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How the Danish consumption affects the world's natural resources

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The Danish consumption taps into the natural resources – not just domestically, but in major parts of the world. Our planet's resources are not infinite, and the focus on sustainability and pressure on resources is increasing.

This analysis takes a closer look at the use of natural resources in the Danish economy and presents the results of the first assessment of the Danish resource footprint. The resource footprint is an attempt to account for the resources extracted from nature both in Denmark and abroad for the goods and services used in the Danish economy.

Main conclusions:

- Danish imports in 2016 weighed 63m tonnes. However, the production of imported goods and services is associated with an additional intermediate consumption of 70m and 21m tonnes respectively, so that total imports accounted for a resource footprint of approximately 154m tonnes in 2016.
- The weight of the goods exported from Denmark in 2016 was 38m tonnes, but behind the production of this was a total extraction of 102m tonnes of raw materials in Denmark and abroad. Moreover, the production of services for export required 35m tonnes of raw materials.
- Denmark's resource footprint per capita is considerably bigger than the EU average. Our consumption and investments etc. required extraction of 22 tonnes of raw materials per capita, whereas the EU average was 14 tonnes.
- The Danish resource footprint has grown since 2013, but is lower than in 2008. Especially the consumption of goods associated with non-metallic minerals, such as stone and gravel for the construction industry, has grown.

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The Danish resource footprint

Many natural resources in the form of biomass, minerals and fossil energy carriers are used in the Danish economy. Many of the natural resources, especially biomass and non-metallic minerals, are extracted in Denmark, but the Danish import of goods and services also requires considerable extraction of raw materials.

For those resources that are non-renewable, the resource extraction means that less resources will be available for the future. For some types of resources, e.g. certain rare metals, the scarcity today gives rise to concern. For other types, the scarcity is not yet as distinct, but even a resource such as sand, which has not traditionally been associated with scarcity, is increasingly mentioned as a raw material that cannot just be extracted indefinitely. In addition to contributing to the depletion, our use of natural resources is also associated with great climate and environmental impact in the different stages from extraction through processing, transport and consumption to waste management. This applies to both exhaustible and renewable resources.

Regardless whether we base it on the existence of a physical limit to how many natural resources we can use, or on our concern for the climate and the environment, it points towards the importance of focusing on the pressure on resources caused by our production in Denmark and abroad.

In this analysis, we take a closer look at the use of natural resources in the Danish economy and presents the results of the first assessment of the Danish resource footprint. In this way, the analysis provides an initial estimate of the amount of raw materials extracted in Denmark and other countries for the production of the goods and services imported, exported and consumed etc. The assessment takes into account the full chain of production behind each product and service. This means that it does not just consider the raw materials used in the immediate production, but also the raw materials used by the manufacturer's subcontractors and their subcontractors etc.

The analysis is based on assessments from the final national accounts, which are available up until 2016. The procedure of the analysis is described in detail in box 1. It must be stressed that the figures for the indirect flows of raw materials presented in the analysis are based on a relatively new calculation method involving model calculations and a vast number of assumptions and estimates. Accordingly, the figures for the indirect flows of raw materials, and thus the total raw material equivalents, are subject to a substantial degree of uncertainty and first and foremost reflect orders of magnitude. In appendix 1, the various concepts are described in more detail.

Box 1. The model behind the calculation of the resource footprint

To calculate the resource footprint of a product, this analysis uses a model developed by Eurostat. By means of input-output models and findings from life cycle analyses, conversion factors have been drawn up, which convert data for the monetary value or actual weight of products to the so-called Raw Material Equivalents (RME). Eurostat's model provides average conversion factors for EU28's imports and exports. Both goods and services are converted to raw material equivalents. The services as such have no weight, but nevertheless, the production of them requires extraction of raw materials, e.g. when oil must be extracted to eventually enable production of transport services.

The conversion to raw material equivalents happens on the basis of either the actual weight or the monetary value. Energy, non-metallic minerals and most agricultural products are converted to raw material equivalents based on the actual weight. For other goods and all services, the monetary value is converted to raw material equivalents. Regardless of the conversion method, the conversion factors originate from Eurostat's model. In some cases, however, the factors have been adjusted to account for the fact that conditions in Denmark deviate from the conditions that exist in the EU28 as a whole. For example, the specific technologies and energy composition of the Danish production of electricity, are taken into account. Allowance has also been made for the fact that the Danish rate of recycling of metals is different from that of the EU28. Other goods for which adjustments have been made of the conversion factors are e.g.: *wood and wood products, petroleum products* and *other products of animal origin.*

The resource equivalents are distributed on four main categories of raw materials – biomass, metal ores, non-metallic minerals and fossil energy carriers – and the sum is the total resource equivalent or resource footprint. Examples of products within the four main groups are shown in the table below.

Table 1 Main groups of natural resources and the most common raw materials

Biomass	Metal ores	Non-metallic minerals	Fossil energy
Cereals and other crops	Iron	Marble, granite, sandstone	Coal
Fruits and vegetables	Copper	Sand and gravel	Crude oil
Wood and wood products	Aluminium	Chemical minerals	Natural gas
Fish and wild catch etc.	Precious metals	Salt	Peat
Animals and meat products		Limestone, gypsum, clays and kaolin	

The calculations of the raw material equivalents are based on Statistics Denmark's material flow account for the actual material flows, which can be downloaded from statistikbanken.dk/mrm2. You can read more about the material flow account here.

Note that the assessments in this analysis are subject to very high uncertainty and first of all reflect orders of magnitude.

The analysis is structured by first looking at the imports, then the exports and finally at the Danish consumption etc. of goods and services.

Fossil energy carriers account for a major part of the Danish import of raw materials

Denmark has a large import of goods and services both for direct use by the Danish consumers and for input in the Danish production. In 2016, the total import of goods and services was just under 1,000 DKK billion, which corresponds approximately to half of Denmark's GDP. A total of 63m tonnes of goods were imported[1].

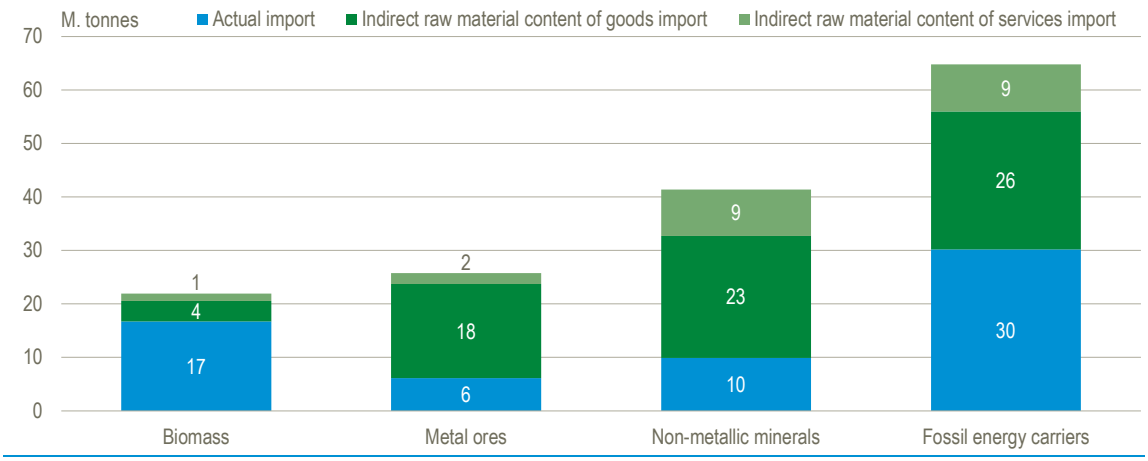
Behind the actual weight of the imports is a footprint by way of all the raw materials extracted from nature and used for production of the imported goods. While the import of services (e.g. transport and construction services purchased from foreign enterprises) does not in itself have any weight, it is associated with flows of raw materials in the same way as the import of goods, since e.g. extraction of energy is necessary to enable production of services. The total Danish import of goods and services can thus be distributed on two subcomponents: the actual weight of the imports and the so-called indirect raw material content. The indirect raw material content of the imports reflects the further extraction of raw materials necessary to produce the products.

Figure 1 shows the raw material equivalent of Danish imports distributed on the actual weight and the indirect raw material content for both goods and services distributed on four types of raw materials: biomass, metal ores, non-metallic minerals and fossil energy carriers. As a whole, the actual weight of the imports was 63m tonnes, while the indirect raw material content was 91m tonnes composed of 70m and 21m tonnes respectively for the import of goods and services. It gave a total amount of raw materials associated with the Danish imports of 154m tonnes in 2016.

Fossil energy constitutes the biggest group of natural resources for both the actual imports and the indirect raw material content. For metal ores and non-metallic minerals, the indirect raw material content of the imports is significantly higher than the actual import of the minerals. The big indirect metal ores content of the imports has to do with the fact that the manufacturing of products with a metallic content, e.g. iron, requires extraction of large quantities of ore and heavy machining processes before you reach the pure metals. The indirect raw material content of the service activities consists especially of non-metallic minerals and fossil energy carriers. The non-metallic minerals are generally used in their extracted form, but they are heavy and a lot of it is required for the production of goods and services. For example, the production of glass and glass products requires extraction of large volumes of sand and gravel.

[1] According to the material flow account, total imports accounted for 64.1m tonnes in 2016, including 1.1m tonnes of waste. As the resource assessment focuses on newly extracted raw materials, the waste is disregarded. This applies to the imports as well as the exports.

Figure 1 **The raw material equivalent of Danish imports. 2016**

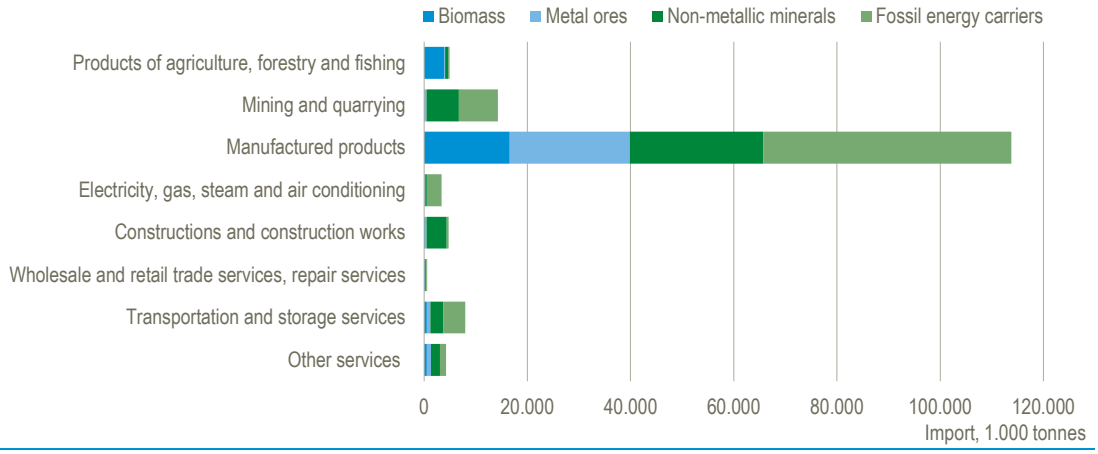


Import of coal and refined petroleum products leave a large resource footprint

Fossil energy carriers account for the biggest part of the resource footprint, but which are the goods and services that cause the increase of the resource footprint?

Figure 2 shows the raw material equivalent of the imports for main groups of imported products. It indicates that the manufactured products import requires by far the largest extraction of raw materials – primarily of fossil energy carriers. From the services (the bottom five rows), it is *transport and storage* as well as *construction activities* that use the highest volumes of raw materials.

Figure 2 **The raw material equivalent of Danish imports by imported products and underlying raw materials. 2016**



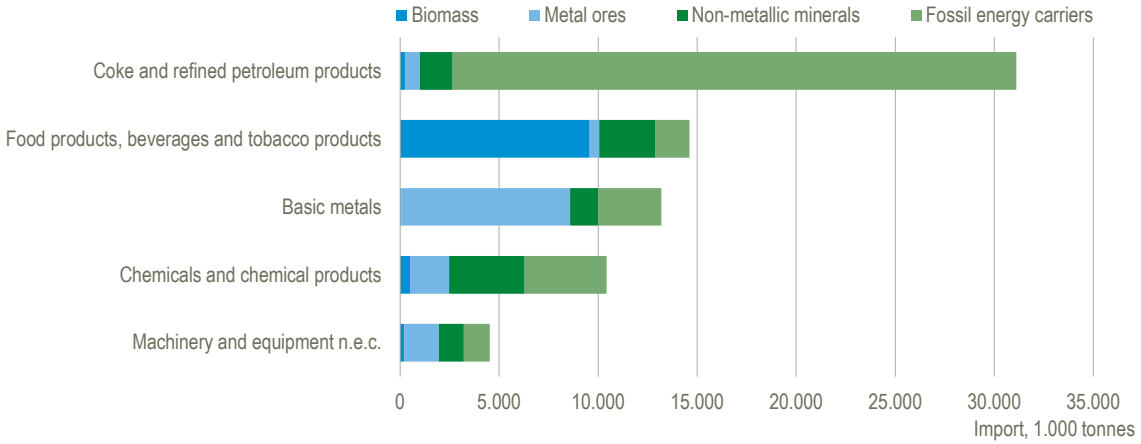
Note: The groups comply with Eurostat's CPA nomenclature. Read more about the CPA nomenclature here.

Since *manufactured products* comprise a lot of different goods, figure 3 shows the five subgroups of manufactured products that require the largest extraction of raw materials. The imports of *coal and refined petroleum products* (e.g. petrol) has the biggest resource footprint, naturally consisting primarily of fossil energy.

The import of *food and beverages etc.* is based on extraction of biomass, i.e. harvesting of crops and production of fruits and vegetables, but it also takes especially non-metallic minerals and fossil energy carriers to produce these goods.

Both metallic and non-metallic minerals and fossil energy carriers have been used for the import of metal products, chemicals and chemical products as well as machinery and equipment, but only small amounts of biomass.

Figure 3 The raw material equivalent of Danish imports for the five largest groups of manufactured products. 2016

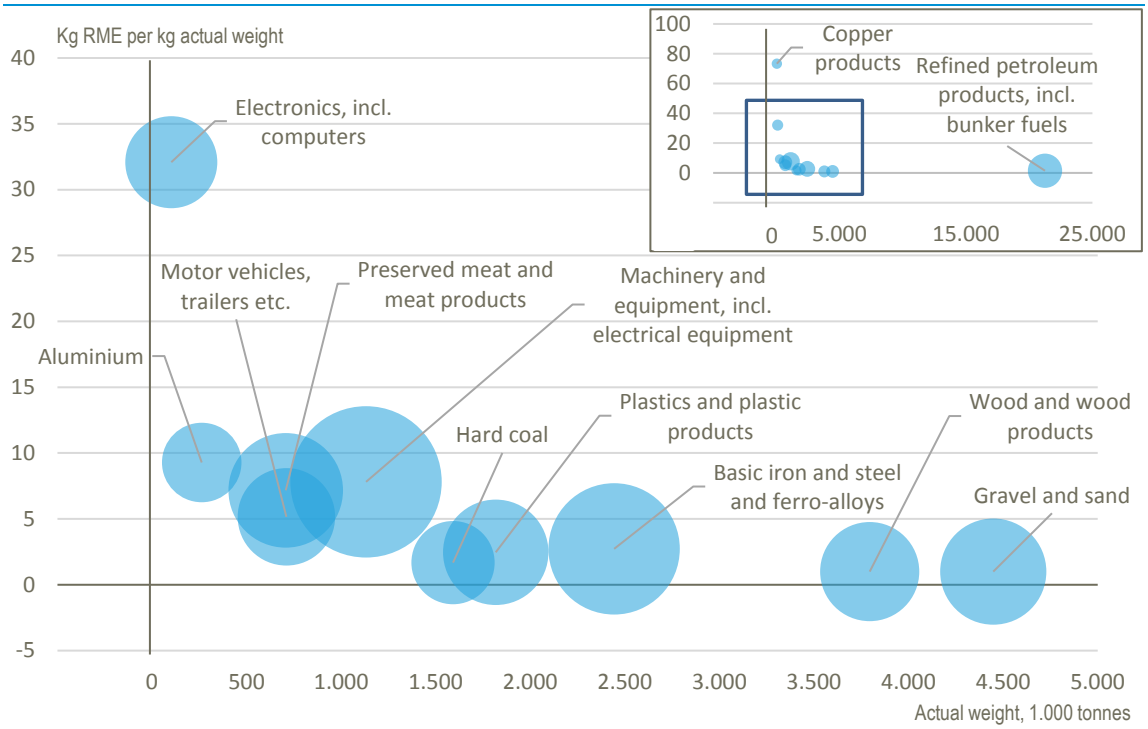


Note: The groups comply with Eurostat's CPA nomenclature. The five shown subgroups account for 67 per cent of the group *manufactured products*. *Machinery and equipment n.e.c.* is machinery and equipment not elsewhere classified.

Electronics require 32 kg of raw materials per kg of goods

Figure 4 shows selected groups of manufactured products at an even more detailed level – e.g. *meats and meat products*, which belong under *food, beverages and tobacco products* in figure 3. The figure shows the correlation between the actual weight of the imported goods[2] (x-axis), the conversion factor from actual weight to the raw material equivalent (y-axis)[3] and the total raw material equivalent of the selected imported goods (the area of the bubble).

Figure 4 Actual weight of selected imported products and raw material equivalent in total and per actual weight. 2016



Note: The areas of the bubbles reflect the raw material equivalent relatively to the other bubbles. The area of a bubble is the product of value on the x-axis and value on the y-axis. The centre of the bubble indicates the values on the x- and y-axes. The conversion factors are bigger than zero, but the axes go below zero to give space to the bubbles close to the axes. The small and the big figure have different scales.

[2] The actual weight shown on the x-axis includes goods crossing the Danish border, whereas - in compliance with the delimitations of the national accounts (the residency principle) - the raw material equivalent and the conversion factors also include certain flows of goods as imports and exports, even though the goods do not necessarily cross the Danish border. This applies e.g. when an enterprise buys goods abroad, has them processed abroad, and sells them abroad. The bubble diagram makes allowance for the delimitations of the national accounts by adjusting the actual weights for the selected products.

[3] Note that for certain goods, the conversion factors shown in the figure (on the y-axis) are calculated implicitly dividing the raw material equivalent by the actual weight. This applies to the goods for which the raw material equivalent in the model calculation is calculated based on the foreign trade reported in values, cf. box 1.

For each product, the raw material equivalent – represented by the area of the bubble – is calculated by multiplying the actual weight shown on the x-axis by the conversion factor shown on the y-axis. The further the bubble is to the right in the diagram, the higher the actual weight of the imports. The higher the bubble is in the diagram, the higher the indirect raw material content of the relevant product, and the bigger the bubble, the higher is the raw material equivalent, and accordingly, the resource footprint of the relevant imports.

The small diagram in the top right corner focuses on two products that are far from the other products: *copper products* and *refined petroleum products incl. bunker fuels*. *Refined petroleum products incl. bunker fuels* is far to the right on the x-axis reflecting large imports of 31m tonnes, and low on the y-axis due to a low indirect raw material content per kg of imported product (1.46). Approximately half of the oil imports originate from bunkering of ships etc. abroad. On the other hand, *copper products* is high on the y-axis due to a high raw material equivalent and low on the x-axis reflecting a low weight of the actual imports.

The other selected products are lumped together in the square frame, and these are brought into focus in the large part of figure 3. *Electronics incl. computers* is far to the left and up high in the diagram. The actual imports of this product group weigh just 100t tonnes, but since each kilogram of imports has a raw material equivalent of approximately 32 kg on average, the resource footprint of the import of *electronics incl. computers* accounted for a total of 3.2m tonnes. The use of precious metals for manufacturing of electronics helps explain the high indirect raw material content in the product group metal ores in figure 1.

Among the selected imported goods shown in the large part of the figure, the largest bubbles – and thus the largest total raw material equivalents – are *machinery and equipment, incl. electrical equipment* (8.8m tonnes) and *basic iron and steel etc.* (6.7m tonnes). The actual weight of the imports of the less processed basic iron and steel is somewhat higher than the corresponding weight of machinery and equipment etc., but on the other hand, the indirect raw material content of the latter is higher. Machinery and equipment etc. generally contains several types of metals, of which some have a very high indirect raw material content. Furthermore, machinery and equipment etc. is the result of several processing stages, for which fossil energy carriers have been used.

Metals have a high indirect raw material content, cf. the position of *copper products* on the y-axis in the small figure and *aluminium products* in the large figure (73 and 9 per kg, respectively). Because of the very small import volumes, precious metal products are not shown in the figure, but these have an exceptionally high indirect raw material content (in the order of 1,000 - 10,000 for platinum products and 100,000 - 150,000 for gold products).

Box 2 uses cars as an example of the raw material consumption for a concrete product.

Box 2. Resource footprint of car imports

An ordinary passenger car contains many types of materials, such as iron, steel, aluminium, glass, plastic and rubber. The manufacturing of these products means that whenever a car is imported to Denmark, it is preceded by the extraction of large quantities of biomass, metal ores, non-metallic minerals and fossil energy carriers.

In 2016, Denmark imported approximately 265,500 passenger cars weighing just under 353,800 tonnes, which corresponds to an average weight per passenger car of 1.33 tonnes. Each kilo of passenger car has a raw material equivalent of approximately 5.5 kg. Accordingly, an average passenger car has a raw material equivalent of 7.3 tonnes, and the total resource footprint of car imports was 1.94m tonnes. Calculated per capita, the resource footprint of the car imports was 339 kg per capita. In appendix 2, the calculation is explained more thoroughly.

The raw material equivalent of the exports was 141m tonnes in 2016.
The raw material equivalent of the imports indicate how much the Danish economy taps into raw materials outside Denmark.[4] Correspondingly, the raw material equivalent of the exports reflects how much of the Danish economy's total raw material input, including the indirect raw material content of the imports, is attributable to Denmark's supply of goods and services to enterprises and consumers abroad.

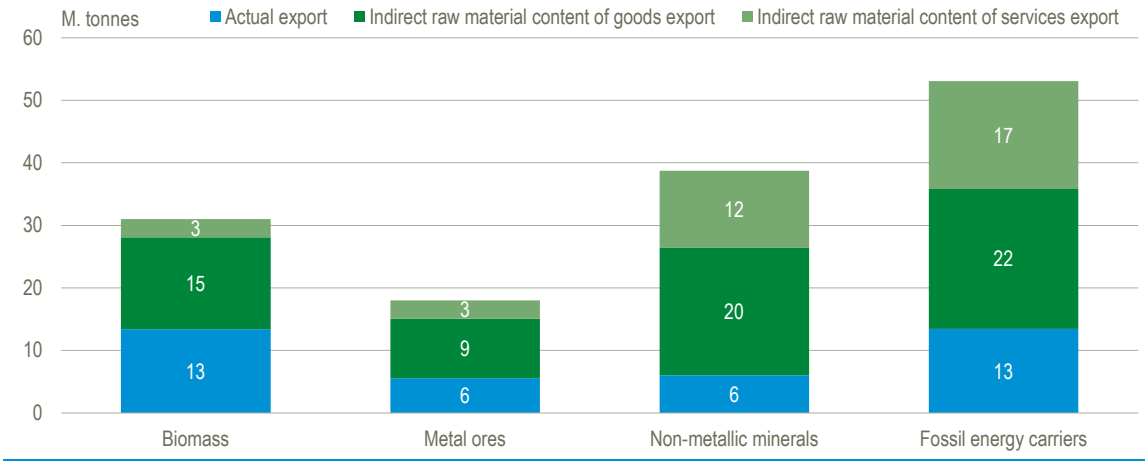
Figure 5 shows the raw material equivalent of the exports for both goods and services, broken down by types of raw materials. The exports combined weighed 38m tonnes in 2016, but the indirect raw material content of the exported products accounted for another 67m tonnes for goods and 35m tonnes for services. Together, this gives a resource footprint for Danish exports of 141m tonnes.

For all four types of raw materials, the indirect raw material content from the merchandise exports is bigger than the raw material equivalent of the actual exports. This does not in the same way apply to the imports, cf. figure 1. This is because the exports more than the imports are characterised by products with a high degree of processing. The raw material content of exported services is considerably higher than the raw material content of imported services.

Fossil energy accounts for the biggest share of the raw material equivalent of exports, accounting for as much as 54m tonnes of the total resource footprint of 141m tonnes, corresponding to more than a third. Non-metallic minerals and biomass follow with approximately 28 and 22 per cent, respectively.

Note that even though there are no metal ores in the Danish underground, the raw material equivalent of Danish exports contains a total of 18m tonnes of metal ores extracted abroad to enable the manufacturing of Danish exports.

Figure 5 **The raw material equivalent of Danish exports. 2016**

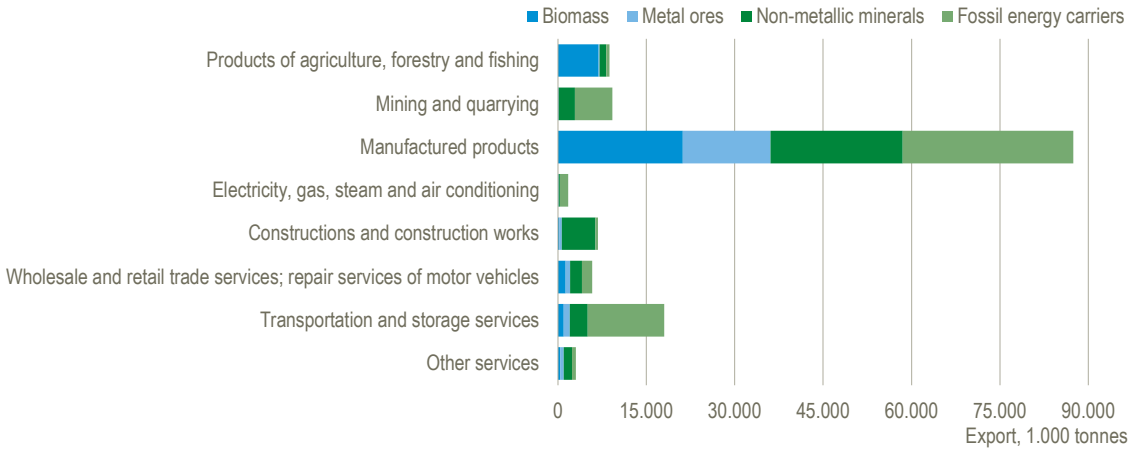


Food and beverages etc. accounts for a major share of the raw material equivalent of exports
Figure 6 shows the raw material equivalent broken down by groups of goods and services. Once again, the main group *manufactured products* accounts for the largest share of the raw material equivalent.

Among services, *transport and storage services* accounts for the largest share of the raw material equivalent, and hereof fossil energy carriers accounts for the largest share of the resource footprint. The use of fuel oil abroad for water transport accounts for the major part of the group *transport and storage services.*

[4] In principle, some of the raw material equivalent of imports originate from extraction of raw materials in Denmark, because some of the foreign enterprises (or their subcontractors) exporting to Denmark base their production on goods imported from Denmark. Overall, this quantity of raw materials is considered to be modest enough to be left out.

Figure 6 **The raw material equivalent of Danish exports by exported products and underlying raw materials. 2016**

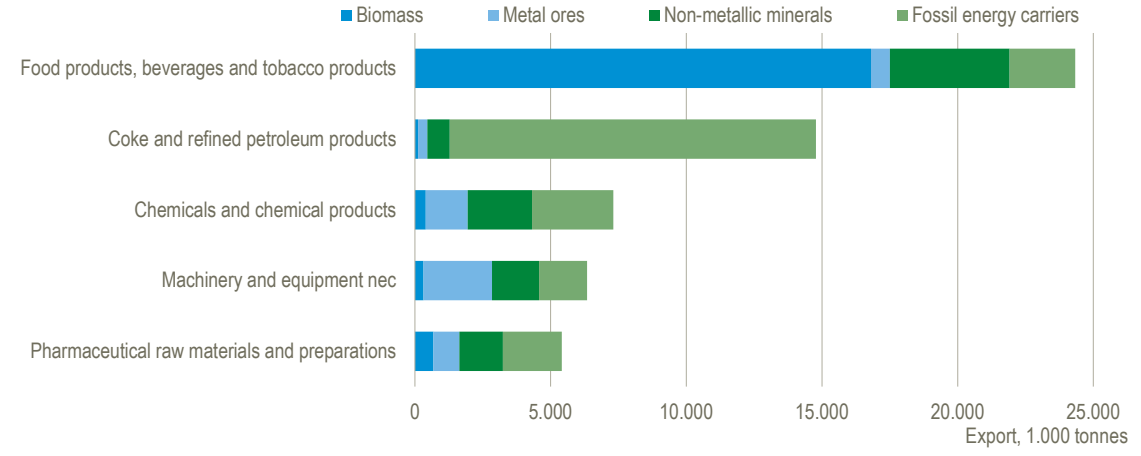


Note: The groups comply with Eurostat's CPA nomenclature.

As for imports, i) *food, beverages and tobacco*, ii) *coal and refined petroleum oil products*, iii) *chemicals and chemical products* as well as iv) *machinery and equipment n.e.c.* contribute the most to the raw material equivalent of exported manufactured products. In addition, *pharmaceutical raw materials and preparations* are at the high end of the raw material equivalents of the exported manufactured products, whereas for imports it is *metal products*, cf. figure 7.

The raw material equivalent of exports of *food, beverages and tobacco* totalled 24m tonnes. This corresponds to around 17 per cent of the total raw material equivalent of exports. Hereof, 17m tonnes was biomass, which is approximately 54 per cent of the total biomass equivalent of exports.

Figure 7 **The raw material equivalent of Danish exports for the five largest groups of manufactured products. 2016**



Note: The groups comply with Eurostat's CPA nomenclature. The five shown subgroups account for 67 per cent of the group *manufactured products*. *Machinery and equipment n.e.c.* is machinery and equipment not elsewhere classified.

Export of meat and petroleum products has large resource footprints

Figure 8 for the raw material equivalent of selected exported products should be interpreted in the same way as figure 3 for the raw material equivalent of imports.

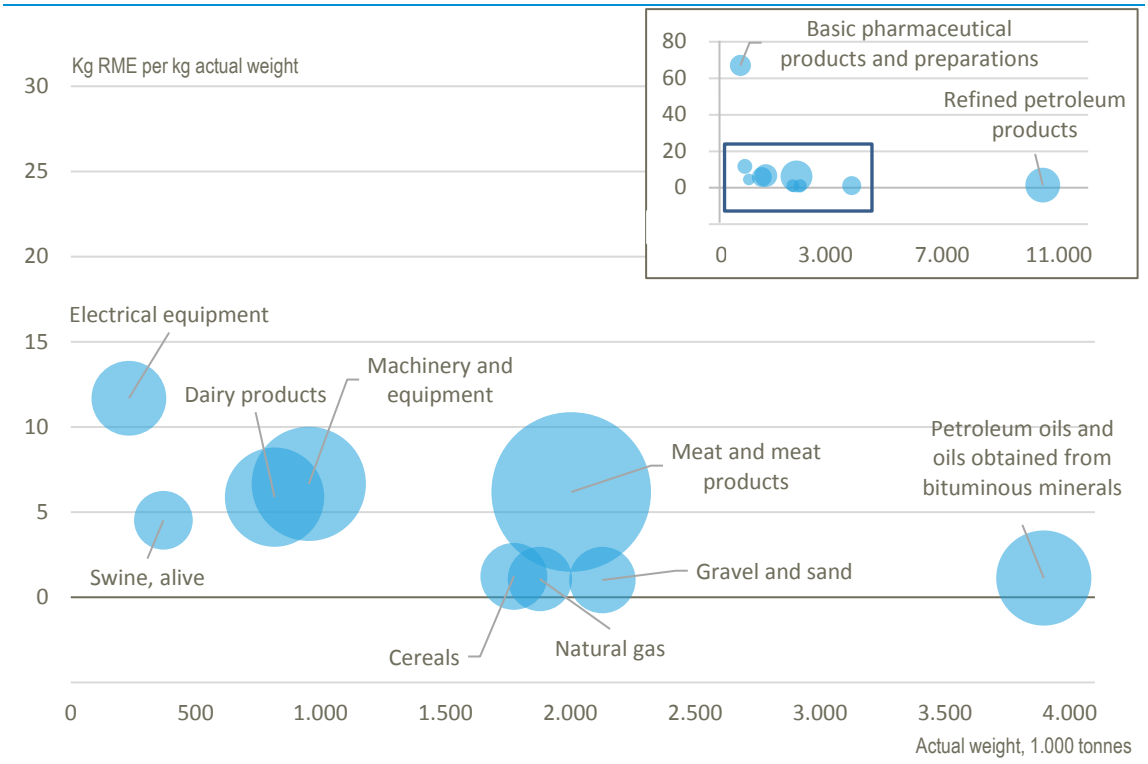
In the small diagram, *pharmaceutical raw materials and preparations* stand out. The actual weight of this group of manufactured products is quite modest (81.000 tonnes), but on the other hand, the products have a high indirect raw material content per kg of actual weight, so that the raw material equivalent of these products is 67 times higher than the actual weight. The reason for this relatively high raw material content is a production process characterised by the use of large quantities of fossil energy carriers (primarily oil and natural gas) as well as various types of minerals (gravel, stone, chalk, titanium). On the contrary, the actual weight of exported *petroleum*

products – as we saw it for the imports – is high (10.4m tonnes), whereas the indirect raw material content is modest. The result is a raw material equivalent of 14.8 million tonnes.

For the products in the large diagram, the raw material equivalents per kg of actual weight are all in the interval 1 to 12, and the actual weight of the exports does not exceed 4m tonnes. Among these goods, the exports of *petroleum oils and oils obtained from bituminous minerals* account for the major part when the actual weight is used as a standard, whereas the export of *meat and meat products* has the highest raw material equivalent in total due to a high actual exports weight (of 2m tonnes) and a medium-sized indirect raw material content (of 6 kg per kg of actual weight).

As we saw it for the imports, the exports of the product groups *machinery and equipment* as well as *electrical equipment* have high indirect raw material equivalents, which are seven and twelve times higher than the actual exports, and for this reason, these groups dominate.

Figure 8 **Actual weight of selected exported products and raw material equivalent in total and per actual weight, 2016**



Note: The areas of the bubbles reflect the raw material equivalent comparatively to the other bubbles. The area of a bubble is the product of value on the x-axis and value on the y-axis. The centre of the bubble indicates the values on the x- and y-axes. The conversion factors are bigger than zero, but the axes go below zero to give space to the bubbles close to the axes. The small figure and the big figure have different scales.

Biomass associated with Danish exports exceeds the biomass equivalent of the imports

While the total resource footprint of Danish imports was 154m tonnes, the resource footprint for the Danish exports was 141m tonnes in 2016. Accordingly, the imports are connected with a higher total consumption of raw materials than the exports. This applies to most of the raw material types except from biomass. Danish exports and imports of biomass in 2016 correspond to 31 and 22m tonnes respectively in raw material equivalents.

The biomass-based products in the merchandise exports are predominantly products of animal origin with a high indirect raw material content, whereas the imports are based to a higher extent on products of vegetable origin with a lower indirect raw material content.

The resource footprint of exported meat can be put into perspective by comparing it with the exported cereals, as the actual exported weight of meat and meat products corresponds roughly to the actual weight of exported cereals (of 2 and 1.8m tonnes respectively, cf. figure 8). However, the exported meat and meat products has a raw material equivalent of 12.4 tonnes against 2.2 tonnes for cereals. In other words, the meat production for export is six times more raw material-intensive than the production of cereals for export. In addition to the large resource footprint of

the exported meat, the exported *dairy products* (4.8m tonnes) and *livestock pigs* (1.7m tonnes) are also associated with a high consumption of raw materials, especially of biomass.

Growth in the resource footprint of Danish consumption

Based on the above figures for the resource footprint of the imports and exports, we want to look into the amount of raw materials required from Denmark and abroad to meet private and public consumption and investments taking place in Denmark (i.e. total domestic use in the National Accounts).

The assessment can be seen as an indicator of the pressure Denmark puts on the world's resources through its consumption and other use of goods and services, however deducting the share that has to do with our production for export. In other words, it is an indicator of the global footprint of Danish consumption, looking at consumption in a wide sense, i.e. including investments and stock changes.

The footprint can be referred to as *the resource equivalent of domestic use*. Raw Material Consumption can be abbreviated RMC. RMC is calculated as follows:

RMC =
Extraction of raw materials in Denmark
\+ the raw material equivalent of imports
\- the raw material equivalent of exports

The assessment of RMC for Denmark in 2016 appears from table 3. The Danes' consumption in 2016 resulted in a total resource consumption of 125m tonnes, approximately half of which was non-metallic minerals, whereas the use of particularly metal ores only accounted for a minor share.

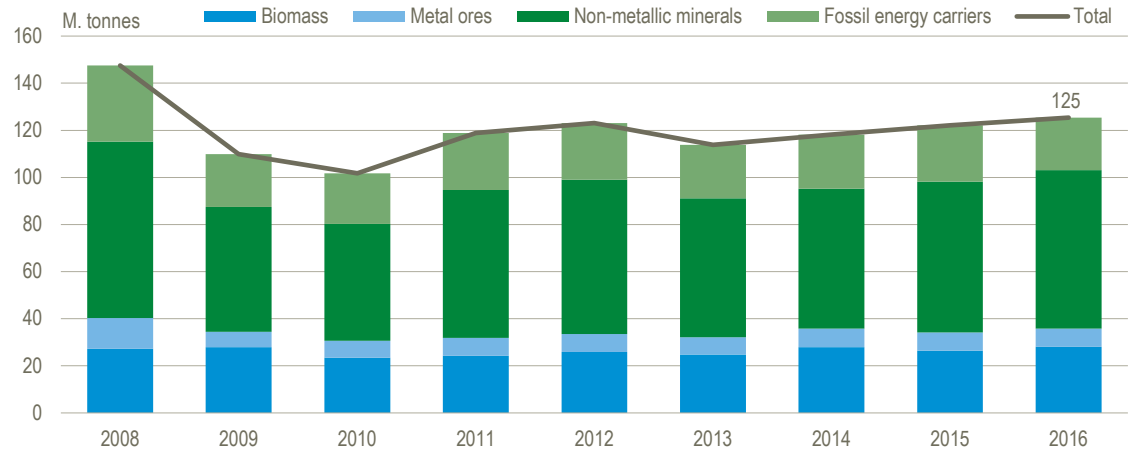
Table 3 Raw material consumption, RMC, for Denmark. 2016

	1. Danish extraction of resources	2. Imports	3. Exports	4. Raw material consumption, RMC (4=1+2-3)
	M. tonnes			
Total	**112**	**154**	**141**	**125**
Biomass	37	22	31	28
Metal ores	0	26	18	8
Non-metallic minerals	65	41	39	67
Fossil energy	11	65	53	22

Figure 9 shows the development in the raw material consumption, RMC, from 2008 to 2016. The footprint increased by 11.6m tonnes (10 per cent) from 2013 to 2016. The development must be seen in the light of increasing construction activity in the period. The growth is largely driven by the non-metallic minerals (primarily in the form of sand, gravel and stone used by the construction industry as input in their production[5]). Throughout the period, the non-metallic minerals have varied the most, whereas the changes in volumes for the other resource types have been more stable.

[5] More information about this in Nyt fra Danmarks Statistik (our newsletter in Danish) about Stable resource productivity from 14 December 2018.

Figure 9 **Raw material consumption, RMC, for Denmark**



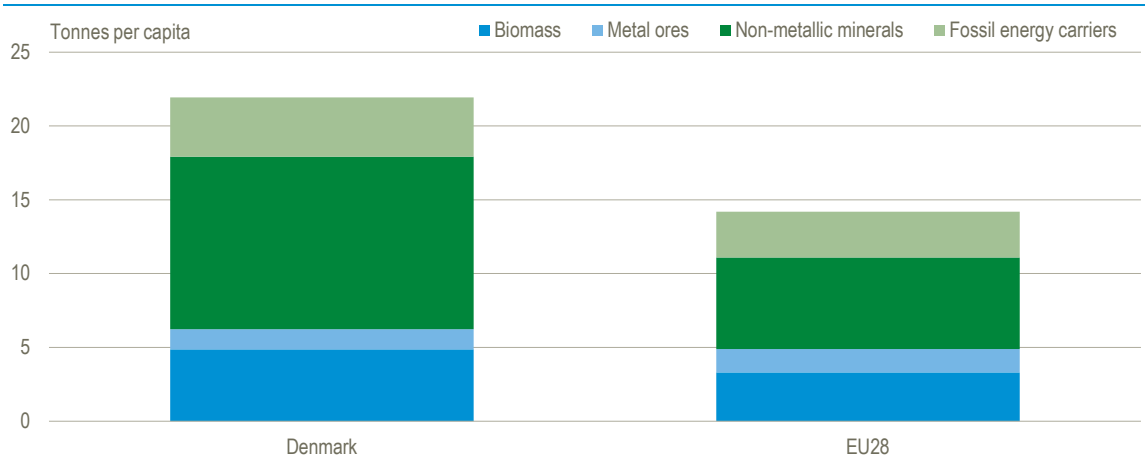
The resource footprint per capita is higher in Denmark than the EU average

As it appears from table 3 and figure 9, the raw material consumption was 125m tonnes in Denmark in 2016. It corresponds to 22 tonnes per capita, which is substantially higher than the average per capita in the EU of 14 tonnes per capita, cf. figure 10.

Part of the explanation of the big difference between Denmark and the EU may be that Denmark is among the wealthiest EU countries and both the Danish production and final use of goods and services is higher than the EU's. For example, the purchasing power adjusted GDP per capita was 26 per cent higher in Denmark compared to the EU in 2016.

Whereas RMC of the EU28 is more or less evenly distributed on the four groups of resources, extraction of non-metallic minerals accounts for a large share of the Danish resource footprint. They account for more than 50 per cent of Danish RMC, corresponding to 67.3m tonnes. Over 95 per cent of this is due to non-metallic minerals in Denmark, primarily sand and gravel (57.1m tonnes or 46 per cent of total RMC in 2016), which are used as input materials in the construction industry.

Figure 10 **Raw material consumption, RMC, for Denmark and EU28. 2016**



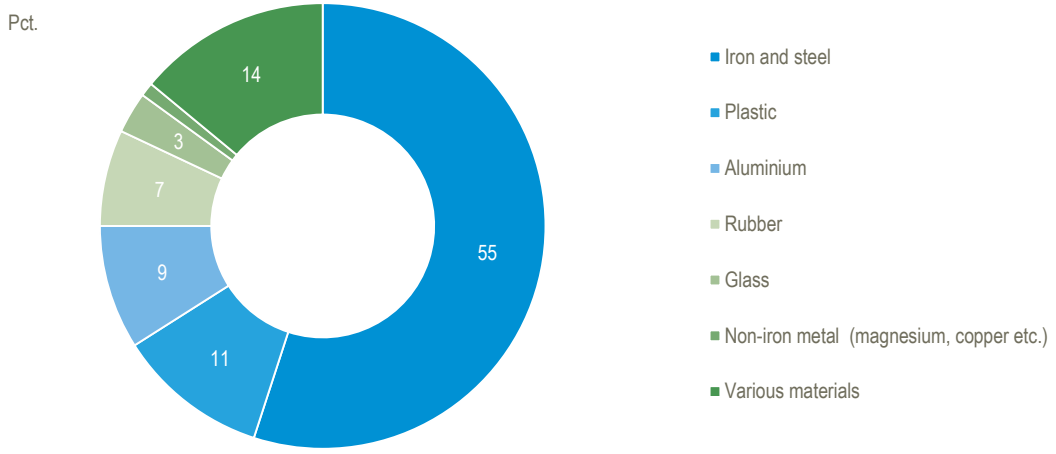
Appendix 1. Concepts and glossary

Raw material equivalent (resource footprint)	The amount of raw materials necessary on a global scale to be able to produce a good or a service. The raw material equivalent includes all raw materials to be extracted from nature, comprising also the raw materials required in the production processes (e.g. fossil energy) both with the primary producer and with all subcontractors, domestic and foreign. Raw material equivalents are measured in tonnes. The raw material equivalent can be assessed for an individual product, e.g. a car or for top-level categories as total imports, exports or consumption. The raw material equivalent of a product can be considered as composed of *the actual weight* and *the indirect raw material content* of the product.
Actual weight	The weight a product (or group of products) has when it is traded. Only physical goods, as opposed to services, have an actual weight. For example, the actual weight of Danish imports is the total weight of imported products when they enter Denmark.
Indirect raw material content	The weight of the raw materials that are extracted directly or indirectly to enable the production but that do not become part of the final product. This includes e.g. the share of extracted ore that is separated from the pure metals and the amount of fossil energy included in the various production processes. To a certain extent, the indirect raw material content can be seen as an indicator of waste loads and emissions that have taken place throughout the production chain.
The raw material equivalent of imports	The total amount of raw materials extracted to enable the production of the imported goods and services. The extraction typically takes place abroad (in the producer country and other countries). However, it is possible that part of the raw material equivalent is extracted in the importing country itself, if enterprises in that country work as subcontractors of foreign enterprises.
The raw material equivalent of exports	The total quantity of raw materials required to produce the exports. The raw material equivalent typically consists of raw materials extracted both domestically and abroad, since use of imported products is directly or indirectly required to enable the production of the exported products.
Raw material consumption, RMC (domestic resource footprint)	Domestic extraction of raw materials plus the raw material equivalent of imports minus the raw material equivalent of exports. The raw material consumption reflects the global extraction of raw materials that is necessary to meet domestic final use in the form of private and public consumption and investments etc., but excluding the raw material equivalent of exports.

Appendix 2. Calculation of the resource consumption of a passenger car

An ordinary passenger car contains many and different types of materials, each of which involves natural resources. The distribution of materials is shown in figure 11.

Figure 11 **Distribution in per cent of materials in an ordinary passenger car. 2017**



Source: Hovorun et al. 2017[6].

Large quantities of natural resources are used for the production of a car – primarily in the form of iron, minerals and fossil fuels – which must be extracted from the world's environment. Figure 12 shows the distribution of the raw materials required to produce an average new car imported to Denmark in 2016.

Figure 12 **Natural resources used for the production of an average car imported to Denmark in kg of raw material equivalents. 2016**

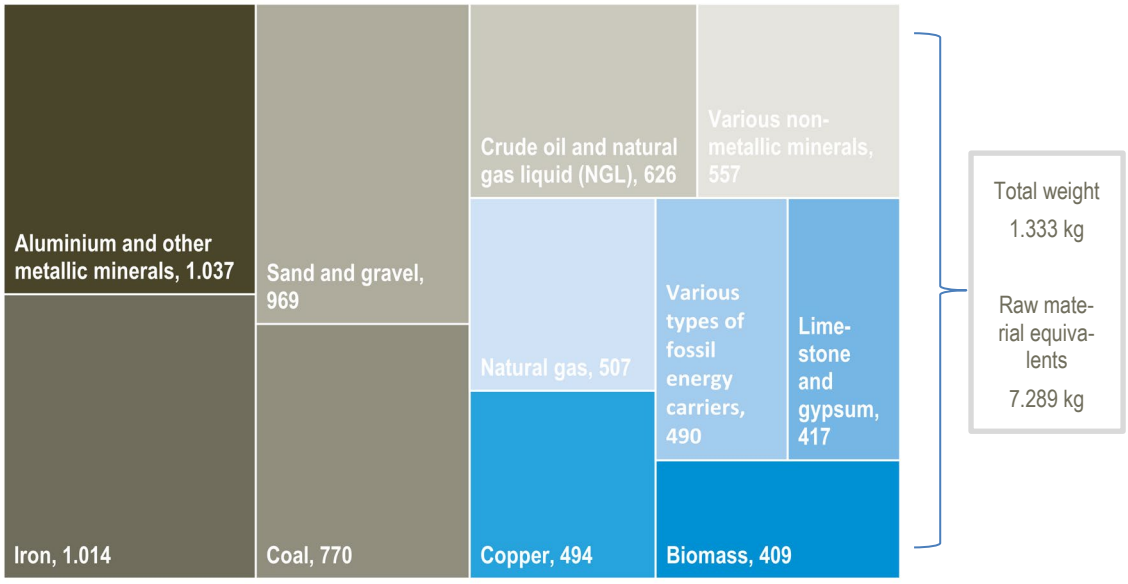


Table 4 shows that for each million DKK of imported passenger cars in 2016, approximately 77 tonnes of raw materials were used to produce the cars. Converted to tonnes, it means that each kilogram of cars imported in 2016 required around 5.5 kg of natural resources. With an average weight of 1.33 tonnes for an imported car, this is a total raw material content of 7.3 tonnes for an average car imported in 2016.

[6] Hovorun T. P., Berladir K. V., Pererva V. I., Rudenko S. G., Martynov A.: Modern materials for automotive industry, Journal of Engineering Sciences, Volume 4, Issue 2 (2017), pp. F 8–F 18.

Altogether, the import of new cars contributed to the Danish pressure on resources from abroad by approximately 1.94m tonnes of natural resources in 2016. This corresponds to 339 kg on average per capita. The results must be interpreted with caution, as the assessment is based on a certain measure of assumptions and averages. First of all, the conversion coefficient from kg of real weight to raw material equivalents is implicit, because the raw material equivalents originally were estimated based on the monetary value in DKK. Furthermore, the conversion coefficients are connected with the wider group of motor vehicles etc., and thus the coefficients are not entirely specific for cars.

Table 4 **Imports of new cars in various units of measurement. 2016**

1. Imports in value	2. Imports in weight	3. Imported amount	4. Average weight	5. RME coefficient	6. Amount in RME	7. Implicit RME coefficient
1.000 DKK	Tonnes	Units	Kg per unit	Kg RME per 1.000 DKK	1.000 tonnes	Kg RME per kg of actual weight
			(2. divided by 3.)		(1. multipl. by 5.)	(6. divided by 2.)
25.270.009	353.817	265.503	1.333	76.6	1.935	5.5

Note: RME is an abbreviation of raw material equivalents