seats) wooden articles (29%) and charcoal (22%). See Figure 15.

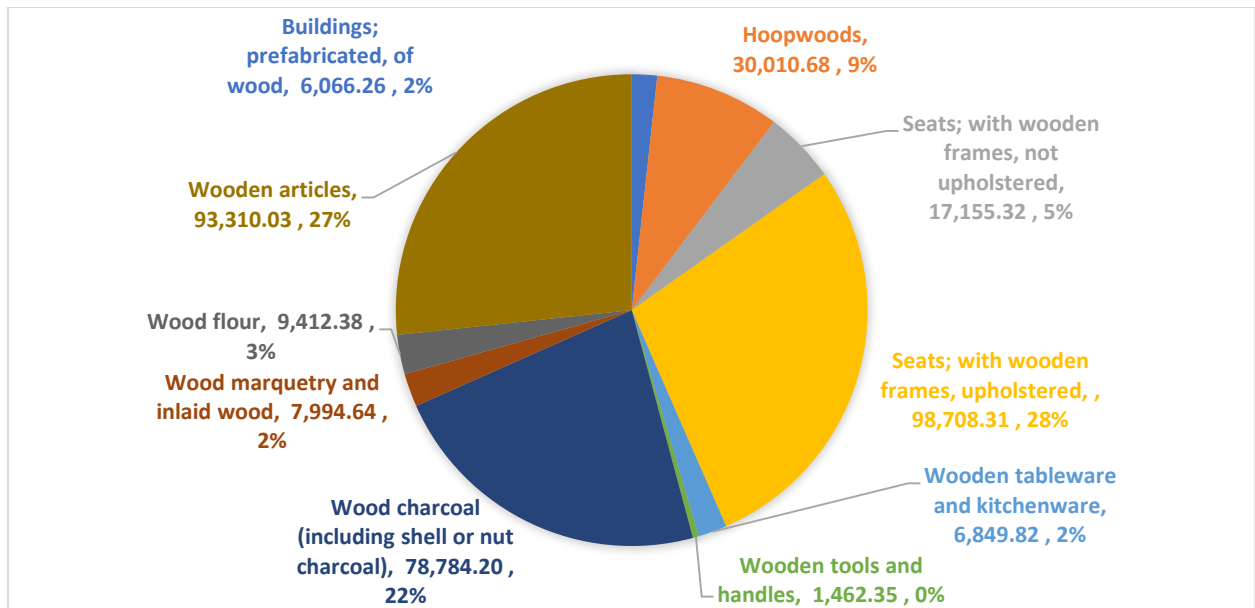


Figure 15: Average annual imports of non-EUTR timber products in WRME (m<sup>3</sup>) into Denmark between 2014-2018

Danish imports of non-EUTR timber products come from a wide range of countries. Figure 16 shows those countries from which Denmark imports a greater than 2% share of its non-EUTR timber product imports. Poland, China and Germany make up half of the volume of these imports at 26%, 12% and 12% respectively. Some the countries that Denmark is importing these products from are high risk in terms of deforestation and/or human rights violations, such as China, Indonesia, Sri Lanka and Vietnam.

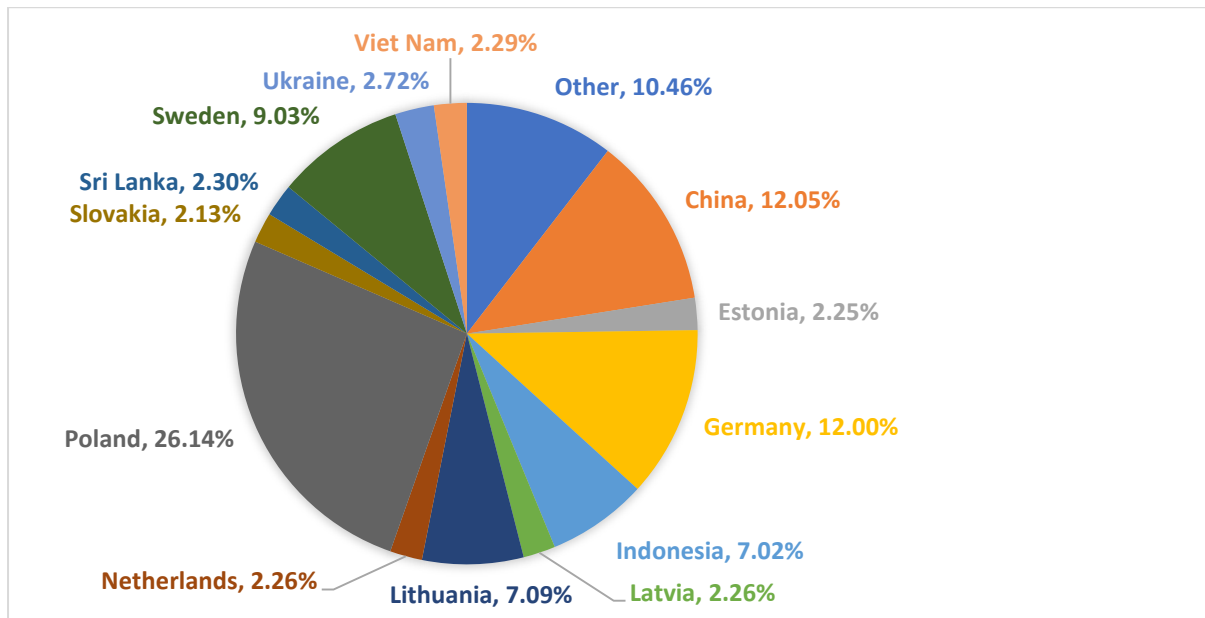


Figure 16: Countries from which Denmark imports non-EUTR products, by volume in WRME meters cubed. Not provenance assigned.

Imports not covered by the EUTR from Poland and China were investigated further to see what they comprised of. Wooden seats and charcoal dominate imports from Poland (Figure 17), whereas wooden seats and wooden articles dominate imports from China (Figure 18).

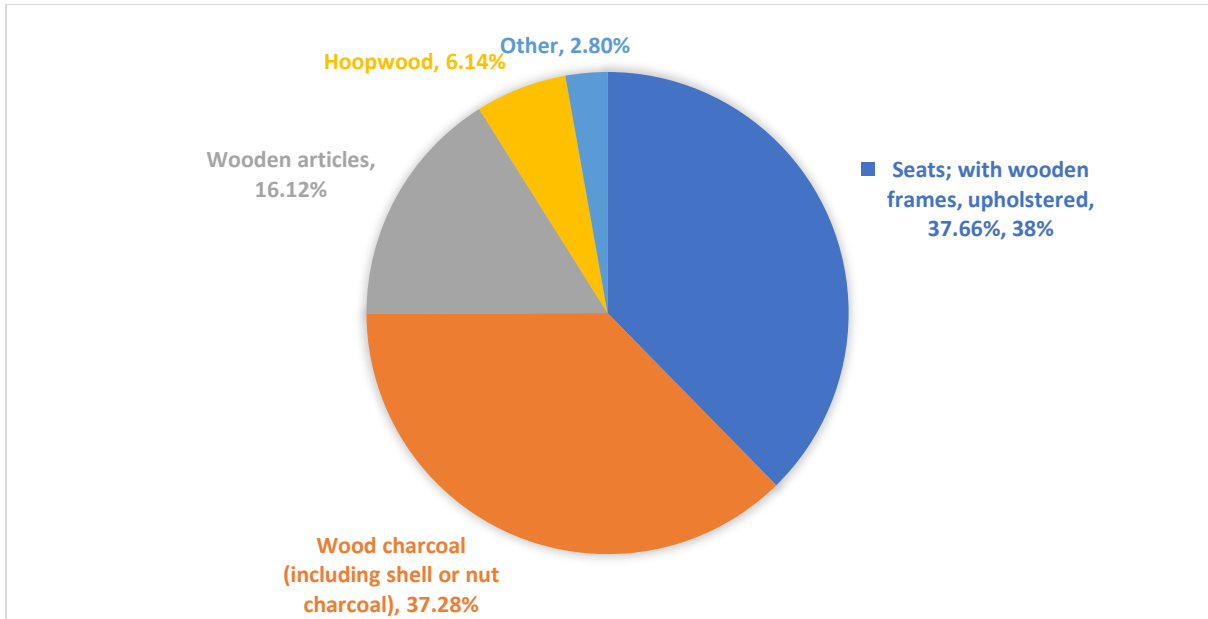


Figure 17: Danish imports of non-EUTR timber products from Poland, by volume in WRME meters cubed, as a percentage of all non-EUTR imports from Poland. Not provenance assigned

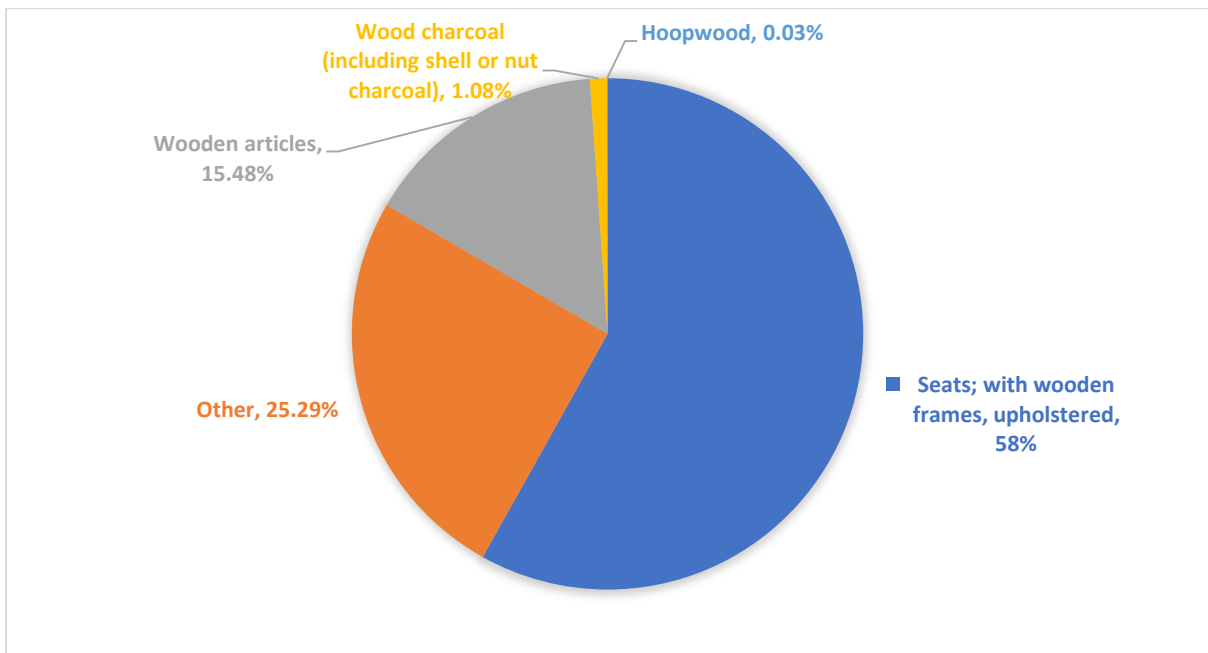


Figure 18: Danish imports of non-EUTR timber products from China, by volume in WRME meters cubed, as a percentage of all non-EUTR imports from Poland. Not provenance assigned

Charcoal is one of the main timber commodities not covered by the EUTR, which has been shown in other countries to be imported from countries with high deforestation and human rights risks. Denmark imports the majority of charcoal from Poland (43%) and Indonesia (28%). Indonesia, along with Sri Lanka (Figure 19), is considered high risk in terms of deforestation and human rights abuses, whereas Poland is low risk on deforestation, and medium risk on social indicators. However, as the HS codes for charcoal do not distinguish the material used to make charcoal it is likely that a significant proportion of the charcoal imported from Sri Lanka and possibly Indonesia is derived from coconut shells, with a lesser risk of deforestation associated.



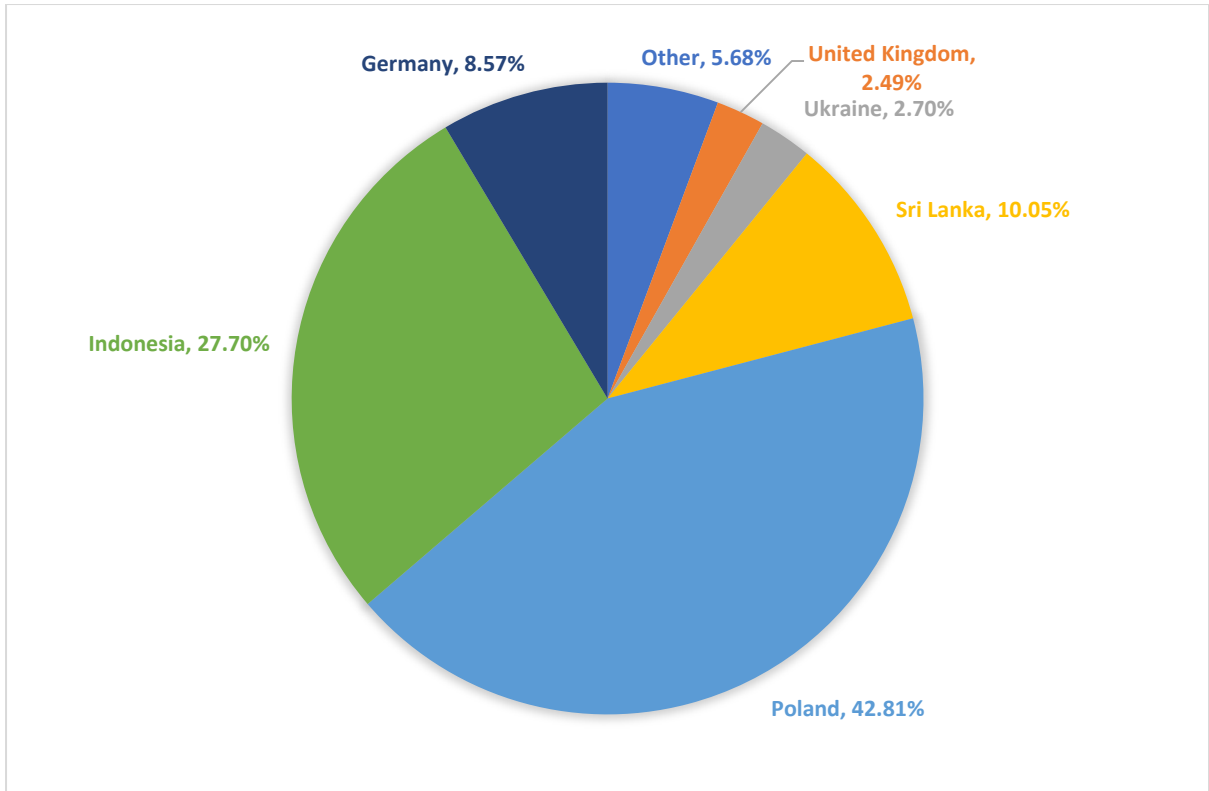


Figure 19: Countries from which Denmark imports charcoal, by volume in WRME meters cubed. Not provenance re-assigned

## 5 Pulp and Paper

### 5.1 Production, uses and sustainability

#### 5.1.1 Production systems

Paper and pulp products can be harvested from either plantations or natural forests. 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. The cellulose fibres are derived directly from pulp grade logs, from wood chips and wood reclaimed from other manufacturing processes (e.g. furniture making), and from recycled paper.

Over the past decade the largest increase in demand for forest products globally has been in pulp and paper. Current demand in Asia is so high that even though production within the region is growing, it is still a net importer.<sup>44</sup> There has also been a steep rise in the use of recovered and recycled paper in recent decades. However, it is important to note that paper is not infinitely recyclable, and fibre from tree species with specific technical characteristics is required for some specific types of product.

Denmark has an estimated forest cover of 608,078 hectares, covering 14.1% of its land area.<sup>45</sup> In 2018, Denmark produced 1.35 million cubic meters of paper and pulp. Denmark is a net importer of pulp and paper products, with a trade deficit of 1.55 million cubic meters in 2018.

#### 5.1.2 End uses

Paper and paperboard are used in magazines, books, stationery, office paper, boxes, packaging, tissues, and labels. It can be coated with a wide variety of materials for specific uses such as printing photographs, pressure sensitive papers, or heat sensitive papers. Pulp and paper are made predominantly from cellulose fibres present in trees in developed countries, with agricultural residues more widely used in some developing nations. The cellulose fibres are derived directly from pulp grade logs, from wood chips, wood reclaimed from other manufacturing processes (e.g. furniture making), and from recycled paper.

#### 5.1.3 Environmental and social issues associated with pulp and paper production

The creation of pulpwood plantations has sometimes been at the expense of natural forest, or other natural habitats.<sup>46</sup> This can have a significant impact on biodiversity, and for this reason the main certification schemes, FSC and PEFC, essentially excluding plantations

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<sup>44</sup> Aulisi, A., A. Sauer, and F. Wellington (2008) *Trees in the greenhouse: Why climate change is transforming the forest products business*. Washington, DC: World Resources Institute

<sup>45</sup> Ministry of Environment and Food of Denmark <https://eng.mst.dk/trade/forestry/>

<sup>46</sup> For example: *Deforestation in Riau's Forests: NASA Land-Cover and Land-Use Change (LCLUC) Program: Two Global Pulp and Paper Companies will Decide Their Fate*. <http://lcluc.umd.edu/hotspot/deforestation-riaus-forests-two-global-pulp-and-paper-companies-will-decide-their-fate-0> Last accessed 18 August 2018.

De-Li Zhai, Charles H. Cannon, J.W. Ferry Slika, Cui-Ping Zhang, Zhi-Cong Dai (2012). Rubber and pulp plantations represent a double threat to Hainan's natural tropical forests. *Journal of Environmental Management*, Volume 96, Issue 1, 15 April 2012, Pages 64-73

that have replaced natural forest on areas converted from natural forest after November 1994 and 2010 respectively.<sup>47,48</sup>

See Section 4.1.5 for more information about environmental and social issues, certification and the EU and Denmark's policy response.

## 5.2 Global trade in pulp and paper products

The value of pulp and paper products traded globally in 2016 was € 153 billion (44% of the value of all exported timber, pulp and paper products). The USA is the top-ranked country in terms of both quantity (see Figure 20 a) and value (see Figure 20 b) of pulp and paper products exported, accounting for € 16.6 billion in 2016 (11% of global pulp and paper exports). Germany (€ 16.1 billion, 11%), China (€ 13.6 billion, 9%), Canada (€ 10.7 billion, 7%) and Sweden (€ 8.9 billion, 6%) make up the rest of top five exporters of pulp and paper products.

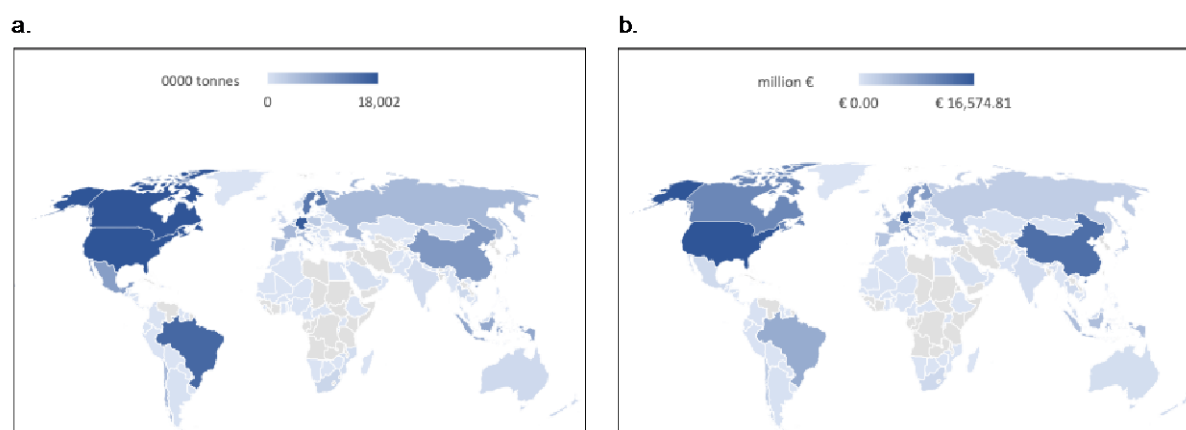


Figure 20: Global exports of pulp and paper products in 2016: a. quantity (thousand tonnes), and b. value (million Euros)

## 5.3 Danish pulp and paper imports

### 5.3.1 Value of pulp and paper imports

There is no clear trend in the value of pulp and paper imports into Denmark between the years of 2014 and 2018. At their lowest in 2017, imports were worth €1.25 billion, and at their highest in 2018, they totalled €1.33 billion. In an average year, Denmark imports €1.29 billion - or 9.64 billion Danish kroner - of pulp and paper products (Figure 21).

<sup>47</sup> Forest Stewardship Council (2015). FSC International Standard: Principles And Criteria For Forest Stewardship FSC-Std-01-001 V5-2 En.

<sup>48</sup> PEFC International Standard (2010). Requirements For Certification Schemes. PEFC ST 1003:2010.

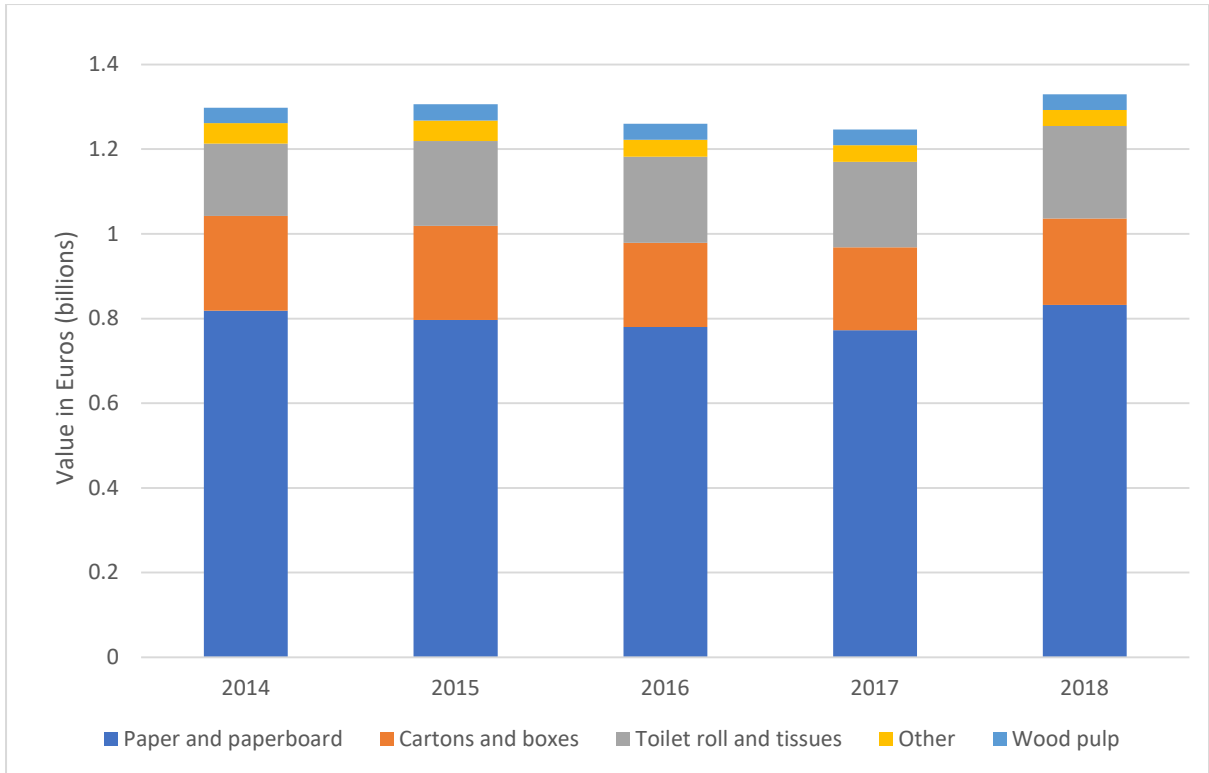


Figure 21: Value of Danish pulp and paper imports between 2014-201

Overall, two-thirds of this import value is from different types of paper and paperboard (62.11%), followed by cartons (16.22%) and toilet paper (14.93%). Wood pulp only totals 3% of import value (Figure 22).

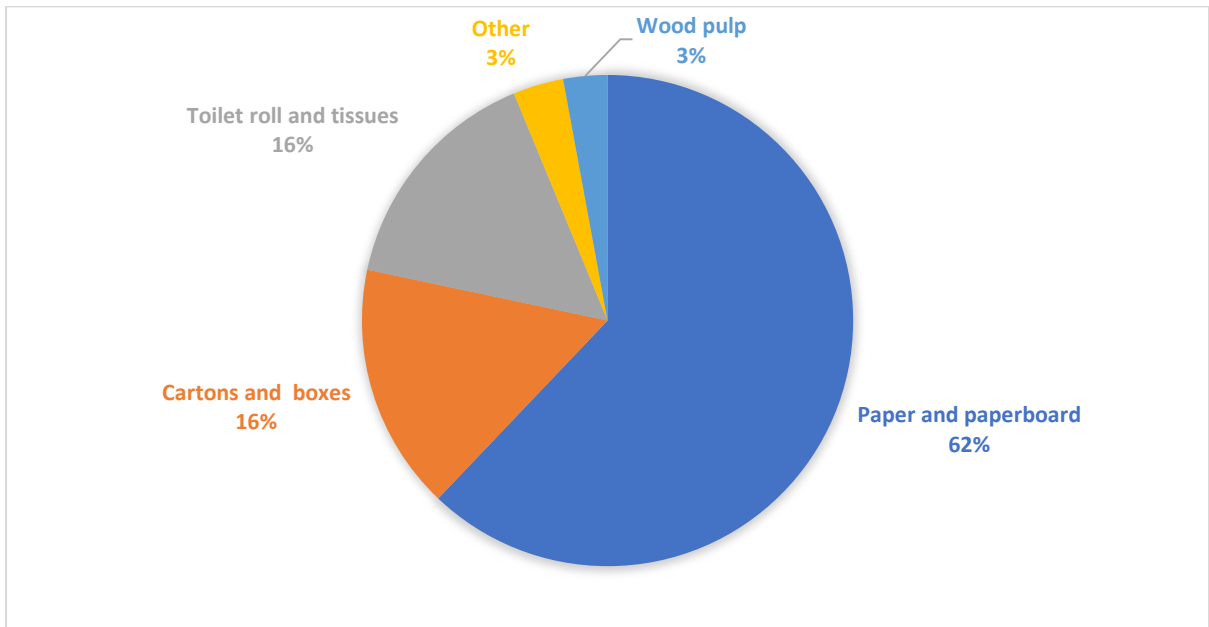


Figure 22: Value of Danish pulp and paper imports as percentage of the total

### 5.3.2 Quantity of pulp and paper imports

Similar to timber imports, Denmark's imports of pulp and paper were converted from tonnes into wood raw material equivalent (WRME), which indicates the volume of wood (in m<sup>3</sup>) needed to produce the pulp or paper final products.<sup>49</sup>

When imports are converted to establish the total volume of just the wood used to make products, Denmark on average imports 3.17 million WRME cubic meters of pulp and paper per year. When analysing quantity of imports rather than value, a steady downward trend becomes apparent, from 3.36 million WRME meters cubed in 2014, to 3 million WRME meters cubed in 2018 (Figure 23).

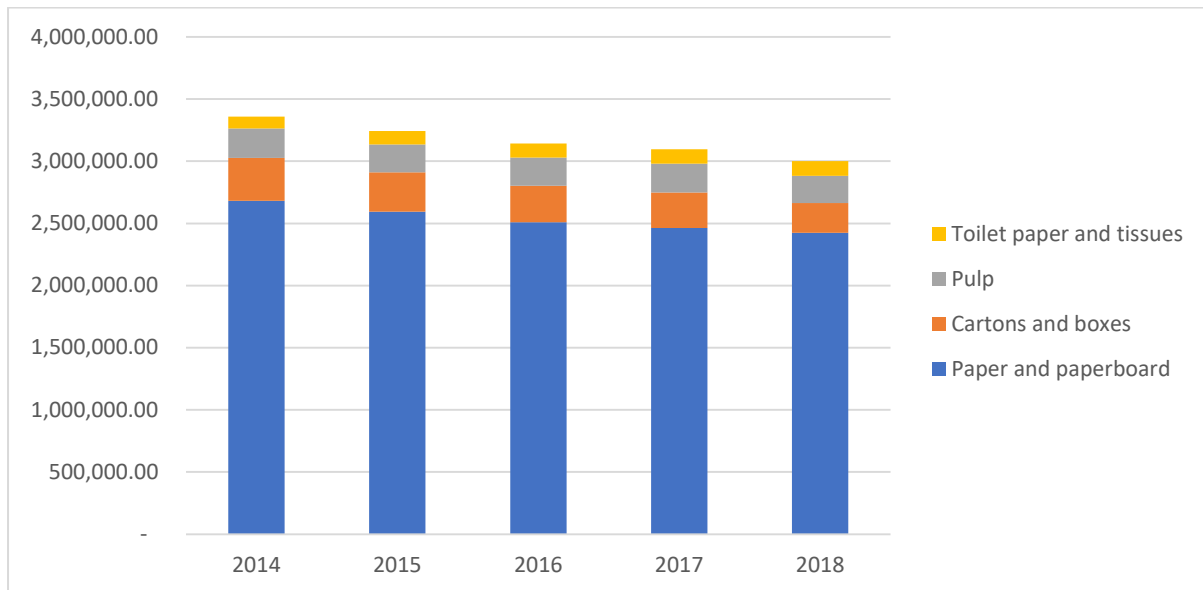


Figure 23: Quantity of Danish pulp and paper imports 2014-2018, in WRME (m<sup>3</sup>)

Paper and paperboard products make up 80% of the imports, whereas pulp products make up 7% of volume (Figure 24). This shows that Denmark imports paper as a finished product, rather than importing as wood pulp to process into paper.

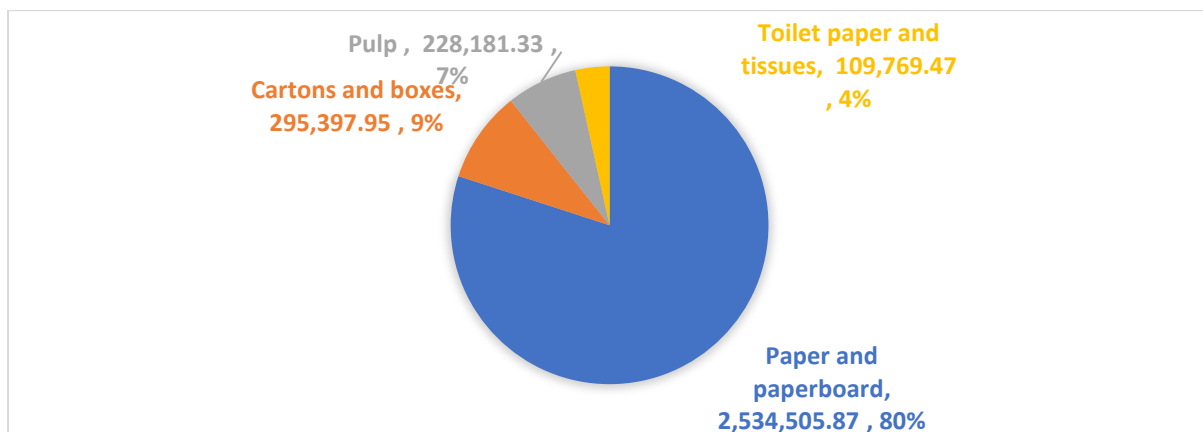


Figure 24: Quantity of Danish imports of pulp and paper, as a percentage of the total worked out as an average between 2014-2018

<sup>49</sup> Conversion factors to Wood Raw Material Equivalent underbark were obtained from the UK Forestry Commission <https://www.forestry.gov.uk/website/forstats2009.nsf/0/8b4784e90b2a535480257361005015c6>

### 5.3.3 Danish imports of pulp and paper versus exports

Denmark only exports two types of pulp and paper commodity categories in large quantities – paper and paperboard (59% of exports) and cartons and boxes (37%), which is less varied than the types of pulp and paper products that it imports (Figure 25).

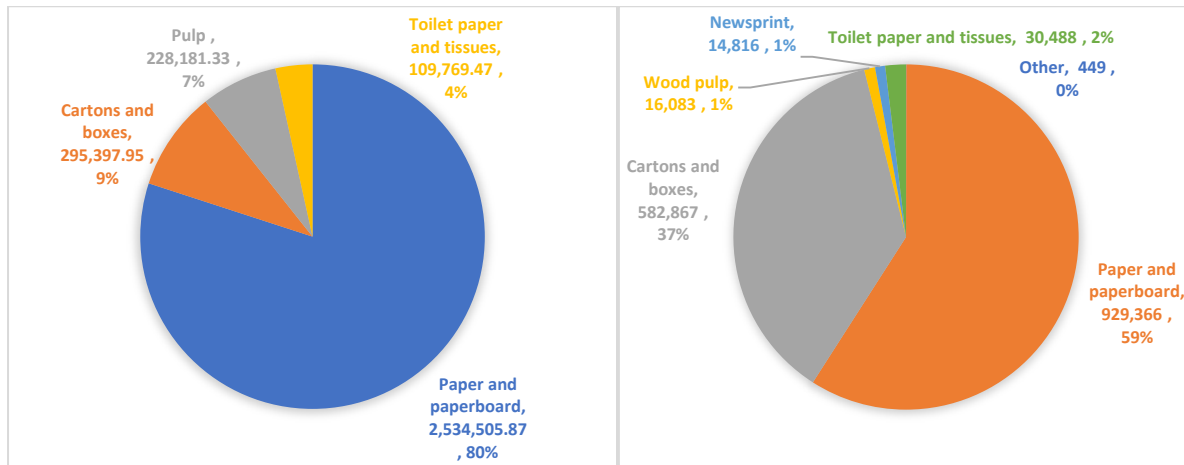


Figure 25: Danish imports of pulp and paper products (left) compared to Danish exports of pulp and paper products (right) in volumes in an average year between 2014-2018

### 5.3.4 Provenance of pulp and paper imports

We conducted a provenance reassignment on the data to account for the fact that many countries exporting pulp and paper to Denmark are not producers of timber, but are instead processors or traders.

Denmark imported pulp and paper from 199 countries in total, however similar to timber, most imported pulp and paper comes from a smaller group of countries. Just eight countries' exports represent a greater than 2% portion of Denmark's pulp and paper imports.

After conducting the provenance reassignment (see Section 3.2), more than half of pulp and paper was estimated to originate from just two countries – Sweden (31% of the total) and Germany (28% of the total). Overall, the majority of pulp and paper, as with timber, is imported from neighbouring European countries (Figure 27).

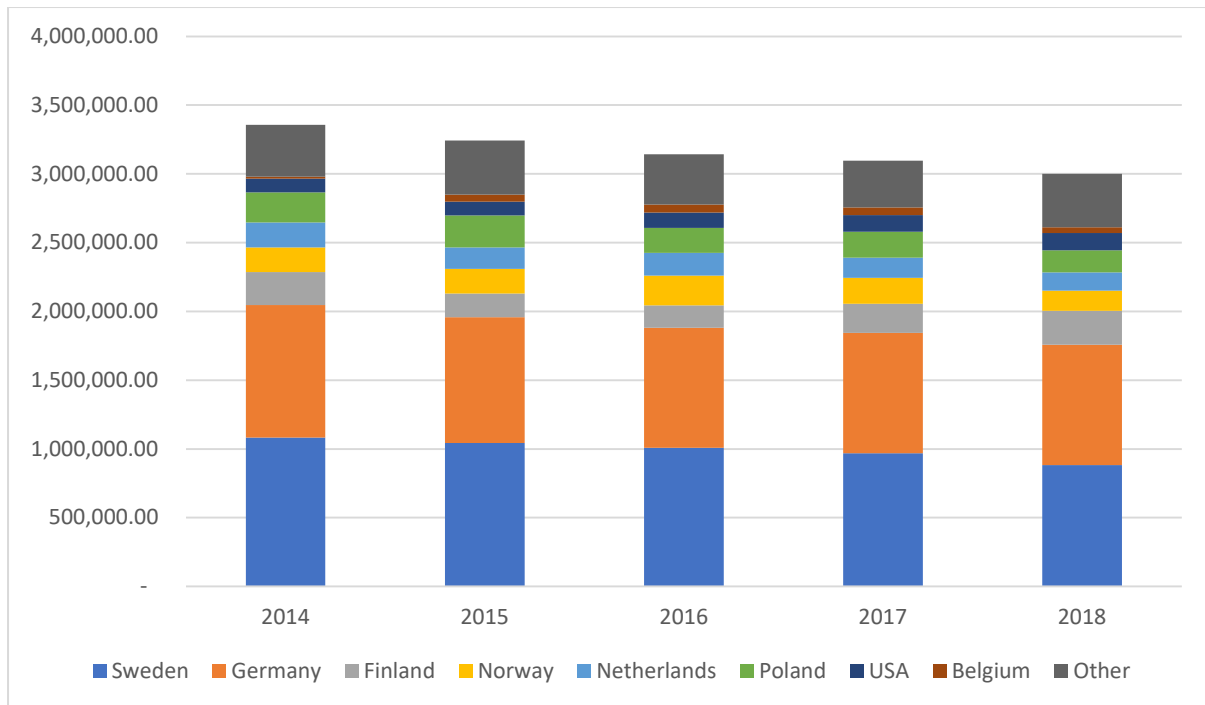


Figure 26: Danish imports of pulp and paper products from 2013-2018 by country

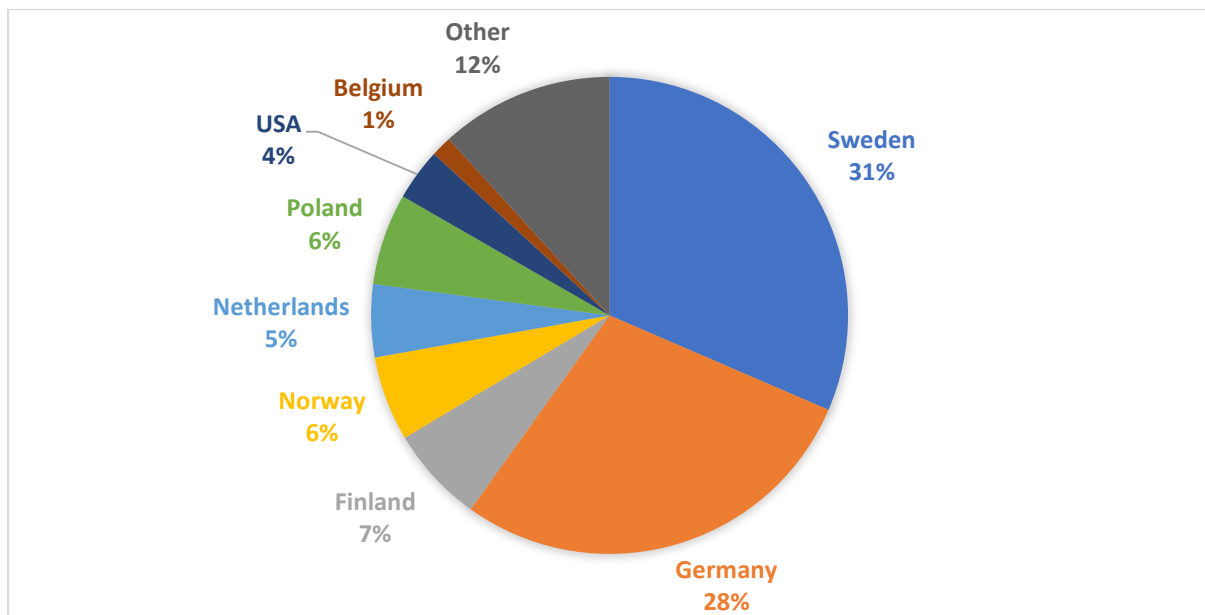


Figure 27: Danish imports of pulp and paper, by country, by quantity in WRME average between 2014-2018

### 5.3.5 Estimated consumption of pulp and paper products

Consumption was estimated using the following equation:

$$(\text{Danish production} + \text{Danish imports}) - \text{Danish exports} = \text{consumption}$$

$$(1.66\text{m}^3 + 3.17\text{m}^3) - 1.57\text{m}^3 = 3.26\text{m}^3 \text{ (in millions of WRME)}$$

Between 2014-2018 there was a reduction in the production, import and consumption of pulp and paper products. This reduction is steepest between 2014-2015, and then slows. On

average, Denmark consumes 67% of the pulp and paper products that it produces and imports (Figure 28).

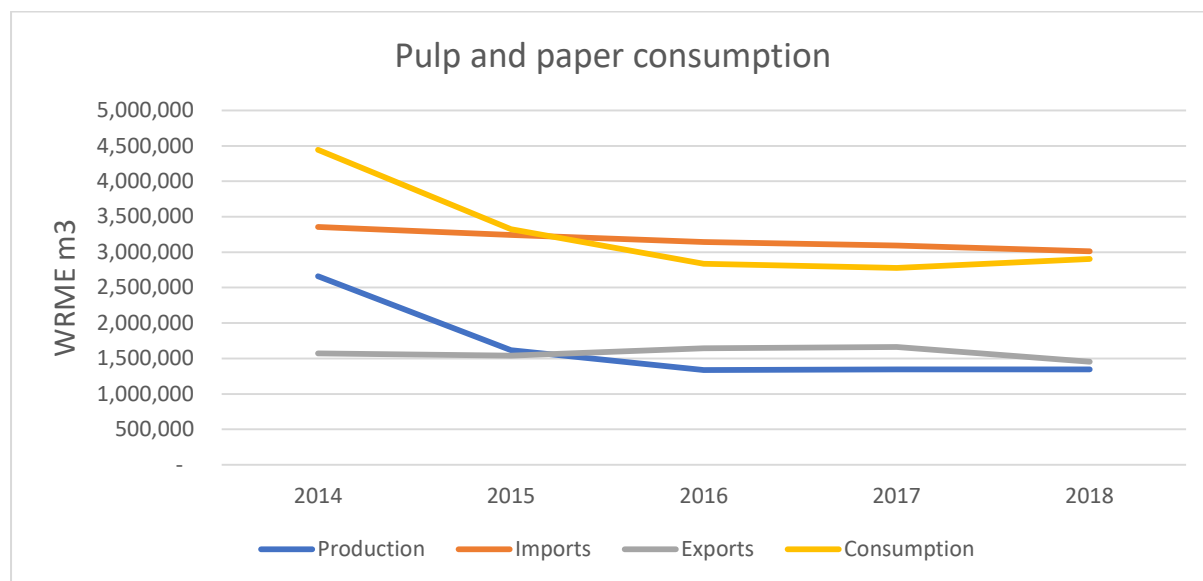


Figure 28: Production, imports, exports and consumption of pulp and paper products (converted to WRME, m<sup>3</sup>)

### 5.3.6 Footprint of pulp and paper imports

On average, the forested land area required to produce Danish pulp and paper imports in the five years assessed was 662,237.87 hectares – or around two times the land area of Funen . This area of forested land required decreased over the five years assessed from around 700,000 hectares in 2014 to around 616,000 hectares in 2018. The forested land area required in five of the major exporting countries decreased over the five years assessed (Sweden, Germany, Norway, Netherlands and Poland), while the forested land area required in three countries increased (Finland, USA and Belgium). The biggest decrease was in Poland, while the largest increase was in the USA (Figure 29).

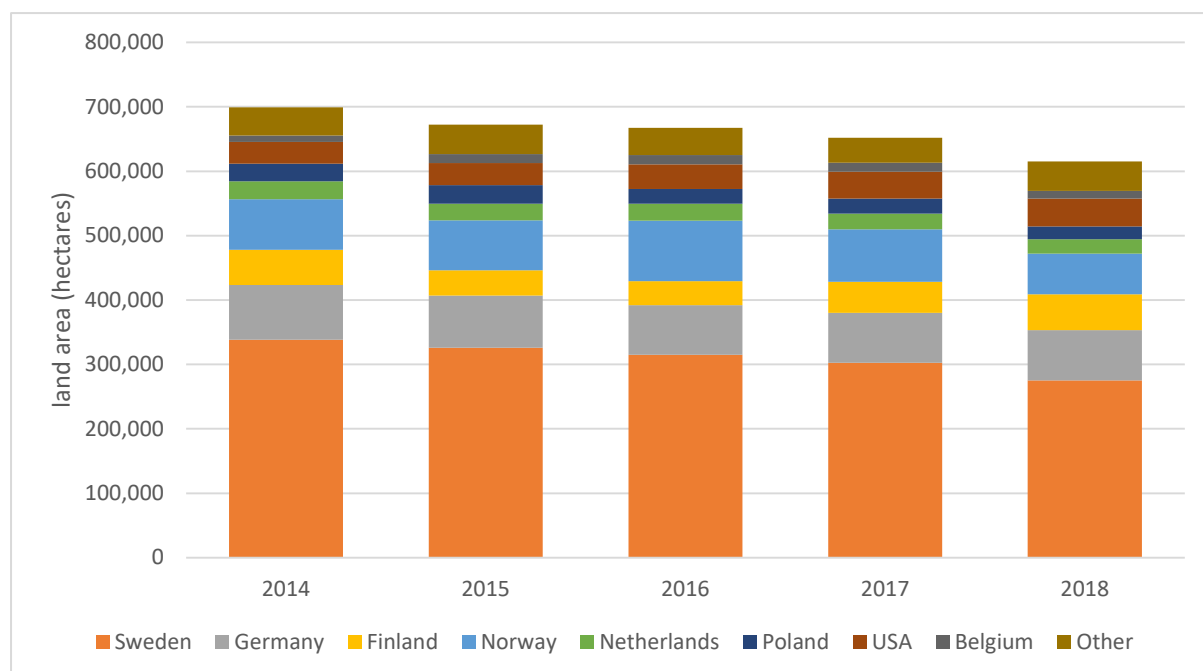


Figure 29: The land area (in hectares) required to produce Danish pulp and paper imports, by country



### 5.3.7 Risk analysis of pulp and paper imports

Danish imports of pulp and paper use a total forested land area of 663,000 hectares in an average year. Over half of this land area (53%) is grown in countries that are medium risk across deforestation and social indicators (Figure 30). One-sixth is grown in countries that are low risk on deforestation and social indicators, and none of the countries where Denmark sources over 2% of its pulp and paper imports from flagged as high risk. This makes Danish pulp and paper imports a lower risk than those of soy and timber. See Table 4 for the full list of countries and their risk rating, and Figure 31 for the global spread on a map.

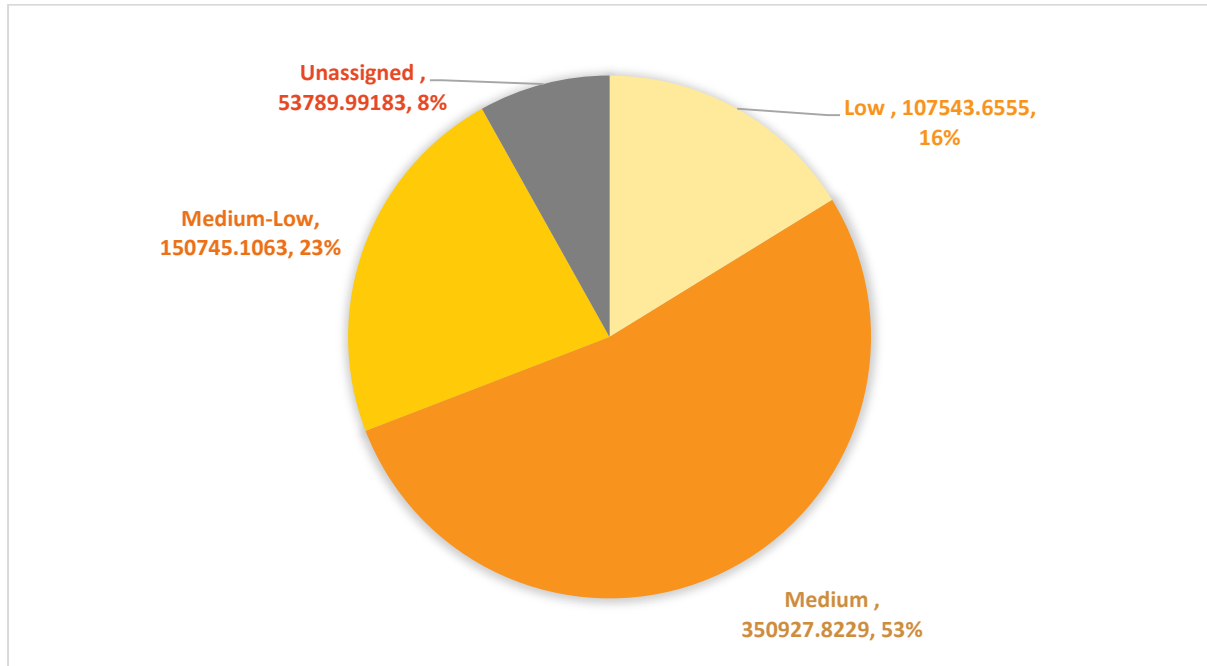


Figure 30: Danish imported pulp and paper land areas in countries from which it sources more than 2% of imports, categorised according to country risk category

Table 4: Danish import land hectares in countries that supply a greater than 2% share of Danish imports of pulp and paper, rated from very high to low according to performance across four deforestation and social indicators. Hectares are an average year between 2014-2018

| Country     | Pulp and paper (annual land footprint in hectares) | Tree cover change (ha) | Deforestation Rate | Labour standards | Corruption perception |                        |                    |                  |                  |               | Rating     |
|-------------|--|------------------------|--------------------|------------------|-----------------------|------------------------|--------------------|------------------|------------------|---------------|------------|
|             |  |                        |                    |                  |                       | Tree cover change (ha) | Deforestation Rate | Labour standards | Corruption Index | Overall score |            |
| Belgium     | 5,743.69   | 21259                  | 2.05%              | 2                | 75                    | 1                      | 1                  | 1                | 1                | 4             | Low        |
| Finland     | 46,986.40  | 1215990                | 0.00%              | 1                | 85                    | 3                      | 1                  | 1                | 1                | 6             | Medium-Low |
| Germany     | 80,356.86  | 148283                 | 0.08%              | 1                | 80                    | 1                      | 1                  | 1                | 1                | 4             | Low        |
| Netherlands | 21,443.11  | 6021                   | 0.00%              | 1                | 82                    | 1                      | 1                  | 1                | 1                | 4             | Low        |
| Norway      | 79,203.50  | 255316                 | -0.53%             | 1                | 84                    | 1                      | 2                  | 1                | 1                | 5             | Medium-Low |
| Poland      | 24,555.20  | 384295                 | 5.75%              | 3                | 60                    | 1                      | 1                  | 2                | 2                | 6             | Medium-Low |
| Sweden      | 311,678.70   | 1401296                | -7.56%             | 1                | 85                    | 3                      | 3                  | 1                | 1                | 8             | Medium     |
| USA         | 39,249.13  | 113612363              | 0.20%              | 4                | 71                    | 3                      | 1                  | 2                | 1                | 7             | Medium     |
| Unassigned  | 53,789.99  | n/a                    | n/a                | n/a              | n/a                   | n/a                    | n/a                | n/a              | n/a              | n/a           |            |

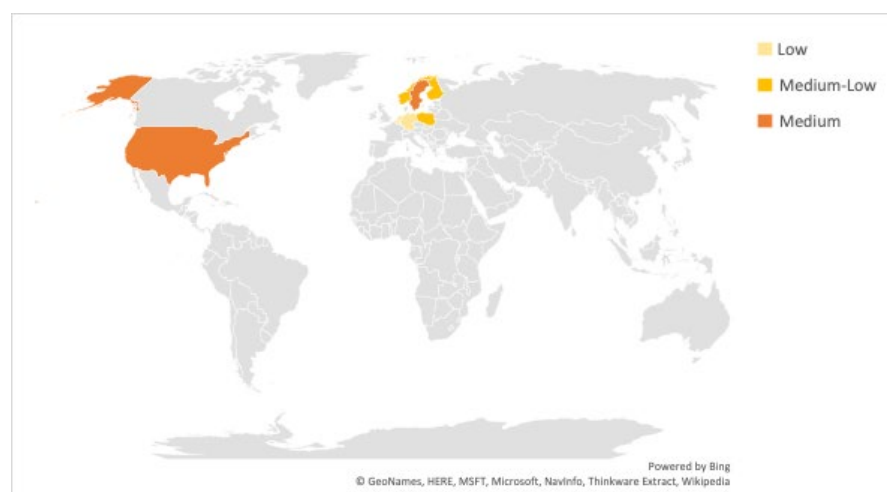


Figure 31: Social and deforestation risk profile of countries from where Denmark imports over 2% of soy, timber, pulp and paper. an average year between 2014-2018.

## 6 Soy

### 6.1 Production, uses and sustainability of soy

#### 6.1.1 Production

Soy (or soybean, or soya), *Glycine max*, is a leguminous species native to East Asia, grown for its edible bean. Cultivation is successful in climates with hot summers, with prime growing conditions in mean temperatures of 20-30°C. It can grow in a wide range of soils, but optimum growth occurs in moist alluvial soils with a good organic content. Soy, like most legumes, fixes nitrogen via a symbiotic relationship with bacteria. It is grown widely in Asia, North, Central and South America.

Soy production has increased eightfold since the 1960's and has doubled since 2000. This growth in production has been dominated by three countries: the USA, Brazil, and Argentina, which together account for over 80% of global production. The rate of growth has been particularly rapid in South America, with more than half of Argentina's agricultural area now used for the cultivation of soy.<sup>50</sup>

Global soybean production is predicted to increase significantly in the coming decades. The FAO projections suggest an increase to 515 million tonnes by 2050.<sup>51</sup> The majority of this expansion is projected to come from South America.<sup>52</sup> Developing countries are likely to account for the majority of additional soy meal consumption due to increased livestock production, driven by the trend of more meat-rich diets.

#### 6.1.2 End uses

Soybeans contain 38% protein (double that of pork, and treble that of eggs), a wide range of essential amino acids, a high proportion of unsaturated fat, and they produce more protein per hectare than any other major crop. This high protein content has resulted in soy being a major animal feed ingredient.

The main uses of soy are:

- **Soy oil:** Soybeans contain approximately 18% oil, which is refined and used as vegetable oil for cooking, in a wide variety of processed foods, and also in the production of biofuels.<sup>53</sup>
- **Soy meal:** This is the material remaining from oil extraction, which can contain up to 49% protein.<sup>54</sup> The meal is 'toasted' (steam treated) and ground and then is almost entirely used in livestock feed.

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<sup>50</sup> García-Lopez, G.A. and Arizpe, N. (2010), 'Participatory processes in the soy conflicts in Paraguay and Argentina', *Ecological Economics*, 70(2), 196-206.

<sup>51</sup> Bruinsma, J. (2009) The resource outlook to 2050: by how much do land, water and crop yields need to increase by 2050? Paper presented at the FAO Expert Meeting, 24-26 June 2009, Rome on "How to Feed the World in 2050". Food and Agriculture Organization of the United Nations, Economic and Social Development Department, Rome, Italy.

<sup>52</sup> FAO, Source: [http://siteresources.worldbank.org/INTAFRICA/Resources/257994-1215457178567/Soybean\\_Profile.pdf](http://siteresources.worldbank.org/INTAFRICA/Resources/257994-1215457178567/Soybean_Profile.pdf)

<sup>53</sup> U.S. Soybean Export Council conversion table, see: <https://ussec.org/resources/conversion-table>

<sup>54</sup> Cromwell, G. L. (2012) Soybean meal - An exceptional protein source. Soybean Meal InfoCenter, Ankeny, IA

- **Direct human consumption:** Soy is used directly in a range of food – especially in China, Japan and Indonesia – including soy sauce, tempeh, tofu, soy flour, soy milk, textured vegetable protein, and edamame.

Close to 85% of the global soybean crop is crushed for oil and meal, with approximately 70% of the total used to feed livestock.<sup>55</sup> In the EU, this figure rises to around 90%. Soy meal accounts for over 60% of the world's production of vegetable and animal meal and occupies a prominent position among protein feedstuffs used for the production of feed concentrates.

Soybean oil is the second most important vegetable oil (after palm oil), accounting for 25% of global vegetable/animal oils and fats consumption.<sup>56</sup> Soy oil is used in food products, cosmetics, detergents, industrial products, and increasingly it is being used to produce biodiesel (especially in the USA). A valuable by-product from the crushing process is soy lecithin. It is an effective emulsifying agent in food products such as chocolate, biscuits, peanut butter and coffee creamer, and also in cosmetics, textiles, paints, coatings and waxes.<sup>57</sup>

Only about 6% of the global soy production is directly used in food products, mainly in Asia. Another small share of beans is used in animal feed prior to extracting the oil ('full-fat soybeans').<sup>58</sup>

Denmark is listed as having one vegetable oil-based biodiesel refinery and one vegetable oil-based oleo chemistry refinery,<sup>59</sup> suggesting that the country is able to produce a certain amount of biodiesel and refined vegetable oil products from imported soy products.

### 6.1.3 Environmental and social issues associated with soy production

The expansion of soy production in South America has been strongly associated with deforestation and other natural habitat destruction.<sup>60</sup> One study estimated that soy production accounted for 0.6 million hectares of land use change per year between 2000-11 in Brazil, Argentina, Paraguay and Bolivia. The same study estimated that 0.4 million hectares per year of this land use change was embedded in global trade.<sup>61</sup> Seventy per cent of the Saladillo wetlands in Cordoba, Argentina have been lost as a result of the construction of canals for soy cultivation.<sup>62</sup> Soy can also act as an indirect driver of deforestation, displacing cattle ranching towards the forest frontier.<sup>63</sup>

<sup>55</sup> Soja Coalitie (2014) Soy Barometer. Source:

[http://www.bothends.org/uploaded\\_files/document/Soy\\_Barometer2014\\_ENG.pdf](http://www.bothends.org/uploaded_files/document/Soy_Barometer2014_ENG.pdf)

<sup>56</sup> FAO, Source: [http://siteresources.worldbank.org/INTAFRICA/Resources/257994-1215457178567/Soybean\\_Profile.pdf](http://siteresources.worldbank.org/INTAFRICA/Resources/257994-1215457178567/Soybean_Profile.pdf)

<sup>57</sup> Soja Coalitie (2014) Soy Barometer. Source:

[http://www.bothends.org/uploaded\\_files/document/Soy\\_Barometer2014\\_ENG.pdf](http://www.bothends.org/uploaded_files/document/Soy_Barometer2014_ENG.pdf) Note that there is no separate HS code for lecithin, but its imports are included within higher level codes for soy oil.

<sup>58</sup> Soja Coalitie (2014) Soy Barometer. Source:

[http://www.bothends.org/uploaded\\_files/document/Soy\\_Barometer2014\\_ENG.pdf](http://www.bothends.org/uploaded_files/document/Soy_Barometer2014_ENG.pdf)

<sup>59</sup> Bio-refineries in Europe (2017) Nova Institute and Bio-based Industries Consortium

[https://biconsortium.eu/sites/biconsortium.eu/files/downloads/MappingBiorefineriesAppendix\\_171219.pdf](https://biconsortium.eu/sites/biconsortium.eu/files/downloads/MappingBiorefineriesAppendix_171219.pdf)

<sup>60</sup> Nepstad, D.C., et al. (2006) 'Globalisation of the Amazon Soy and Beef Industries: Opportunities for Conservation', *Conservation Biology* 20: 6

<sup>61</sup> Henders, S., Persson, U.M. & Kastner, T. (2015). Trading forests: land-use change and carbon emissions embodied in production and exports of forest-risk commodities. *Environ. Res. Lett.* 10.

<sup>62</sup> Soja Coalitie (2014) Soy Barometer. Source:

[http://www.bothends.org/uploaded\\_files/document/Soy\\_Barometer2014\\_ENG.pdf](http://www.bothends.org/uploaded_files/document/Soy_Barometer2014_ENG.pdf)

<sup>63</sup> Barona, E., et al. (2010) 'The Role of Pasture and Soybean in Deforestation of the Brazilian Amazon', *Environmental Research Letters*, 5 (2).

The expansion of soy cultivation has led to land rights issues with local communities and indigenous groups, sometimes escalating into violent conflict. Soybean expansion has been associated with poor labour conditions and violations of human rights in Brazil<sup>64</sup> and Paraguay.<sup>65</sup> The fertilisers and pesticides used in soy cultivation can also pose health risks to people living near soy farms.<sup>66</sup>

#### 6.1.4 Certification

Certification schemes have proliferated within the soy sector in the past decade.

Perhaps the most prominent scheme is the Roundtable on Responsible Soy (RTRS). RTRS members include producers, industry, trade & finance, and civil society organisations. The scheme includes a standard with independent third-party verification, and chain of custody arrangements that include segregation, mass balance or a credit system. The RTRS standard excludes deforestation of High Conservation Value Forest<sup>67</sup> after 2009, and has social requirements that are at or above national legal minimum requirements for issues such as land rights and workers' terms and conditions.<sup>68</sup> A revised version of the standard effectively precludes the conversion of any natural vegetation from June 2016 onwards, and a new module related to non-GM production was approved in 2018. The first RTRS-certified soy came on the market in June 2011, and by 2019, over three million tonnes of soy was RTRS certified.<sup>69</sup> Most of the companies buying credits are based in the EU.<sup>70</sup>

A second certification scheme, the ProTerra Certification Program, was created in 2006 within Cert ID (part of Global ID Group), a global certification body that provides accredited certification programs to the food and agricultural industry. It was transferred in full to the ProTerra Foundation in 2012. The standard includes sustainability criteria and excludes genetically modified (GMO) soy. Certification of producers, handling, transport and storage, and processing and manufacturing is possible, involving independent third-party verification. In 2015, 3.6 million tonnes of soy were certified by ProTerra.<sup>71</sup>

In addition to these soy-specific multi-stakeholder standards, there are a numerous proprietary standards which include third party verification (e.g., ADM's Responsible Soy Standard, Cargill's 'Triple S' standard, the Certified Responsible Soya (CRS) standard owned by Cefetra), the FEFAC guidelines (which benchmarks standards), and the FEMAS standard (which is in essence a food quality benchmark with an add-on responsible soy module).

Proprietary standards typically focus on legal compliance, good agricultural practice, and legal treatment of workers. Their provisions regarding deforestation and social issues are typically weaker than those of RTRS and ProTerra. For example, FEFAC compliant

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<sup>64</sup> <https://milieudefensie.nl/publicaties/factsheets/factsheet-2-dutch-soy-coalition-modern-slavery-in-brazil>

<sup>65</sup> Hobbs, J. (2012) Paraguay's destructive soy boom. The New York Times. Source: <http://www.nytimes.com/2012/07/03/opinion/paraguays-destructive-soy-boom.html>

<sup>66</sup> Soja Coalitie (2014) Soy Barometer. Source: [http://www.bothends.org/uploaded\\_files/document/Soy\\_Barometer2014\\_ENG.pdf](http://www.bothends.org/uploaded_files/document/Soy_Barometer2014_ENG.pdf)

<sup>67</sup> High Conservation Value Forests are those that contain one or more outstanding biological, ecosystem, social or cultural value. First defined in the Forest Stewardship Council standard for sustainable forest management, the definition is now used in sustainability initiatives in many sectors.

<sup>68</sup> Jason Potts, Mathew Lynch, Ann Wilkings, Gabriel Huppé, Maxine Cunningham, Vivek Voora (2014). State of Sustainability Initiatives Review. IISD & IIED.

<sup>69</sup> RTRS. Source: <http://www.responsiblesoy.org/mercado/volumenes-y-productores-certificados/?lang=en>

<sup>70</sup> RTRS. Source: <http://www.responsiblesoy.org/mercado/compradores-de-creditos/?lang=en>

<sup>71</sup> RTRS. Source: <http://soyscorecard.panda.org/solutions>

standards need only exclude illegal deforestation, thus allowing legal deforestation, and the ADM and Triple S standards do not demand that workers have freedom of association and collective bargaining. Proprietary standards also tend to be significantly less transparent than RTRS and ProTerra, with no publicly available copies of audit reports, and in some cases the standard not being readily available (e.g., CRS).

Non soy-specific standards, including organic standards, are also used in the sector. The International Sustainability and Carbon Certification (ISCC) was created in 2010 and has developed a standard that is consistent with the requirements of the EU Renewable Energy Directive (Directive 2009/28/EC) for biofuel feedstock.

Certification of non-GM soy requires compliance with non-GM criteria, but no other environmental or social standards. Non-GM soy is often used for soy used for direct human consumption, as EU-labelling rules state that the presence of GM-ingredients in food products above a threshold of 0.9% has to be disclosed.

Overall in 2017, 29% of the soy used in Denmark was FEFAC SSG compliant.<sup>72</sup> Danish dairy producer Arla Foods purchased 310,000 RTRS credits in 2017 and 270,000 credits in 2018, making it the single biggest Danish buyer.<sup>73</sup> This came after a company decision in 2016 to incentivise more farmers to convert to GM-free feed so that Arla could capture increased market demand for GM-free foods, and customer willingness to pay a price premium.<sup>74</sup>

### **6.1.5 The EU and Denmark's responses to environmental and social issues with soy**

Many policy instruments cover both the environmental and social issues associated with palm oil and soy oil. These include EU and international policies, such as the EU Renewable Energy Directive, the UNFCCC Paris Agreement, and voluntary initiatives such as the Consumer Goods Forum.

Internationally, one of the most significant initiatives to reduce deforestation associated with soy production is the Amazon Soy Moratorium. The Moratorium began in 2006 as a voluntary agreement designed to ensure that traders do not buy soy grown in the Amazon on land deforested after 2006. The commitment was renewed in 2008 with the participation of the Brazilian government, and since then has been renewed annually. In May of 2016, the agreement was renewed indefinitely '*until it is no longer necessary*'. The Moratorium is considered to have been successful in halting deforestation in the Brazilian Amazon: before the moratorium, 30% of soy expansion occurred through deforestation, compared with just one per cent after the Moratorium came into effect.<sup>75</sup> However, habitat destruction remains unmanaged in other soy sourcing areas such as in the *Cerrado*, which holds 5% of the world's biodiversity, and indeed conversion of *Cerrado* may have been exacerbated by the Moratorium.

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<sup>72</sup> The Sustainable Trade Initiative (2017) European Soy Monitor. Source: (p.51)

<https://www.idhsustainabletrade.com/uploaded/2019/04/European-Soy-Monitor.pdf>

<sup>73</sup> The Sustainable Trade Initiative (2017) European Soy Monitor. Source:

<https://www.idhsustainabletrade.com/uploaded/2019/04/European-Soy-Monitor.pdf>

<sup>74</sup> Arla (2016) Arla incentivises more gm free feed. Source: <https://www.arla.com/company/news-and-press/2016/press-release/arla-incentivises-more-gm-free-feed-1403459/>

<sup>75</sup> Gibbs, H. K., L. Rausch, J. Munger, I. Schelly, D. C. Morton, P. Noojipady, B. Soares-Filho, P. Barreto, L. Micol, and N. F. Walker (2015) 'Brazil's Soy Moratorium: Supply chain governance is needed to avoid deforestation.' *Science* 347(6220): 377-378

Despite the success of the soy moratorium, there is currently significant doubt over ongoing support for the Moratorium. Since the election of president Jair Bolsonaro, there has been increasing number of political pledges to bring down economic barriers to economic development in the Amazon, which has been interpreted as including the Soy Moratorium.<sup>76</sup>

The *Cerrado*, has received significant attention from environmental organisation due to the increasing threats it faces from soy expansion. In 2017, a grouping of NGOs, including WWF, published the Cerrado Manifesto. The manifesto was a call to halt conversion of *Cerrado* vegetation in Brazil, the main causes of which are expanding agribusiness, and particularly soy cultivation. Over 60 companies signed a Statement of Support for the Cerrado Manifesto, committing them to work with local and international stakeholders to halt deforestation and native vegetation loss in the Cerrado, including support for implementation of Brazil's Forest Code.<sup>77</sup>

The Gran Chaco region in Argentina, Paraguay and Bolivia is another area of significant deforestation that has been linked to European soy imports.<sup>78</sup> This has not received as much industry nor political attention as other soy sourcing regions where there is significant deforestation or land clearance occurring, such as the Amazon or Cerrado, but is nevertheless being closely monitored by Global Forest Watch<sup>79</sup>, WWF<sup>80</sup> and Guyra Paraguay<sup>81</sup>.

In 2014, the Danish Agriculture & Food Council, representing the farming and food industries of Denmark, developed six soy procurement criteria, two of which relate to deforestation. Dakofo, representing the entire feed industry, is a signatory. The initiative focuses on removing illegal deforestation from the soy supply chain. It has formulated six soy purchasing criteria for South American soy and puts the onus on trading partners to take responsibility. In relation to deforestation, the criteria ask for adherence to the Soy Moratorium and rely on legal compliance.<sup>82</sup>

In 2017, The Danish Ethical Trading Initiative (DIEH) convened a working group on soy, which includes government bodies, such as The Ministry for Food, Agriculture and Fisheries, as well as companies, such as the Danish Crown – Europe's largest pork processing company. The alliance's vision is that all soy imported into Denmark is produced responsibly and does not contribute to deforestation or conversion. The Alliance is the first of its kind in Denmark and requires that members commit to publishing a timebound action plan for responsible soy and annually report progress to the Alliance Secretariat.<sup>83</sup>

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<sup>76</sup> Reuters (2019) Brazil farmers push traders to end Amazon soy moratorium. Source: <https://www.reuters.com/article/us-brazil-soybeans-moratorium/brazil-farmers-push-traders-to-end-amazon-soy-moratorium-idUSKBN1XF2J6>

<sup>77</sup> WWF. Source: <https://www.worldwildlife.org/stories/saving-the-cerrado-brazil-s-vital-savanna>

<sup>78</sup> Mighty Earth (2018) The avoidable crisis. Source: [http://www.mightyearth.org/wp-content/uploads/2018/04/ME\\_DEFORESTATION\\_EU\\_English\\_R8.pdf](http://www.mightyearth.org/wp-content/uploads/2018/04/ME_DEFORESTATION_EU_English_R8.pdf)

<sup>79</sup> [https://data.globalforestwatch.org/datasets/3d668cf0fbc415bba1ec00bc6263877\\_5](https://data.globalforestwatch.org/datasets/3d668cf0fbc415bba1ec00bc6263877_5)

<sup>80</sup> <https://www.worldwildlife.org/places/gran-chaco>

<sup>81</sup> <http://guyra.org.py/?lang=en>

<sup>82</sup> The Sustainable Trade Initiative (2017) European Soy Monitor. Source: <https://www.idsustainabletrade.com/uploaded/2019/04/European-Soy-Monitor.pdf>

<sup>83</sup> Dortmund, J. (2019), Personal communication.

Denmark does not grow any soy, however, Saaten Union is trying to develop soybean seeds that require fewer growth days so they could adapt to the growing conditions in a Nordic country like Denmark.<sup>84</sup>

Denmark is among the EU-28 countries that have introduced initiatives to promote the production of alternative plant proteins. The Det Nationale Bioøkonomi Panel (Danish National Bioeconomy Panel), an advisor to the government, published its recommendations on the Future of Proteins in 2018.<sup>85</sup> The Danish Ministry of the Environment and Food launched a Protein Action Plan in 2018 following the panel's recommendations.<sup>86</sup> In 2019, the Danish Protein Innovation was launched as a new broad collaboration aimed at targeting and intensifying development and research on domestic production of protein for feed, food, and pharma.<sup>87</sup>

## 6.2 Global trade in soy

Soy is the most successful and widely traded oilseed on world markets. Brazil, Argentina, USA and Argentina dominate its production and accounted for 91% of globally traded soy products in 2017.<sup>88</sup> The soy products exported differ between countries: USA, Brazil and Paraguay export comparatively more beans, while Argentina and India perform most of the crushing of beans domestically, and thus export comparatively more meal and oil. China dominates global imports of soybeans, oil and meal, with the EU also importing significant quantities – see Figure 32 b.

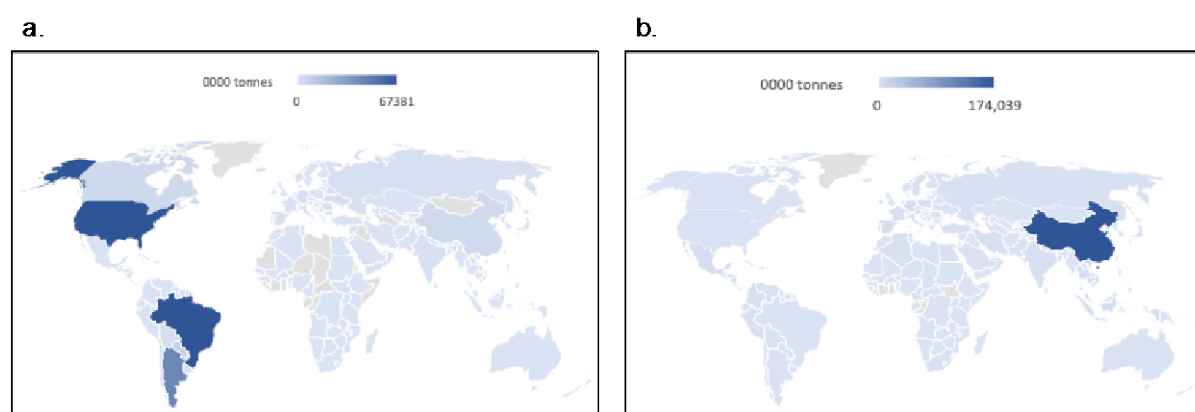


Figure 32: Global trade in soybeans, soy meal and soy oil (million tonnes): a. exports, and b. imports<sup>89</sup>

The year of 2018 proved turbulent for the global trade flows of soy. In July 2018, China applied a 25% tariff on USA soybeans as a reaction to tariffs imposed earlier by the USA. In previous years, the USA supplied about one third of China's soy imports, and as a result China looked for alternative supplies, namely from Brazil, but also Paraguay and

<sup>84</sup> Nielsen, A.T. (November 11) Forædlingsfirma om soja: Mange levnedeheller ikke majs en fremtid i Danmark, LandbrugsAdvisen, Source: <https://landbrugsavisen.dk/for%C3%A6dlingsfirma-om-soja-mange-levnedeheller-ikke-majsen-fremtid-i-danmark>

<sup>85</sup> European Commission (November) Report from the Commission to the Council and the European Parliament on the development of plant proteins in the European Union, p. 13.

<sup>86</sup> Ministry of Environment and Food of Denmark (2018), Handlingsplan for Nye Bæredygtige Proteiner.

<sup>87</sup> DAKOFO (2019) Dansk Protein Innovation er etableret. Source: <https://www.dakofo.dk/nyheder/dansk-proteininnovation-er-etableret/>

<sup>88</sup> PSDOnline (n.d.), Oilseed, soybean: Export 2017/18. Source: <https://apps.fas.usda.gov/psdonline/app/index.html#/app/advQuery>

<sup>89</sup> Source: FAOSTAT



Argentina.<sup>90</sup> Prices for Brazilian soybeans began to increase as demand surged,<sup>91</sup> but this was also counter balanced by Chinese demand for soy weakening in comparison to previous years, partially due to an outbreak of African Swine Fever.<sup>92</sup> In addition, the Chinese pork sector started taking steps to cut its comparatively high soymeal ratios in pork feed, a strategy that could reduce import needs by an estimated 27 million tonnes (around 25%) annually.<sup>93</sup> Meanwhile, USA exporters on short notice had to find other export markets. Prices for USA soybeans hit a ten-year low in July 2018, but found new markets in other Asian and EU countries.<sup>94</sup> Some USA soy was even exported to Argentina, which despite normally being one of the top soy exporters, experienced a drought which weakened domestic production and it imported 1.4 million tonnes of USA soybeans in 2018 to feed its crushing industry.<sup>95</sup>

## 6.3 Danish soy imports

### 6.3.1 Value of soy imports

On average, the value of Danish soy imports is €2.19 billion – 16.37 billion Danish kroner – each year between 2014-2018 (Figure 33). This value was at its lowest in 2016 at €2.04 billion, and its highest in 2018 at €2.32 billion. Over the five-year period, we do see an overall upwards trend, although this dips in 2016.

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<sup>90</sup> Reuters (2018) China imports zero U.S. soybeans in November for first time since trade war started. Source: <https://www.reuters.com/article/us-china-economy-trade-soybeans/china-imports-zero-u-s-soybeans-in-november-for-first-time-since-trade-war-started-idUSKCN1ON0ER>

<sup>91</sup> Shane, D. (2018) China may soon regret slapping tariffs on US soybeans, CNN Business, Source <https://edition.cnn.com/2018/10/01/economy/china-soybeans-trade-war/index.html>

<sup>92</sup> Chen, A. (2018) H1 Outlook: US-China trade war to continue to impact Asian soybean market. S&P Global Platts. Source: <https://www.spglobal.com/platts/en/market-insights/latest-news/agriculture/122618-h1-outlook-us-china-trade-war-to-continue-to-impact-asian-soybean-market>

<sup>93</sup> Mason, J., Gu, H. and K. Plume (2018) Inside China's strategy in the soybean trade war. Reuters. Source: <https://www.reuters.com/article/uk-usa-trade-china-soymealinsight/inside-chinas-strategy-in-the-soybean-trade-waridUSKCN1QQ0D2>

<sup>94</sup> Valinsky, J. (2018) Trade war fallout: Soybean prices plunge to a 10-year low, CNN Business. Source: <https://money.cnn.com/2018/07/11/news/economy/soybean-prices/index.html>

<sup>95</sup> Bronstein, H. and K. Plume (2018) Spoils of trade war: Argentina loads up on cheap U.S. soybeans, Reuters. Source: <https://www.reuters.com/article/us-g20-argentina-grains-insight/spoils-of-trade-war-argentina-loads-up-on-cheap-u-s-soybeansidUSKCN1NZ0HC>

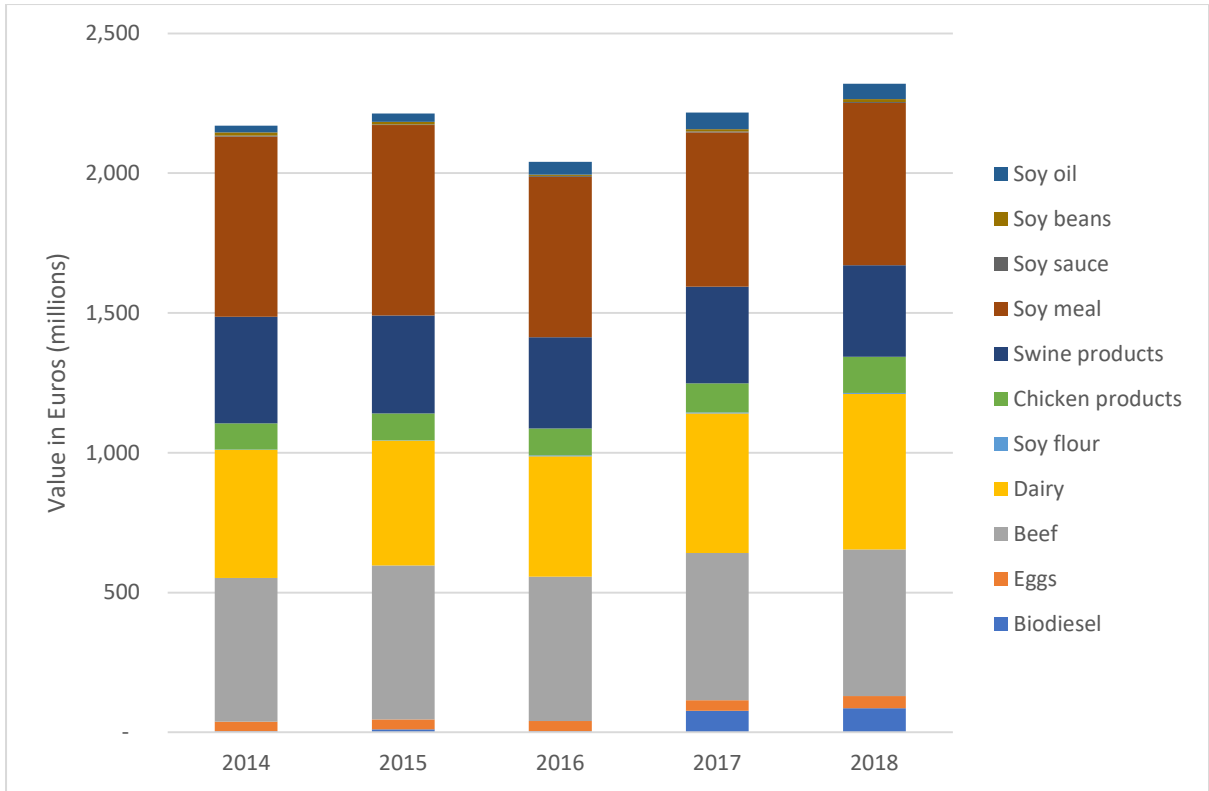


Figure 33: The value of Danish soy imports in Euros from 2014-2018

Overall, livestock products with embedded soy account for a large quantity of the value of Danish soy imports, specifically beef (24%), dairy (22%) and swine (16%). Another significant portion of the value is soy meal (27%). See Figure 34.

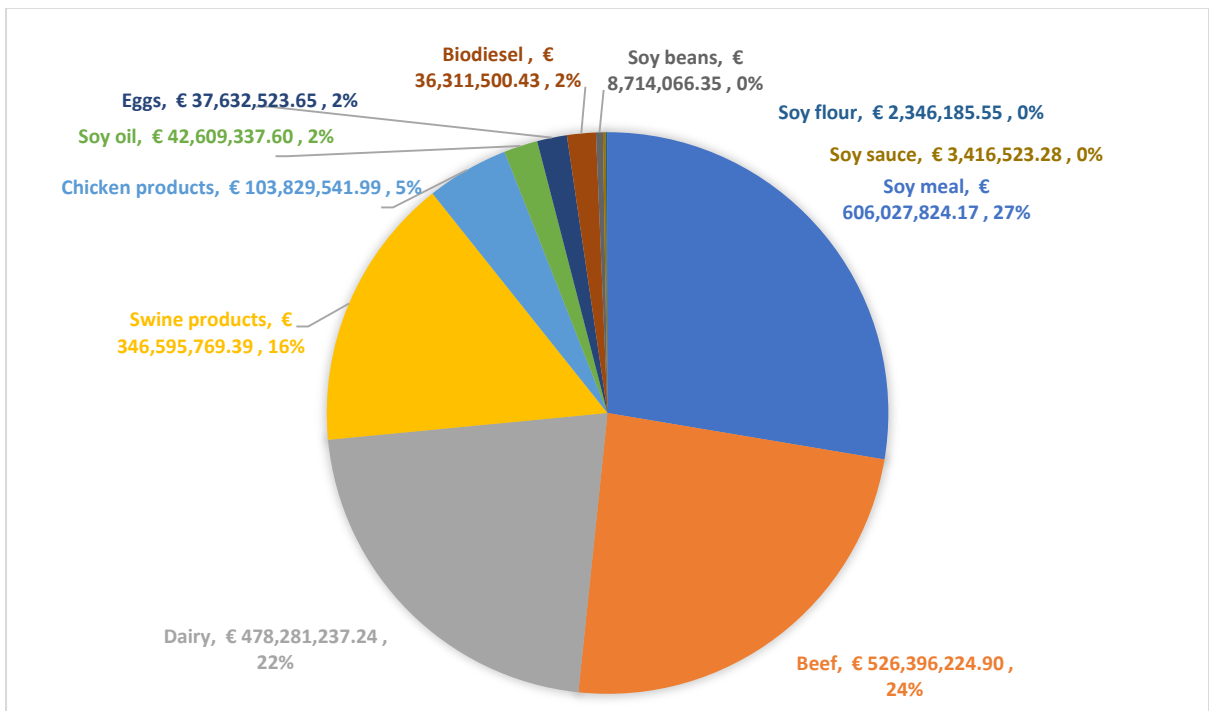


Figure 34: The value of different soy imports as a percentage of total soy imports. Percentage is an average over the years of 2014-2018

### 6.3.2 Quantity of soy imports

Soy product imports were converted using conversion factors into tonnes of actual soy. For example, we used conversion factors of 0.575 for imported chicken meat, and 10.26 for biodiesel to reflect the quantity of soy within or needed to produce all soy commodity imports. See Appendix 3: Soy HS codes and conversion factors for the full list of soy conversion factors used,

When we analyse soy imports by quantity, rather than by value, we see quite a different picture, particularly in terms of proportions of different soy import types. There is no clear upwards or downwards trend in terms of the quantity of Danish soy imports over the five years assessed. Imports peak in 2015 at 1.89 million tonnes and drop to their lowest in 2018 at 1.74 million tonnes (Figure 35). The average annual quantity of soy imports over the five years assessed was 1.8 million tonnes.

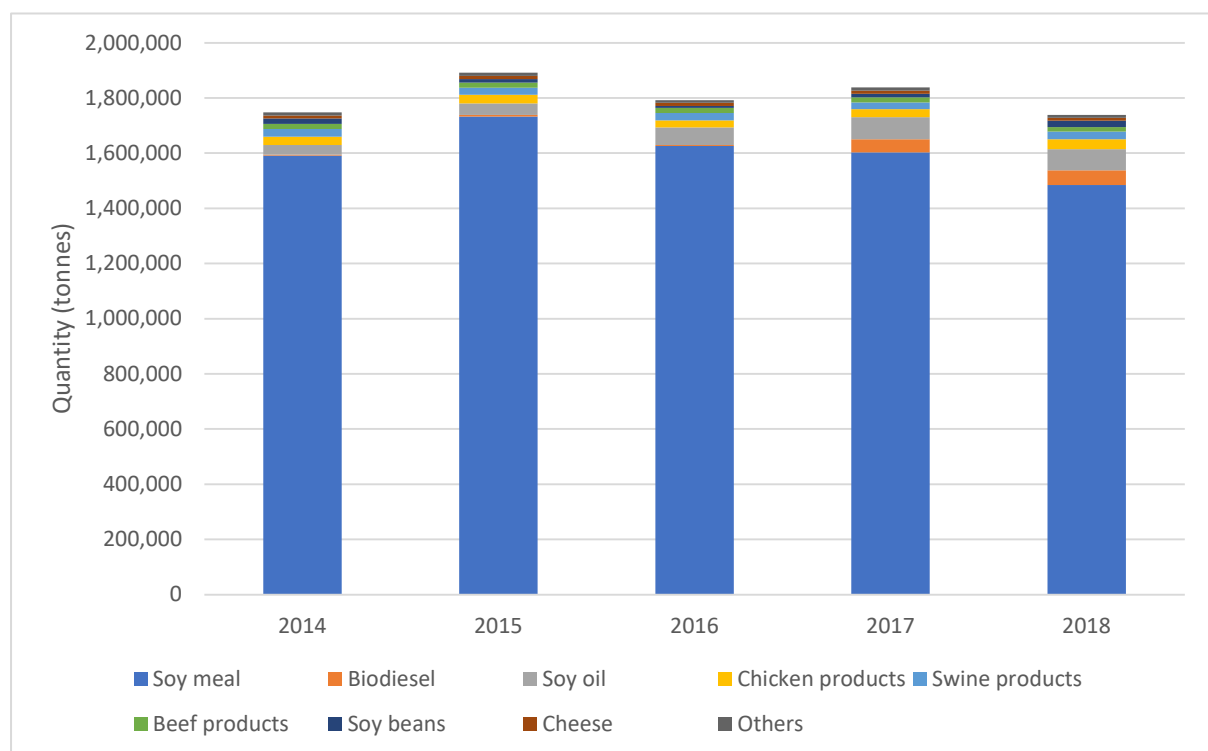


Figure 35: Quantity of Danish soy imports between 2014-2018, in tonnes

Danish imports of soy products by quantity are dominated by soy meal – 89% (Figure 36). This is despite soy meal imports only making up 27% of the value of soy imports. Conversely, whereas soy embedded in beef, dairy and swine make up a high proportion of the value of soy imports (69%), they only make up a small proportion of the quantity (5%).

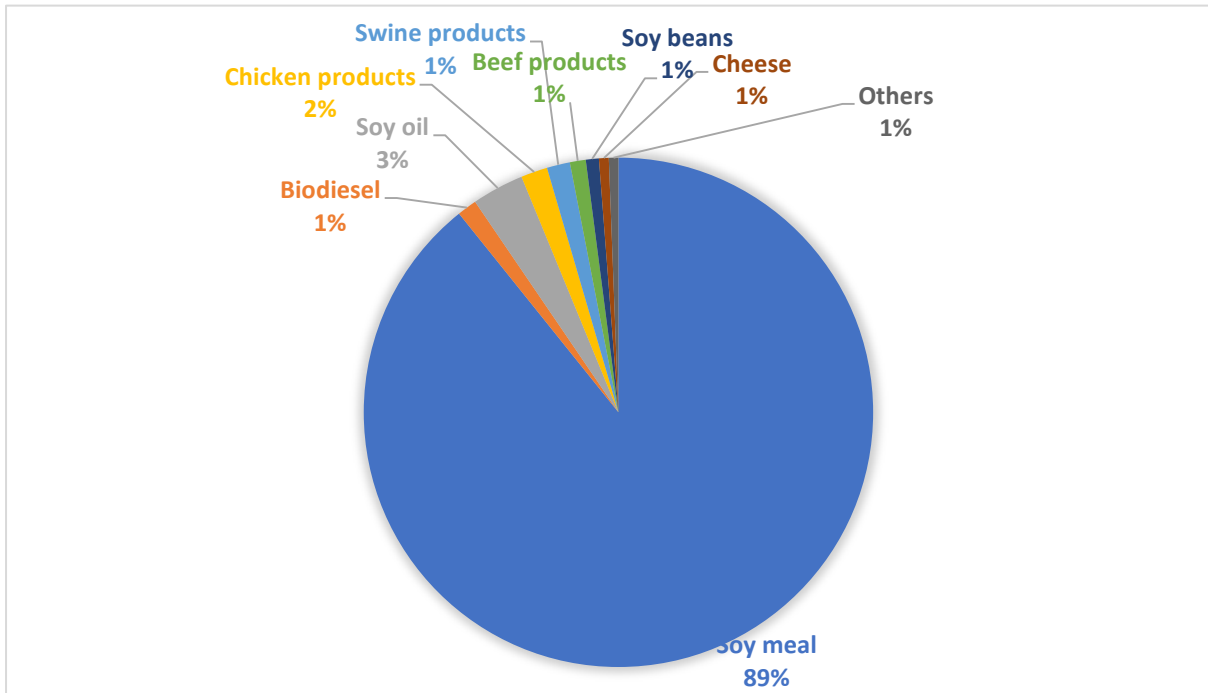


Figure 36: The quantity, in tonnes, of different soy imports as a percentage of total soy imports. Percentage is an average over the years of 2014-2018

### 6.3.3 Provenance of soy imports

Between 2014 – 2018, we see a decrease in the amount of soy imports coming from the USA and Argentina, and an increase in the quantity of soy imports from Brazil and countries designated 'other' since they make up less that 2% of Danish imports (Figure 37). Within the 'other' country grouping, there was a particular increase in the amount of soy coming from China between 2017-2018.

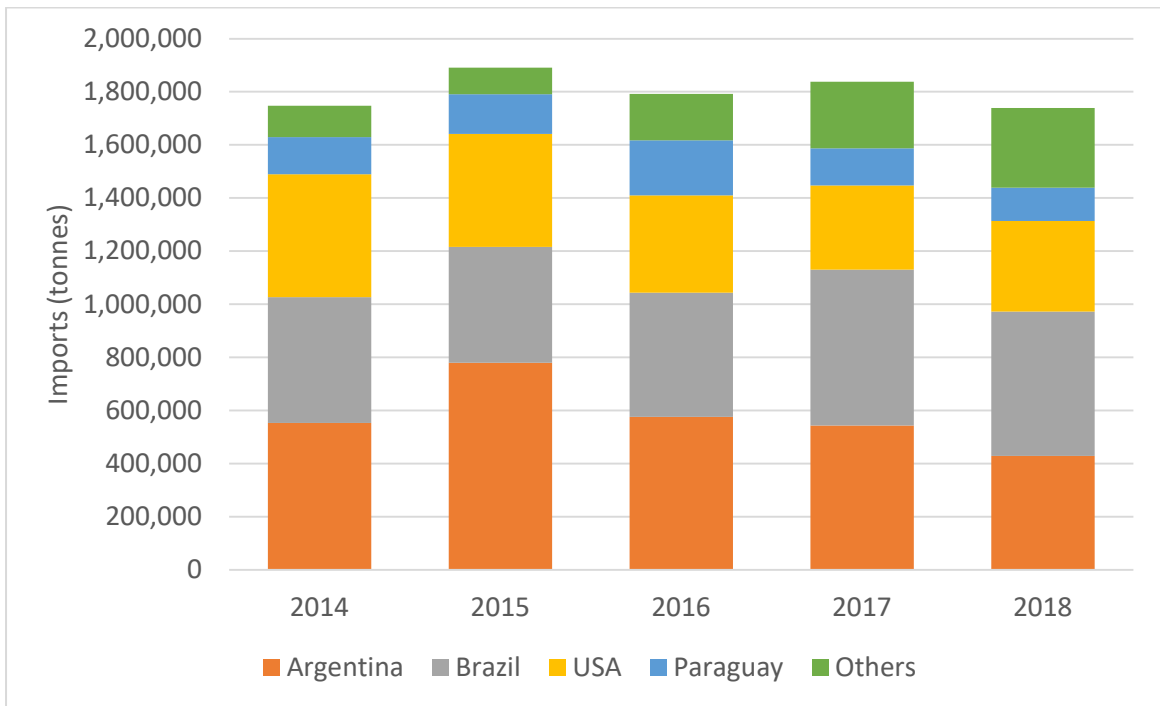


Figure 37: Danish imports in tonnes, by country of provenance (tonnes of soy)

Most of the soy that is imported into Denmark comes from Latin America, with on average 700,818 tonnes coming from Argentina (31.4% of Danish soy imports), 650,122 tonnes coming from Brazil (29.1%) and 146,949 tonnes coming from Paraguay (6.6%). The USA is another significant grower of soy that is imported into Denmark at 497,006 tonnes (22.3% of Danish soy imports) (Figure 38).

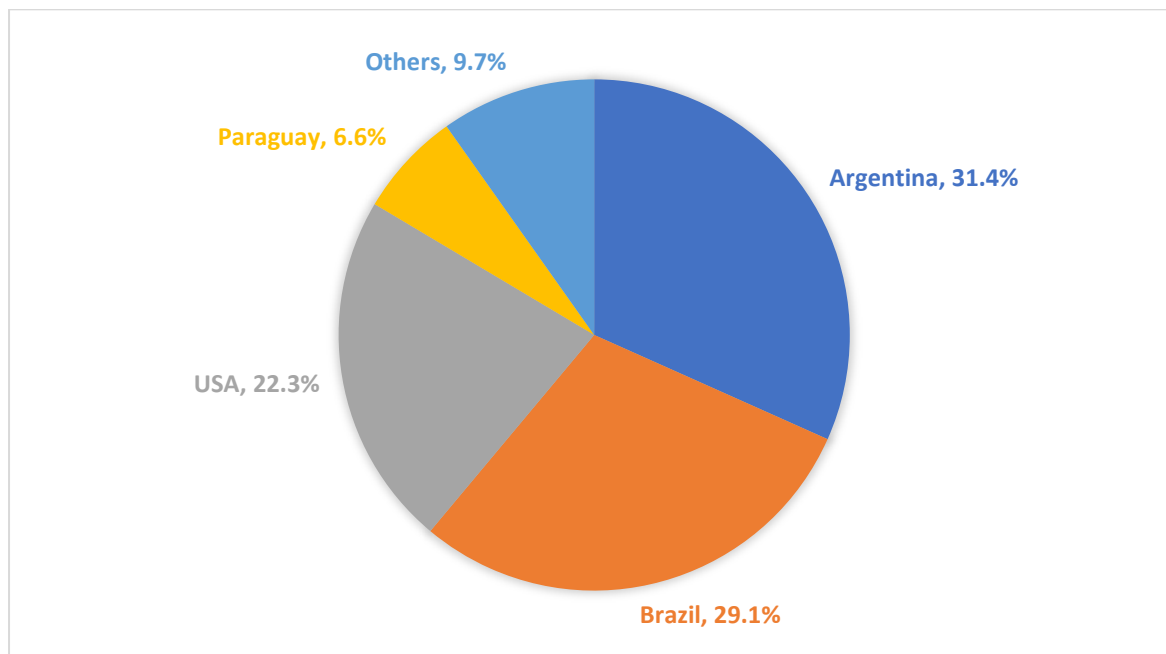


Figure 38: Provenance of Danish imports of soy, by country, as an average of quantities in tonnes per year between 2014-2018

#### 6.3.4 Footprint of soy imports

The average total annual land footprint of Danish soy imports is 898,000 hectares. This is greater than the combined land area of Zealand and Lolland. By country, this is broken down to a land footprint of 265,906 hectares in Argentina, 239,436 hectares in Brazil, 163,096 hectares in USA and 77,262 hectares in Paraguay.

There was an overall increase in the area of land required to grow Danish imports of soy over the period assessed. This was despite there not being an overall increase in the quantity of Danish imports of soy. This is explained by a higher proportion of Danish imports of soy coming from countries with lower soy yields by hectare, for example China.

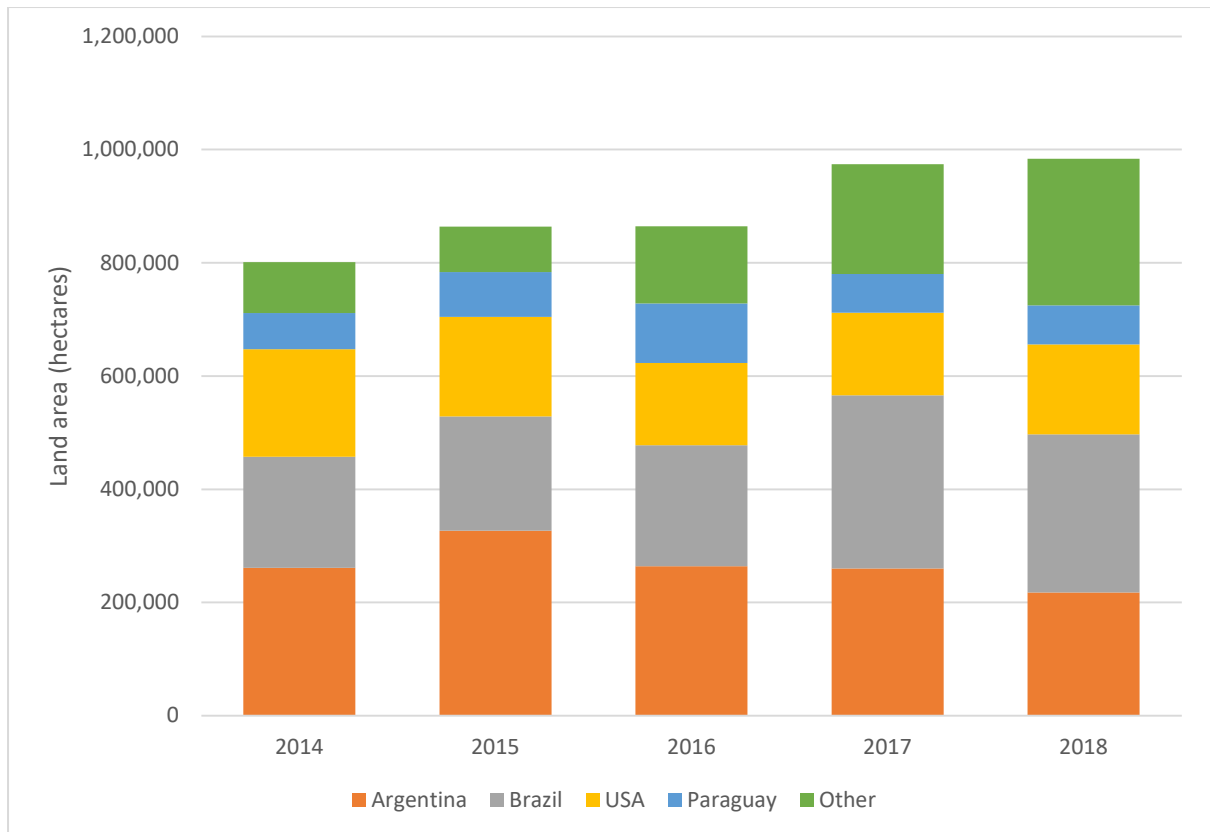


Figure 39: Land area, in hectares, required to grow Danish soy imports between the years of 2014-2018

### 6.3.5 Estimated consumption of soy imports

Denmark is not a producer of soy, so all soy that enters the Danish market is imported. Over the five years assessed, Danish imports of soy remained fairly stable. Of the total quantity of soy that entered Denmark, over half (69%) is consumed in Denmark and the remainder exported (31%). See Figure 40.

Danish exports of soy products remained fairly stable between the years of 2014-2018, rising slightly in the final year. Danish rates of domestic soy consumption follow a very similar trend year on year to soy imports.

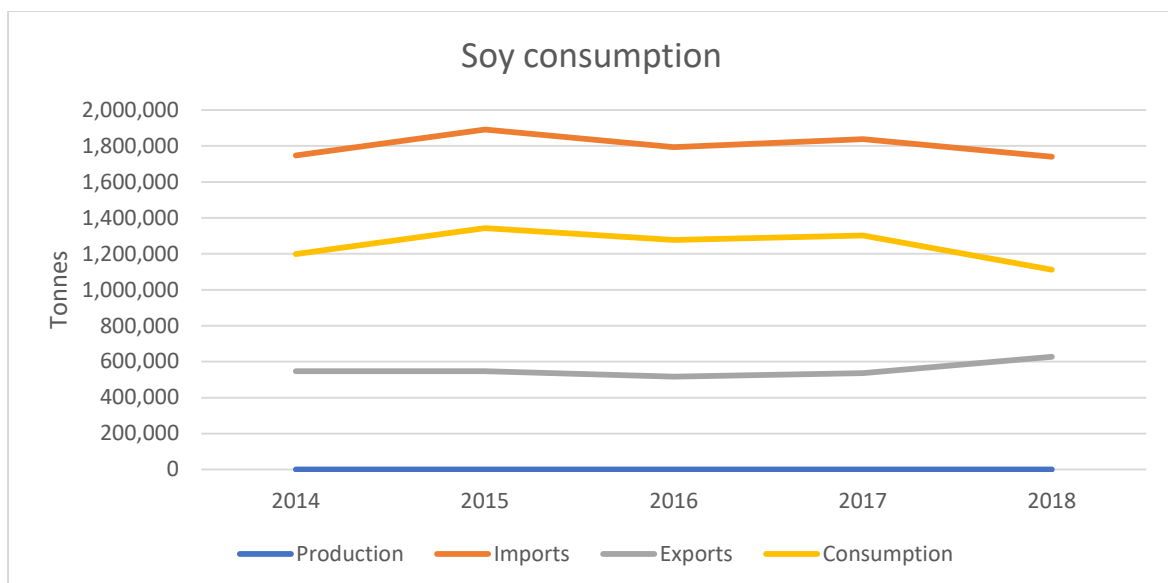


Figure 40: Denmark's production, imports, exports and consumption of soy in tonnes

### 6.3.6 Danish imports of soy versus exports

Denmark's exports of soy products (which includes embedded soy) looks starkly different from its imports. Whereas Denmark imports large quantities of soymeal (89%), it only exports this in small quantities (14%). Conversely, soy exports are dominated by swine meat (52%) which make up just 1% of Denmark's imports (Figure 41). This suggests that Denmark imports large quantities of soymeal, much of which is processed domestically into livestock products – particularly swine meat.

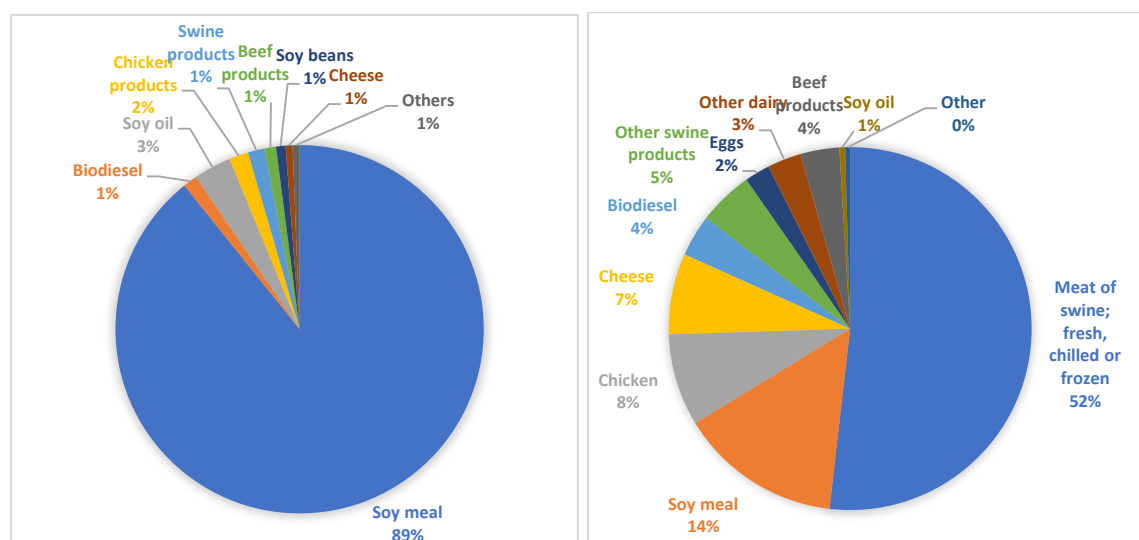


Figure 41: Denmark's imports of soy products (left) compared with Denmark's exports of soy products (right) as an average weight in tonnes between 2014-2018

### 6.3.7 Risk analysis of soy imports

In terms of deforestation and social risks, soy is flagged as the riskiest of the commodities assessed. Around two-thirds (65%) is grown on land in countries that are flagged as high and very high risk (Figure 43). This is mainly due to the high proportion of Danish imports that come from Latin America. See Table 5 for how each country from which Denmark imports over 2% of soy scores on the four deforestation and social risk indicators, and Figure 42 for this information displayed on a map.

Table 5: Danish import land hectares in countries that supply a greater than 2% share of Danish imports of soy, rated from very high to low according to performance across four deforestation and social indicators. Hectares are an average year between 2014-2018

| Country    | Soy (annual land footprint in hectares) | Tree cover change (ha) | Deforestation Rate | Labour standards | Corruption perception | Risk Indicators        |                    |                  |                  |               | Rating    |
|------------|---|------------------------|--------------------|------------------|-----------------------|------------------------|--------------------|------------------|------------------|---------------|-----------|
|            |   |                        |                    |                  |                       | Tree cover change (ha) | Deforestation Rate | Labour standards | Corruption Index | Overall score |           |
| Argentina  | 265,906.35                              | 1097793                | -5.47%             | 4                | 40                    | 3                      | 3                  | 2                | 2                | 10            | High      |
| Brazil     | 239,435.65                              | 18523610               | -1.16%             | 5                | 35                    | 3                      | 3                  | 3                | 3                | 12            | Very high |
| Paraguay   | 77,262.33                               | 1603249                | -9.88%             | 4                | 29                    | 3                      | 3                  | 2                | 3                | 11            | High      |
| USA        | 163,096.06                              | 113612363              | 0.20%              | 4                | 71                    | 3                      | 1                  | 2                | 1                | 7             | Medium    |
| Unassigned | 151,967.24                              | n/a                    | n/a                | n/a              | n/a                   | n/a                    | n/a                | n/a              | n/a              | n/a           |           |

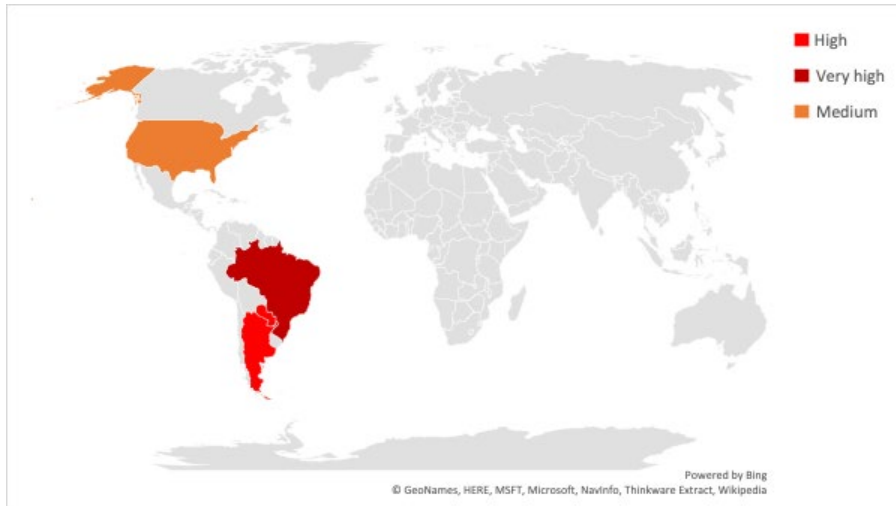


Figure 42: Social and deforestation risk profile of countries from where Denmark imports over 2% of soy in an average year between 2014-2018

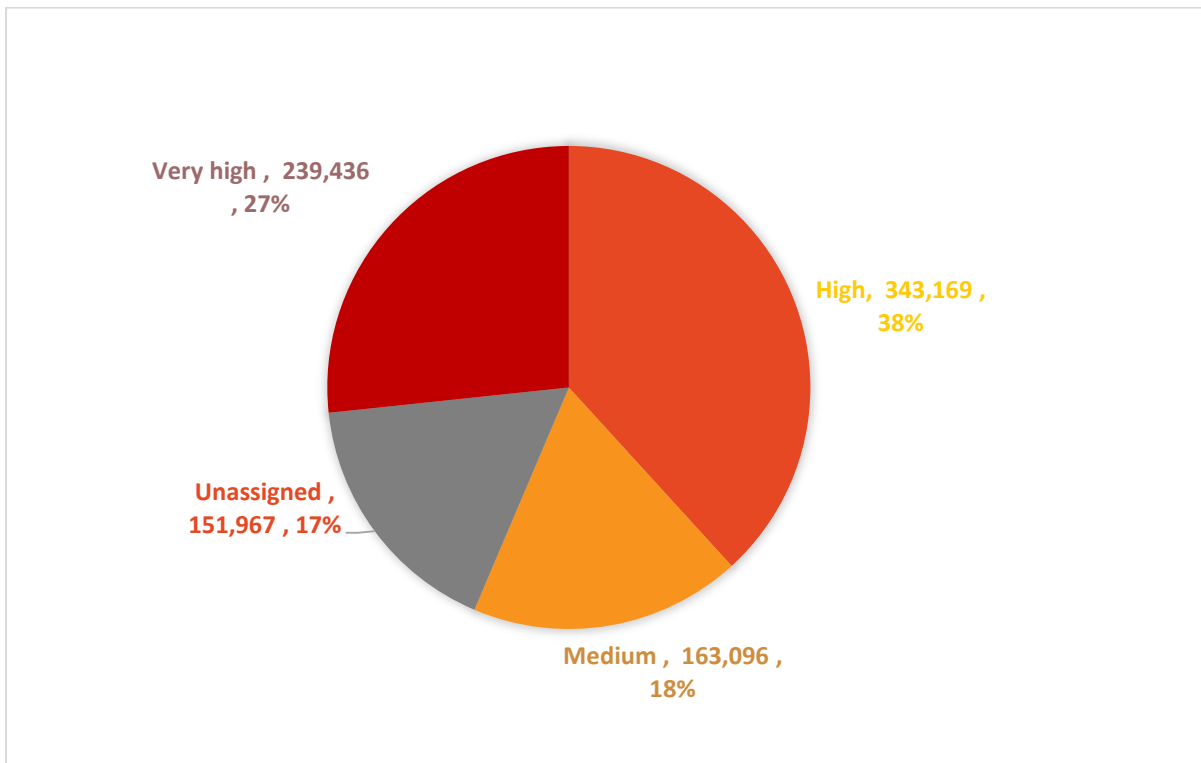


Figure 43: Risk rating of Danish imports of soy, as a percentage of land area (in hectares) required to grow the soy in an average year between 2014-2018

In terms of volume, 68% of the quantity of imported soy (1,497,889 tonnes) comes from high or very high risk countries. See Figure 44.



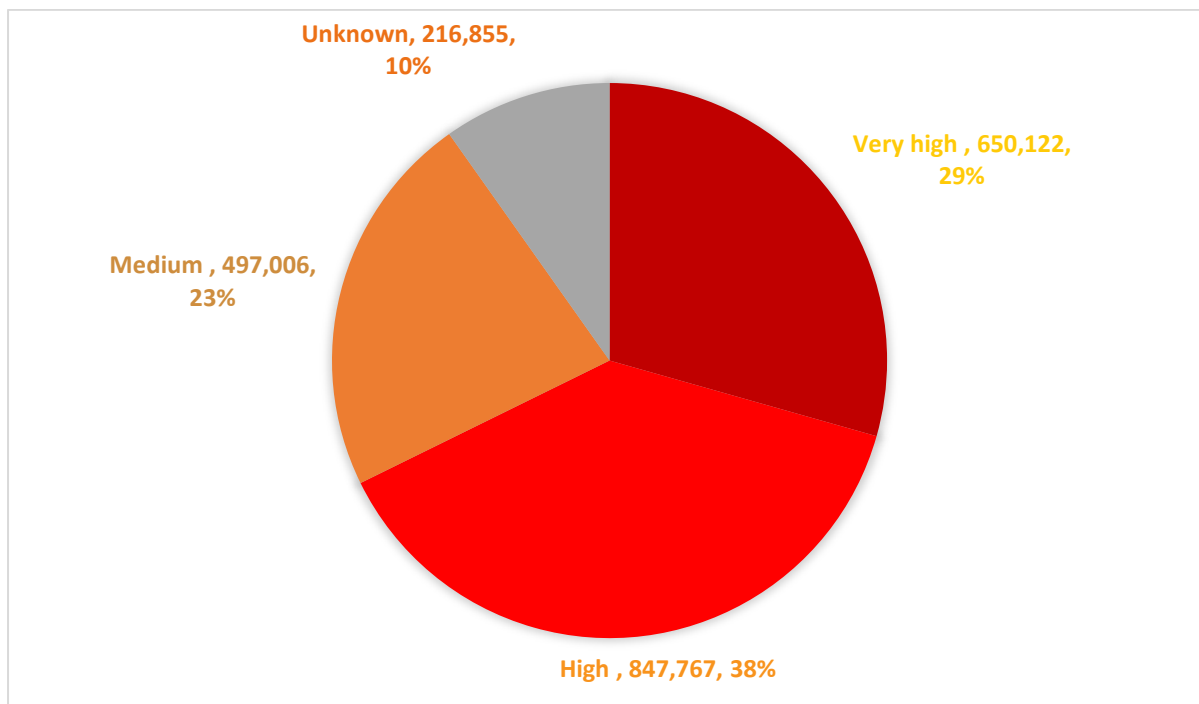


Figure 44: Risk rating of Danish soy imports in tonnes, determined by the risk rating of the country of provenance. Tonnes is an average of imports between 2014-2018.

## 7 Conclusions

Forests cover around a third of the world's land area<sup>96</sup>, but they are under threat. Between 1990 and 2015, the world lost 129 million hectares of forest.<sup>97</sup> Since humans started cutting down forests, 46% of trees have been felled.<sup>98</sup>

Deforestation, forest degradation and habitat conversion decrease biodiversity and contribute to climate change, as well as sometimes violating of the rights of local communities and indigenous peoples. Over 70% of tropical deforestation is driven by commercial agriculture. Moreover, a significant proportion of this deforestation is embedded within the global trade of commodities – see box 1.

Soy, timber, pulp and paper production provides a livelihood for millions of people in countries around the world. However, it has also been associated with deforestation and with social exploitation including land grabs, forced labour, and unfair employment conditions.

Denmark's imports have undoubtedly contributed to these losses of forest and biodiversity, and to some of the exploitative production practices associated with the production of commodities in various countries. To feed Denmark's import demand for timber, soy, pulp and paper, an area of 3.56 million hectares is used overseas every year. This is the equivalent to 84% of the total land area of Denmark, or five times the land area of Zealand. Denmark's land footprint is also increasing – over the five years examined between 2014-2018, its land footprint increased by a fifth (22%), from 3,286,081.26 hectares to 4,011,840.00 hectares.

Of the combined land footprint of soy, timber, pulp and paper, 31% is in countries that are high or very high risk on deforestation and social indicators, and only 6% is in low risk countries. Around half of this high and very high risk land footprint is due to soy imports from South America (54%), and the remainder (46%), is due to timber imports from Russia. For some of these commodity imports, risk is mitigated to a degree through credible certification schemes with a high degree of penetration, for example in the case of Danish energy company imports of fuelwood from Russia. However, for others such as South American soy imports, certification through the Round Table of Responsible Soy has low market uptake.

Denmark's demand for soy, timber, pulp and paper imports has two drivers – domestic consumption and its export markets. Overall, domestic consumption accounts for 76% of Denmark's combined imports and domestic production of soy, timber, pulp and paper, whilst its export market accounts for 24%. However, Denmark still has a high degree of responsibility for the land footprint of commodities it re-exports as it gains financially from the trade, and in some cases processing, such as processing soymeal into swine meat.

The EU, the Danish Government, businesses, NGOs and consumers have taken action to address some of these issues through initiatives such as the EUTR, purchase of FSC certified timber, Consumer Goods Forum zero net deforestation commitments, and the EU Action Plan Against Deforestation. Yet the problems of deforestation and social exploitation have not gone away, and there are opportunities for the EU, the Danish Government,

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<sup>96</sup> Source: <https://data.worldbank.org/indicator/AG.LND.FRST.ZS>

<sup>97</sup> FAO (2016) Global Forest Resource Assessment 2015

<sup>98</sup> Crowther, T., Glick, H., Covey, K. *et al.* (2015) Mapping tree density at a global scale. *Nature* **525**, 201–205 (2015) doi:10.1038/nature14967

companies and consumers to act further in order to break the link between Denmark's commodity imports, and deforestation and social exploitation.

The research presented in this report is intended to underpin WWF Denmark's recommendations for policy makers, businesses, investors in these commodities, and consumers.

## Appendix 1: HS codes under EUTR scope

| HS Code | Short description                                  | In EUTR scope |
|---------|--|---------------|
| 4401    | Fuel wood  | Yes           |
| 4402    | Charcoal   | No            |
| 4403    | Wood in the rough                                  | Yes           |
| 4404    | Hoopwood & poles                                   | No            |
| 4405    | Wood wool  | No            |
| 4406    | Railway sleepers                                   | Yes           |
| 4407    | Wood sawn lengthwise                               | Yes           |
| 4408    | Veneer and ply                                     | Yes           |
| 4409    | Shaped wood  | Yes           |
| 4410    | Particle board                                     | Yes           |
| 4411    | Fibreboard   | Yes           |
| 4412    | Laminates  | Yes           |
| 4413    | Densified wood                                     | Yes           |
| 4414    | Wooden frames                                      | Yes           |
| 4415    | Wood packing                                       | Yes           |
| 4416    | Casks  | Yes           |
| 4417    | Wooden tools                                       | No            |
| 4418    | Joinery & carpentry                                | Yes           |
| 4419    | Wooden kitchenware                                 | No            |
| 4420    | Wood marquetry and inlay                           | No            |
| 4421    | Other articles of wood                             | No            |
| 4701    | Mechanical wood pulp                               | Yes           |
| 4702    | Chemical wood pulp, dissolving grades              | Yes           |
| 4703    | Chemical wood pulp, soda or sulphate               | Yes           |
| 4704    | Chemical wood pulp, sulphite                       | Yes           |
| 4705    | Combined mechanical and chemical pulp              | Yes           |
| 4801    | Newsprint  | Yes           |
| 4802    | Uncoated paper and paperboard                      | Yes           |
| 4803    | Tissues and napkins                                | Yes           |
| 4804    | Uncoated kraft paper                               | Yes           |
| 4805    | Other uncoated paper                               | Yes           |
| 4806    | Glazed, transparent or translucent paper           | Yes           |
| 4807    | Composite paper and paperboard                     | Yes           |
| 4808    | Corrugated paper and paperboard                    | Yes           |
| 4809    | Carbon paper                                       | Yes           |
| 4810    | Paper and paperboard, coated with kaolin           | Yes           |
| 4811    | Paper and paperboard, surface-decorated or printed | Yes           |
| 4812    | Filter blocks of paper pulp                        | Yes           |
| 4813    | Cigarette paper                                    | Yes           |

|                   |   |                  |
|-------------------|---|------------------|
| <b>4814</b>       | Wallpaper                                 | Yes              |
| <b>4816</b>       | Other carbon papers                       | Yes              |
| <b>4817</b>       | Envelopes and letter cards                | Yes              |
| <b>4818</b>       | Toilet paper                              | Yes              |
| <b>4819</b>       | Cartons and boxes of paper and paperboard | Yes              |
| <b>4820</b>       | Note books                                | Yes              |
| <b>4821</b>       | Paper labels                              | Yes              |
| <b>4822</b>       | Bobbins and spools of paper               | Yes              |
| <b>4823</b>       | Other paper and paperboard                | Yes              |
| <b>9401 61</b>    | Upholstered wooden seats                  | No               |
| <b>9401 69</b>    | Seats with wooden frames, not upholstered | No               |
| <b>9403 30</b>    | Wooden office furniture                   | Yes              |
| <b>9403 40</b>    | Wooden kitchen furniture                  | Yes              |
| <b>9403 50</b>    | Wooden bedroom furniture                  | Yes              |
| <b>9403 60</b>    | Other wooden furniture                    | Yes              |
| <b>9403 90</b>    | Furniture parts                           | Yes              |
| <b>9406 10 00</b> | Prefabricated wooden buildings            | No <sup>99</sup> |

<sup>99</sup> Note: HS code 9403 90 30 is specified under EUTR but not reported on UN COMTRADE. HS Code 9406 00 20, specified within EUTR does not exist. The description given of this code by them is prefabricated buildings; so code 9406 10 00 is used instead (description Prefabricated buildings; Of wood).

## Appendix 2: Timber HS codes and conversion factors

Conversion factors used for timber products are from the Forestry Commission.<sup>100</sup> Where an exact conversion factor was not available, the conversion factor of the most similar product, or the average of multiple similar product, was used. For example, '4407: wood sawn lengthways' is converted with a factor of 1.8, which is an average of the factors for sawn soft wood (1.099) and hardwood (2.5).

| HS code | Short description                | Conversion Factor |
|---------|----------------------------------|-------------------|
| 4401    | Fuel wood                        | 1.2               |
| 4402    | Charcoal                         | 6                 |
| 4403    | Wood in the rough                | 1                 |
| 4404    | Hoopwood                         | 1.8               |
| 4405    | Wood wool                        | 1.8               |
| 4406    | Railway sleepers                 | 2.26              |
| 4407    | Wood sawn lengthwise             | 1.8               |
| 4408    | Veneer sheets                    | 3.45              |
| 4409    | Shaped wood                      | 2.5               |
| 4410    | Particle board                   | 2.5               |
| 4411    | Fibreboard                       | 2.5               |
| 4412    | Laminates                        | 2.5               |
| 4415    | Wooden packing cases and pallets | 2                 |
| 4417    | Tools and tool handles           | 2.5               |
| 4418    | Builders joinery                 | 2.5               |
| 4419    | Wooden tableware                 | 2.5               |
| 4420    | Wood marquetry                   | 2.5               |
| 4421    | Other articles of wood           | 2.5               |
| 4413    | Densified wood                   | 2.5               |
| 4414    | Wooden frames                    | 2.5               |
| 4416    | Wooden casks and barrels         | 2.5               |
| 940161  | Wooden seats (upholstered)       | 2.5               |
| 940169  | Wooden seats, not upholstered    | 2.5               |
| 940330  | Wooden office furniture          | 2.5               |
| 940340  | Wooden kitchen furniture         | 2.5               |
| 940350  | Wooden bedroom furniture         | 2.5               |
| 940360  | Other wooden furniture           | 2.5               |
| 940390  | Wooden furniture parts           | 2.5               |

<sup>100</sup> Source: <https://www.forestresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2018/sources/timber/conversion-factors/>

## Appendix 2: Pulp and paper HS codes and conversion factors

Conversion factors used for pulp and paper products are from the Forestry Commission.<sup>101</sup> Where an exact conversion factor was not available, the conversion factor of the most similar product, or the average of multiple similar product, was used.

| HS code | Commodity name  | Conversion factor |
|---------|---|-------------------|
| 4701    | Wood pulp, mechanical wood pulp   | 2.5               |
| 4702    | Chemical wood pulp, dissolving grades   | 2.5               |
| 4703    | Chemical wood pulp, soda or sulphate, other than dissolving grades  | 4.5               |
| 4704    | Chemical wood pulp, sulphite, other than dissolving grades  | 5                 |
| 4705    | Wood pulp obtained by a combination of mechanical and chemical pulping processes  | 2.5               |
| 4801    | Newsprint, in rolls or sheets   | 2.8               |
| 4802    | Uncoated paper and paperboard, used for writing, printing or other graphics, non-perforated punch-cards and punch tape paper, in rolls or rectangular sheets, of any size, other than paper of heading 4801 or 4803; hand-made paper and paperboard | 2.8               |
| 4803    | Tissue, towel, napkin stock or similar; for household or sanitary uses, cellulose wadding, webs of cellulose fibres, in rolls over 36cm in width or rectangular sheets with one side exceeding 36cm when unfolded                                   | 2.8               |
| 4804    | Uncoated kraft paper and paperboard, in rolls or sheets, other than that of heading no. 4802 or 4803  | 2.5               |
| 4805    | Uncoated paper and paperboard n.e.c., in rolls or sheets  | 3.5               |
| 4806    | Vegetable parchment, greaseproof papers, tracing papers, glassine and other glazed transparent or translucent papers, in rolls or sheets  | 1                 |
| 4807    | Composite paper and paperboard, (made by sticking layers together with an adhesive), not surface-coated or impregnated, whether or not internally reinforced, in rolls or sheets  | 2.5               |
| 4808    | Paper and paperboard, corrugated (with or without glued flat surface sheets), creped, crinkled, embossed or perforated, in rolls or sheets other than paper of the kind described in heading 4803   | 2.5               |
| 4809    | Carbon paper, self copy paper, and other copying or transfer papers (including coated or impregnated paper for duplicator stencils or offset plates), whether or not printed, in rolls or sheets  | 1                 |

<sup>101</sup> <https://www.forestryresearch.gov.uk/tools-and-resources/statistics/forestry-statistics/forestry-statistics-2018/sources/timber/conversion-factors/>

|             |  |     |
|-------------|--|-----|
| <b>4810</b> | Paper and paperboard, coated one or both sides with kaolin (china clay) or inorganic substances, with binder or not, no other coating, surface coloured or not, surface decorated or printed, in rolls or rectangular (including square) sheets, of any size   | 2.5 |
| <b>4811</b> | Paper, paperboard, cellulose wadding and webs of cellulose fibres, coated, impregnated, covered, surface-coloured, decorated or printed, rolls or sheets, other than goods of heading no. 4803, 4809, or 4810  | 2.5 |
| <b>4812</b> | Filter blocks, slabs and plates of paper pulp  | 1   |
| <b>4813</b> | Cigarette paper, whether or not cut to size or in the form of booklets or tubes  | 1   |
| <b>4814</b> | Wallpaper and similar wall coverings; window transparencies of paper   | 1   |
| <b>4816</b> | Carbon paper, self-copy paper and other copying or transfer papers, (other than those of heading no. 4809), duplicator stencils and offset plates, of paper whether or not put up in boxes   | 1   |
| <b>4817</b> | Envelopes, letter cards, plain postcards and correspondence cards, of paper, paperboard; boxes, pouches, wallets and writing compendiums, of paper or paperboard containing assortment of paper stationery   | 1   |
| <b>4818</b> | Toilet paper, width 36cm or less or cut to size/shape; handkerchiefs, tissues, towels, serviettes, bed sheets and similar household or hospital articles, apparel and clothing accessories of paper pulp, paper, cellulose wadding or webs of cellulose fibres | 1   |
| <b>4819</b> | Cartons, boxes, cases, bags and the like, of paper, paperboard, cellulose wadding or fibres; box files, letter trays and the like, of paper or paperboard, of a kind used in offices, shops or the like  | 2.5 |
| <b>4820</b> | Registers, account books, diaries and similar; albums for samples or collections, of paper or paperboard   | 1   |
| <b>4821</b> | Paper or paperboard labels of all kinds, whether or not printed  | 1   |
| <b>4822</b> | Bobbins, spools, cops and similar supports of paper pulp, paper or paperboard (whether or not perforated or hardened)  | 1   |
| <b>4823</b> | Paper, paperboard, cellulose wadding and webs of cellulose fibres; cut to size or shape, articles of paper pulp, paper and paper-board, cellulose wadding or webs of cellulose fibres, n.e.c. in chapter 48  | 1   |



## Appendix 3: Soy HS codes and conversion factors

The conversion factors for soy are from the WWF Soy Report Card<sup>102</sup>, unless otherwise stated in a footnote. Where an exact conversion factor was not available, the conversion factor of the most similar product, or the average of multiple similar product, was used.

| HS codes | Commodity  | Conversion factors    |
|----------|--|-----------------------|
| 203      | Meat of swine; fresh, chilled or frozen  | 0.263                 |
| 404      | Whey and products consisting of natural milk constituents; whether or not containing added sugar or other sweetening matter, not elsewhere specified or included | 0.0165                |
| 10221    | Cattle; live, pure-bred breeding animals   | 0.18                  |
| 10229    | Cattle; live, other than pure-bred breeding animals  | 0.18                  |
| 10290    | Bovine animals; live, other than cattle and buffalo  | 0.18                  |
| 20110    | Meat; of bovine animals, carcasses and half-carcasses, fresh or chilled  | 0.18                  |
| 20130    | Meat; of bovine animals, boneless cuts, fresh or chilled   | 0.18                  |
| 20210    | Meat; of bovine animals, carcasses and half-carcasses, frozen  | 0.18                  |
| 20220    | Meat; of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), frozen  | 0.18                  |
| 20230    | Meat; of bovine animals, boneless cuts, frozen   | 0.18                  |
| 20610    | Offal, edible; of bovine animals, fresh or chilled   | 0.18                  |
| 20621    | Offal, edible; of bovine animals, tongues, frozen  | 0.18                  |
| 20622    | Offal, edible; of bovine animals, livers, frozen   | 0.18                  |
| 20629    | Offal, edible; of bovine animals, (other than tongues and livers), frozen  | 0.18                  |
| 20711    | Meat and edible offal; of fowls of the species Gallus domesticus, not cut in pieces, fresh or chilled  | 0.575                 |
| 20712    | Meat and edible offal; of fowls of the species Gallus domesticus, not cut in pieces, frozen  | 0.575                 |
| 20713    | Meat and edible offal; of fowls of the species Gallus domesticus, cuts and offal, fresh or chilled   | 0.575                 |
| 20714    | Meat and edible offal; of fowls of the species Gallus domesticus, cuts and offal, frozen   | 0.575                 |
| 21011    | Meat; salted, in brine, dried or smoked, of swine, hams, shoulders and cuts thereof, with bone in  | 0.263                 |
| 21012    | Meat; salted, in brine, dried or smoked, of swine, bellies (streaky) and cuts thereof  | 0.263                 |
| 21019    | Meat; salted in brine, dried or smoked, of swine, n.e.c. in item no. 0210.1  | 0.263                 |
| 21020    | Meat; salted, in brine, dried or smoked, of bovine animals   | 0.18                  |
| 40110    | Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, not exceeding 1%            | 0.0165 <sup>103</sup> |

<sup>102</sup> Source: [https://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf\\_soy\\_scorecard\\_2016\\_r6.pdf](https://d2ouvy59p0dg6k.cloudfront.net/downloads/wwf_soy_scorecard_2016_r6.pdf)

<sup>103</sup> Correct conversion factor for litre of milk > soy (0.017 - see: [www.responsiblesoy.org/contribute-to-change/know-your-soy-print/?lang=en](http://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](http://hypertextbook.com/facts/2002/AliciaNoelleJones.shtml))

|               |   |                       |
|---------------|---|-----------------------|
| <b>40120</b>  | Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 1% but not exceeding 6%  | 0.0165                |
| <b>40140</b>  | Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 6% but not exceeding 10%                                       | 0.0165                |
| <b>40150</b>  | Dairy produce; milk and cream, not concentrated, not containing added sugar or other sweetening matter, of a fat content, by weight, exceeding 10%  | 0.0165                |
| <b>40210</b>  | Dairy produce; milk and cream, concentrated or containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content not exceeding 1.5% (by weight)                   | 0.1403 <sup>104</sup> |
| <b>40221</b>  | Dairy produce; milk and cream, concentrated, not containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)                     | 0.1403                |
| <b>40229</b>  | Dairy produce; milk and cream, containing added sugar or other sweetening matter, in powder, granules or other solid forms, of a fat content exceeding 1.5% (by weight)                                       | 0.1403                |
| <b>40291</b>  | Dairy produce; milk and cream, concentrated, not containing added sugar or other sweetening matter, other than in powder, granules or other solid forms   | 0.033                 |
| <b>40299</b>  | Dairy produce; milk and cream, containing added sugar or other sweetening matter, other than in powder, granules or other solid forms   | 0.033                 |
| <b>40310</b>  | Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other sweetening matter or flavoured or containing added fruit or cocoa  | 0.0165                |
| <b>40390</b>  | Dairy produce; buttermilk, curdled milk or cream, kephir, fermented or acidified milk or cream, whether or not concentrated or containing added sweetening, flavouring, fruit or cocoa (excluding yoghurt)    | 0.0165                |
| <b>40610</b>  | Dairy produce; fresh cheese (including whey cheese), not fermented, and curd  | 0.0801 <sup>105</sup> |
| <b>40620</b>  | Dairy produce; cheese of all kinds, grated or powdered  | 0.1442 <sup>106</sup> |
| <b>40630</b>  | Dairy produce; cheese, processed (not grated or powdered)   | 0.1442                |
| <b>40640</b>  | Dairy produce; cheese, blue-veined and other cheese containing veins produced by <i>Penicillium roqueforti</i> (not grated, powdered or processed)  | 0.1442                |
| <b>40690</b>  | Dairy produce; cheese (not grated, powdered or processed), n.e.c. in heading no. 0406   | 0.1442                |
| <b>40711</b>  | Birds' eggs, in shell; fresh, fertilised eggs for incubation, of fowls of the species <i>Gallus domesticus</i> (domestic hens)  | 0.307                 |
| <b>40721</b>  | Birds' eggs, in shell; fresh, not for incubation, of fowls of the species <i>Gallus domesticus</i> (domestic hens)  | 0.307                 |
| <b>40891</b>  | Eggs; birds' eggs (not in shell, excluding yolks only), dried, whether or not containing added sugar or other sweetening matter   | 0.307                 |
| <b>40899</b>  | Eggs; birds' eggs (not in shell, excluding yolks only), fresh, cooked by steaming or boiling in water, moulded, frozen, otherwise preserved, whether or not containing added sugar or other sweetening matter | 0.307                 |
| <b>120110</b> | Soya beans; seed, whether or not broken   | 1                     |
| <b>120190</b> | Soya beans; other than seed, whether or not broken  | 1                     |
| <b>120810</b> | Flours and meals; of soya beans   | 1                     |

<sup>104</sup> 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](http://www.quora.com/How-much-milk-is-required-to-produce-1-kilogram-of-powdered-milk))

<sup>105</sup> Use same conversion factor as for milk products but multiplied by 5 as 5 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](http://3wheeledcheese.wordpress.com/2012/01/19/indian-cottage-cheese-paneer-raw-milk-indian-family-200-years-of-cheese-making))

<sup>106</sup> Use same conversion factor as for milk products but multiplied by 9 as 8-10 litres of milk are used to produce 1 kg of cheese (see: [cheeseforum.org/forum/index.php?topic=4475.0](http://cheeseforum.org/forum/index.php?topic=4475.0))

|               |   |                      |
|---------------|---|----------------------|
| <b>150710</b> | Vegetable oils; soya-bean oil and its fractions, crude, whether or not degummed, not chemically modified  | 1                    |
| <b>150790</b> | Vegetable oils; soya-bean oil and its fractions, other than crude, whether or not refined, but not chemically modified  | 1                    |
| <b>160241</b> | Meat preparations; of swine, hams and cuts thereof, prepared or preserved (excluding homogenised preparations)  | 0.263                |
| <b>160242</b> | Meat preparations; of swine, shoulders and cuts thereof, prepared or preserved (excluding homogenised preparations)   | 0.263                |
| <b>160249</b> | Meat preparations; of swine, meat or meat offal (including mixtures), prepared or preserved, n.e.c. in heading no. 1602   | 0.263                |
| <b>160250</b> | Meat preparations; of bovine animals, meat or meat offal, prepared or preserved (excluding livers and homogenised preparations)                                 | 0.18                 |
| <b>210310</b> | Sauces; soya  | 0.2 <sup>107</sup>   |
| <b>230400</b> | Oil-cake and other solid residues; whether or not ground or in the form of pellets, resulting from the extraction of soya-bean oil                              | 1                    |
| <b>20120</b>  | Meat; of bovine animals, cuts with bone in (excluding carcasses and half-carcasses), fresh or chilled   | 0.18                 |
| <b>3826</b>   | Biodiesel and mixtures thereof; not containing or containing less than 70% by weight of petroleum oils or oils obtained from bituminous minerals <sup>108</sup> | 10.26 <sup>109</sup> |

<sup>107</sup> Wilson, L. A. (1995) "Soy foods." Practical handbook of soybean processing and utilization. 428-459.

<sup>108</sup> Biodiesel is made from various feedstock, including soy, palm oil, rape seed, etc. The quantities of biodiesel imported were therefore adjusted for the estimated use of soy feedstock, based on EU averages. These are 5% in 2014, 4% in 2015 and 6% in 2017, with an average of 5% used for 2017-18 for which figures were not found. The same adjustment was made for exports. Source: Transport & Environment - Report June 2018: Up in smoke: Europe's cars driving deforestation in South East Asia.

<https://www.transportenvironment.org/publications/smoke-europe%E2%80%99s-cars-driving-deforestation-south-east-asia>

<sup>109</sup> Calculations are based on publication of the University of Arkansas, see: [www.uaex.edu/publications/PDF/FSA-1050.pdf](http://www.uaex.edu/publications/PDF/FSA-1050.pdf)

## Appendix 4: Net Annual Increment values used for timber, pulp and paper

To convert Denmark's import volumes into a land footprint in each country, we divided by the Net Annual Increment (NAI) figure for that country. This gives us the amount of land needed to grow the imported volume of timber specific to the countries of import. The full list of figures can be found in the NAI FAO GFRE 2015 Deck Reference report.<sup>110</sup> The below table contains a list of countries with over 2% of Denmark's imports of pulp and paper, and the corresponding Net Annual Increment (NAI) conversion factor used in meters cubed per hectare per year.

| Country            | Sector         | NAI (m <sup>3</sup> /ha/year) |
|--------------------|----------------|-------------------------------|
| Belgium            | Pulp and Paper | 7.7                           |
| Estonia            | Timber         | 6.6                           |
| Finland            | Both           | 4.4                           |
| Germany            | Both           | 11.2                          |
| Latvia             | Timber         | 6.6                           |
| Lithuania          | Timber         | 6.4                           |
| Netherlands        | Pulp and paper | 7.3                           |
| Norway             | Both           | 2.3                           |
| Poland             | Both           | 8                             |
| Portugal           | Timber         | 7.85                          |
| Russian Federation | Timber         | 1.3                           |
| Sweden             | Both           | 3.2                           |
| USA                | Both           | 2.9                           |
| Unassigned         | Both           | 6.93                          |

<sup>110</sup> Source: <http://www.fao.org/3/a-i4808e.pdf>