

MFAfin – Finnish material flow accounts

Main results

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FOREWORD

The Finnish material flow accounts 2000 – 2015 has been carried out as Excel workbook, which contains detailed information on domestic extraction of raw materials, as well as imports and exports of goods and services from year 2000 onwards. Detailed methodology description document is accompanied also.

In this report the main results are presented and explained.

Background documents:

TMRfin_2000-2015 (Excel workbook)

MFAfin – Method description 2017 (pdf)

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1 MAIN MATERIAL FLOW INDICATORS AND THEIR CONTENT

In Figure 1 the main economy-wide material flow indicators of Finland for the year 2015 are presented.

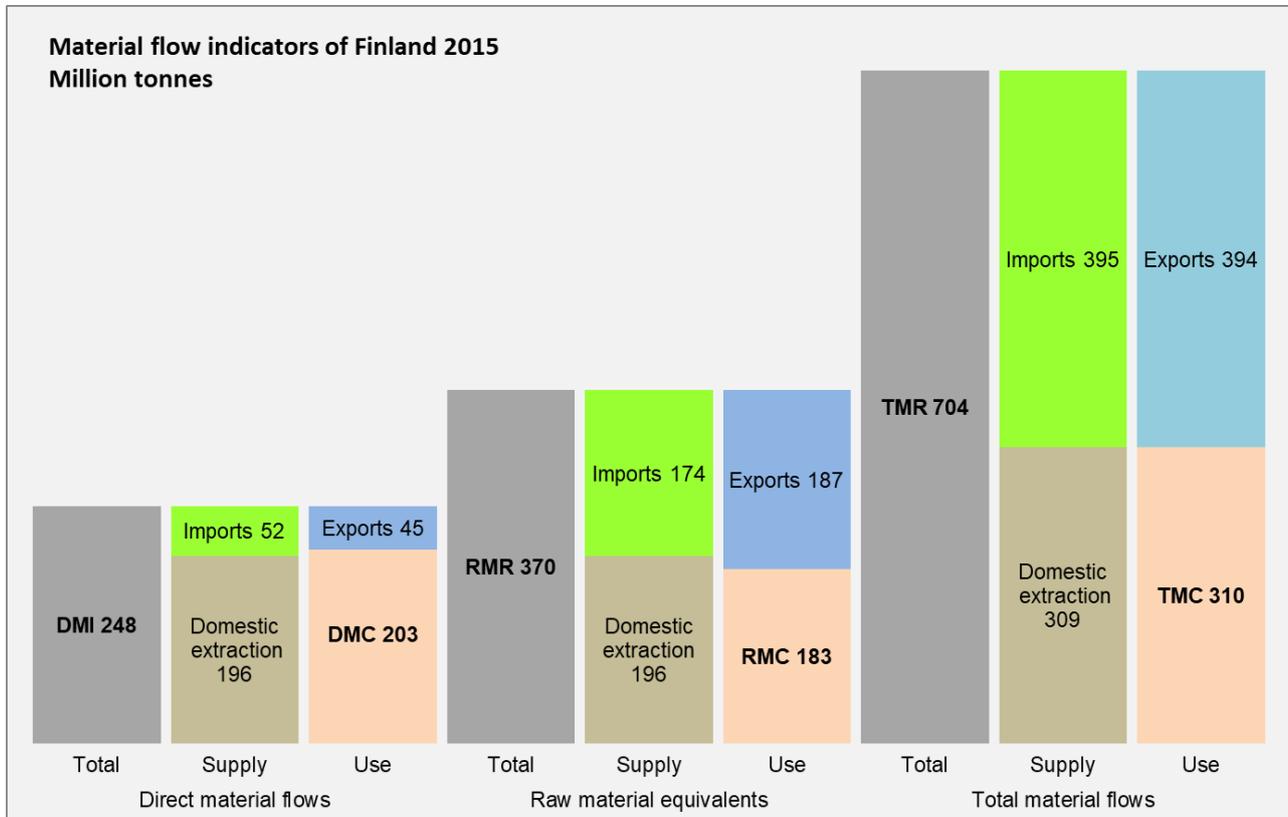


Figure 1. Material flow indicators of Finland 2015, million tonnes.

Direct material flows contain the domestic used extraction and direct mass of imported and exported products. Direct Material Input (DMI) measures the sum of domestically extracted raw materials and imported products entering the economy. The Direct Material Consumption (DMC) is reached when the direct exports are subtracted from the total input.

In raw material equivalent flows the direct imports and exports are converted into raw materials needed to produce the imported and exported products. In this context the raw material content of immaterial imports and exports such as electricity and services are also estimated. The raw material content of imports are estimated by LCA methods and exports by environmentally extended input-output model ENVIMAT for detailed product groups of imports and exports.

For the total raw material flow we use the term Raw Material Requirement (RMR) instead of Raw Material Input (RMI), because the raw materials itself do not enter the domestic economy. Even if the RMR is substantially higher than DMI, the Raw Material Consumption (RMC) is less than DMC. This is because in DMC only the direct mass of exports is subtracted from DMI so that the indirect material use of producing exported products are also left to DMC. In raw material equivalent flows exports include the indirect flows and thus they are not included into RMC.

Total material flows also include the unused extraction – e.g. unused overburden and waste rock in mining and logging residues left to the forests. Methodologically total material flows can be considered as an extension of the raw material equivalent flows, even if the flows are nearly two times higher than raw material flows.

European Commission has chosen the RMC to the central material flow indicator in the material efficiency initiatives. However so far raw material equivalent material flow accounts are published at the total EU level only and the country level data are limited to direct material flows.

For international comparison the per capita material flow indicators are useful as depicted in Figure 2. The per capita DMC of Finland is 37 tonnes and per capita RMC 34 tonnes. The corresponding figures estimated to the total EU are DMC 13 and RMC 14 for the year 2014 (Eurostat 2017). Thus the material use per capita in EU is less than a half of that in Finland.

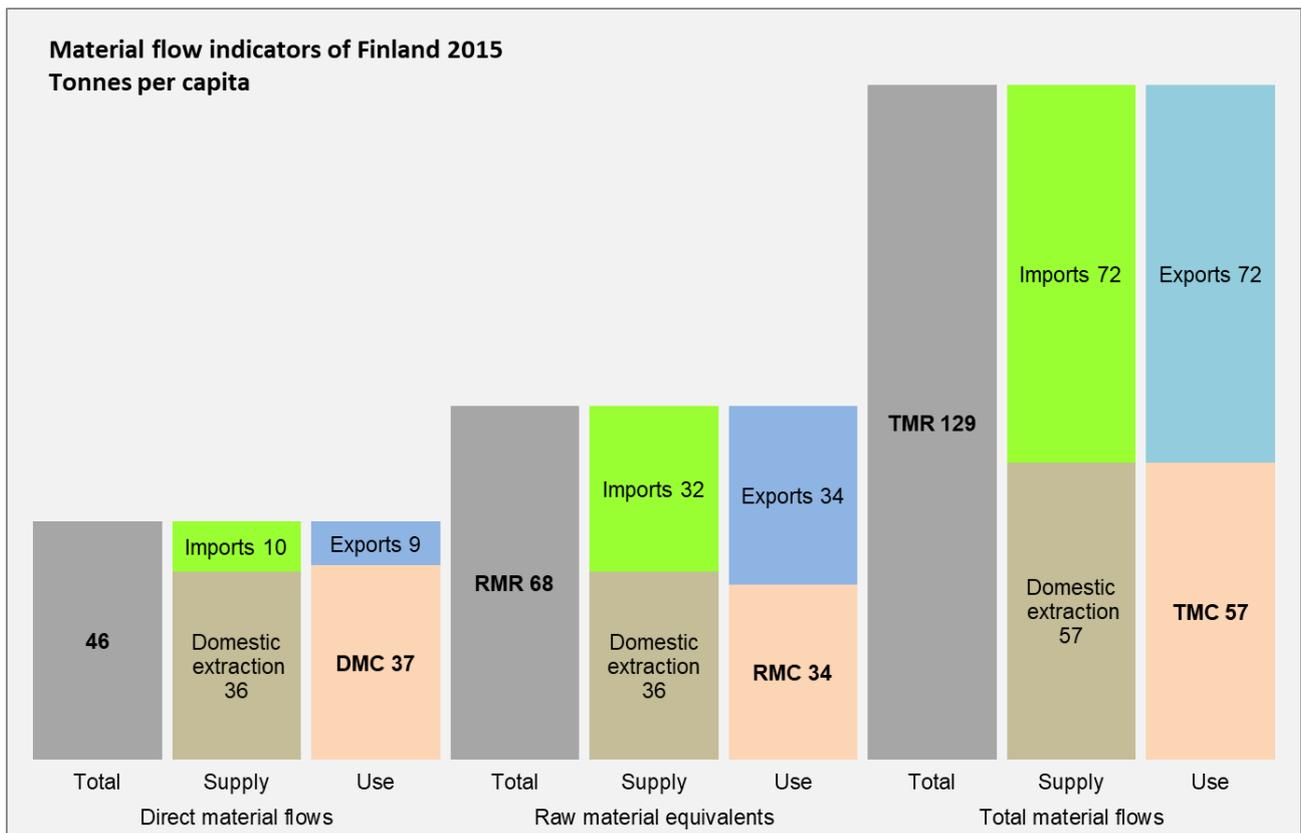


Figure 2. Material flow indicators of Finland 2015, tonnes per capita.

The shares different material types in raw material equivalent flows are shown in Figure 3. The wild catch includes wild fish, game, and mushrooms and berries from nature. The fossil fuels include peat also. Soil materials include sand, gravel and crushed stone.

The soil materials comprise almost 60 % of the domestic extraction and raw material consumption, too. The share of fossil fuels in domestic extraction is only 2 % but in RMC 15 % being the second largest material group. This shows that the energy efficiency is an important ingredient in the material efficiency, too. The share of biotic materials, crops, wild catch and wood, is 21 % in domestic extraction and 14 % in raw material consumption.

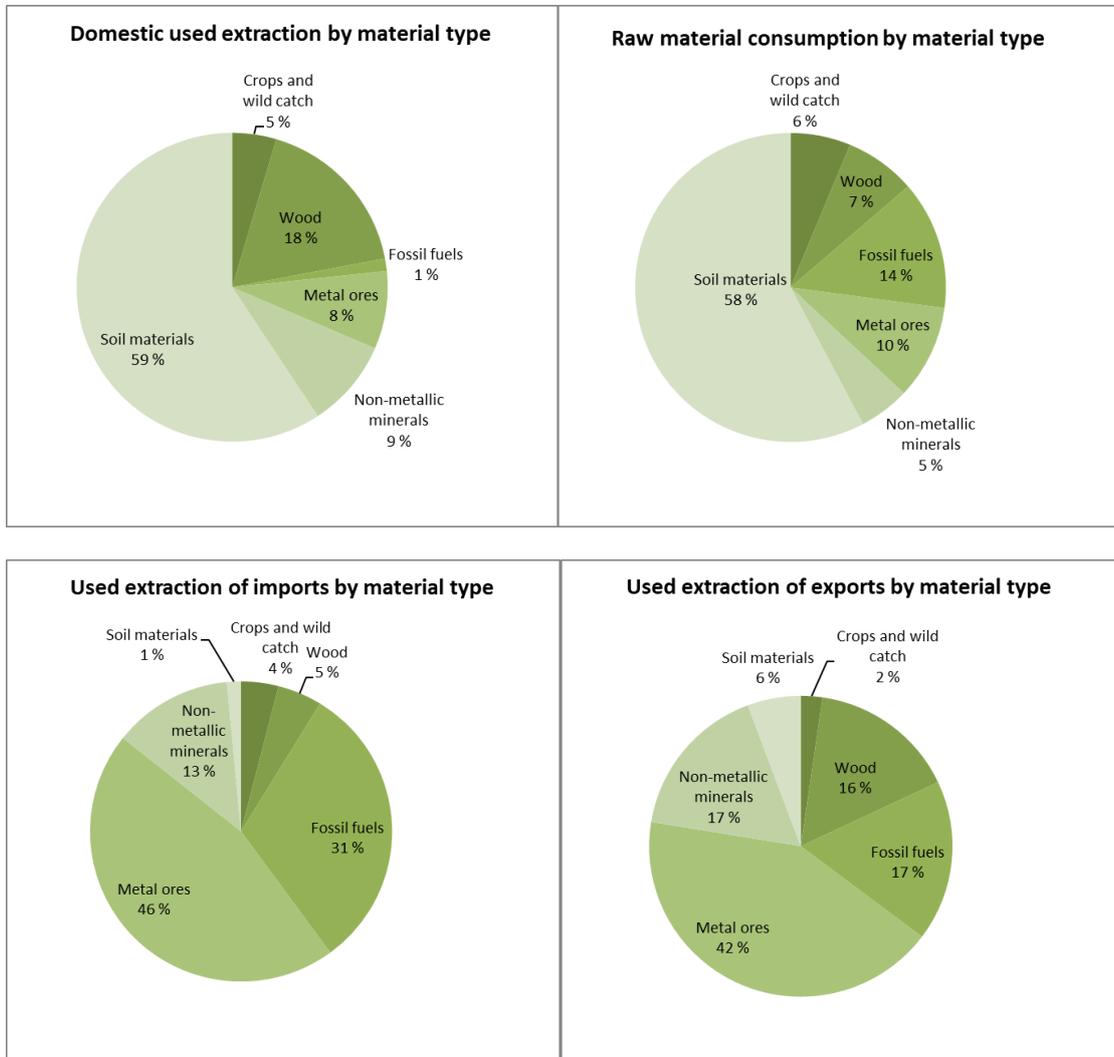


Figure 3. Material content of domestic extraction, raw material consumption, exports and imports in raw material equivalent flows of Finland, 2015.

2 DEVELOPMENT OF MATERIAL FLOWS 2000 – 2015

Figure 4 shows the development of material consumption time series 2000 – 2015. The peak of series is in the year 2008, the end year of the rapid economic growth period in Finland.

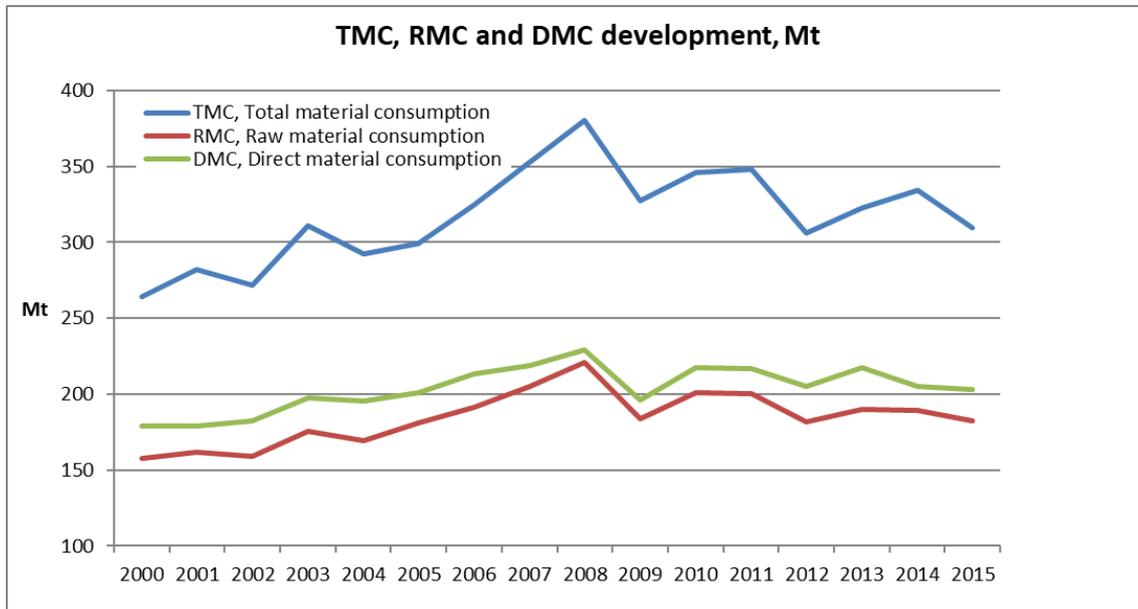


Figure 4. Development of direct material consumption (DMC), raw material consumption (RMC) and total material consumption (TMC) 2000 – 2015, Mt

In Figures 5 and 6 the development of domestic extraction and raw material consumption by material types is depicted. In domestic extraction the expansion of metal mining after the year 2008 can be seen.

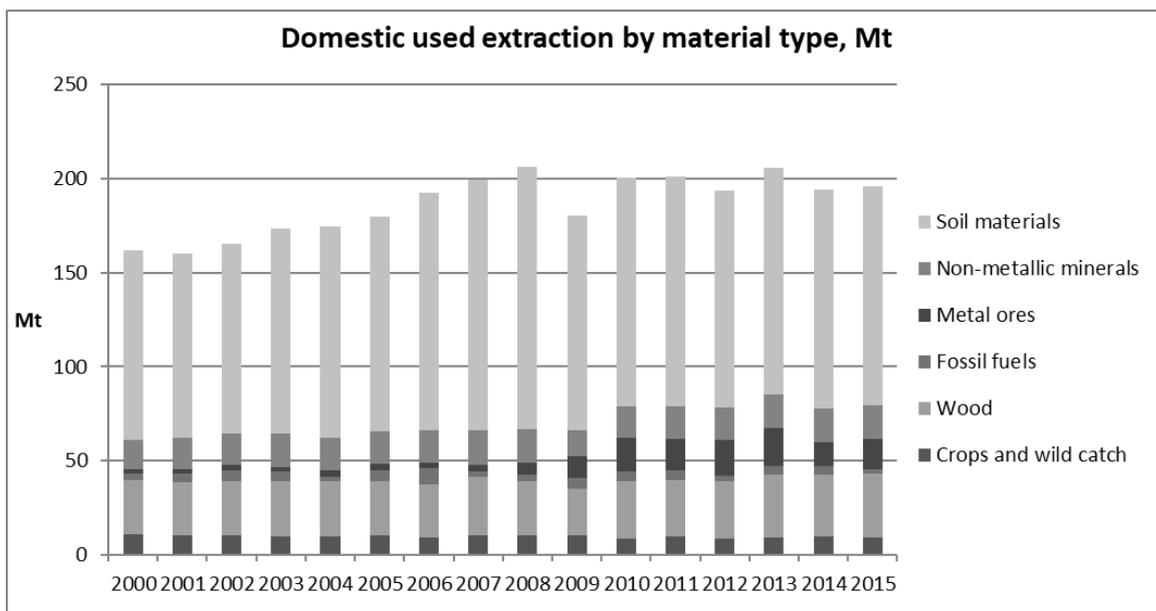


Figure 5. Domestic used extraction by material type 2000 - 2015, Mt

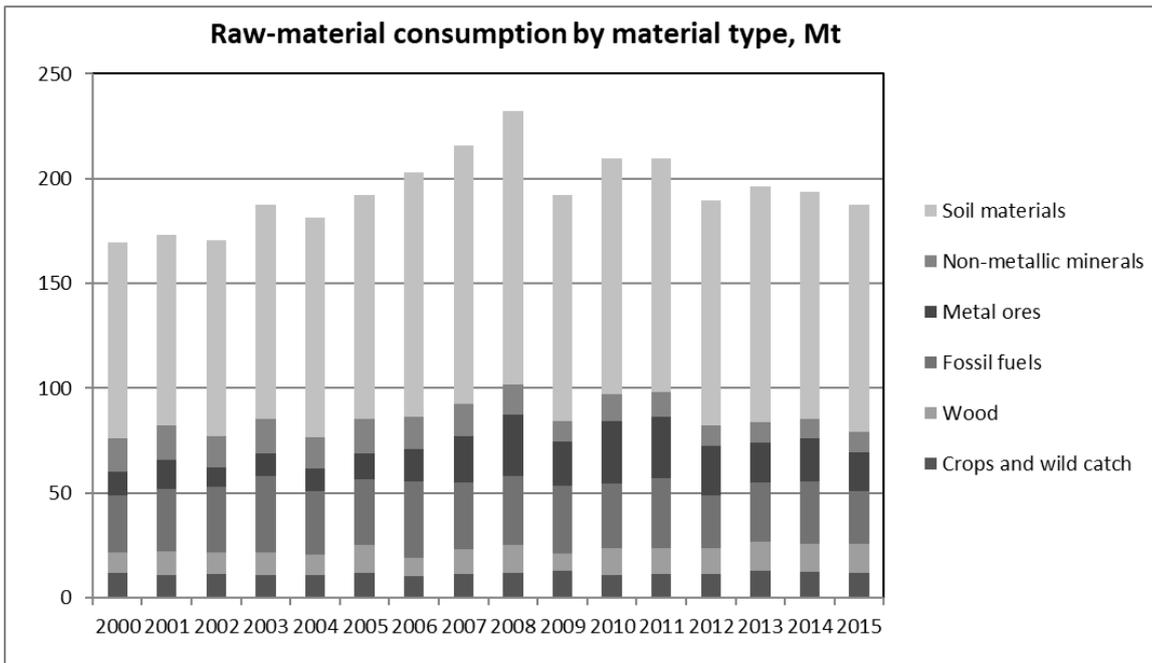


Figure 6. Raw material consumption by material type, Mt

The development of the share of biotic materials on domestic extraction and raw material consumption is shown in Figure 7. The shares of biotic materials have been diminishing before the economic recession 2008 and turned to a slight growth after that.

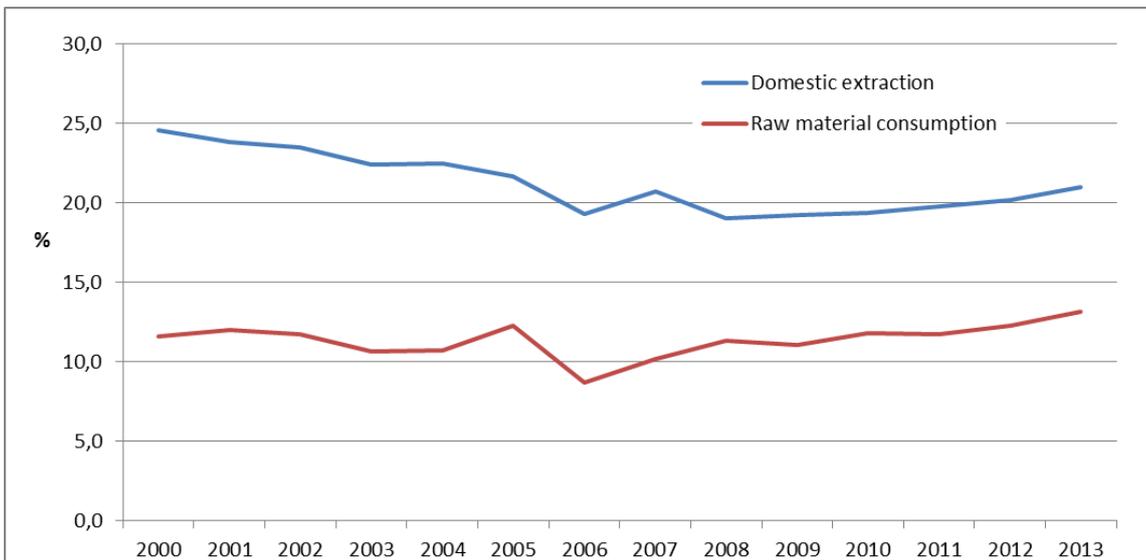


Figure 7. Share of biotic materials in domestic extraction and raw material consumption, %

3 MATERIAL EFFICIENCY INDICATORS

Material efficiency in the economy can be measured as material intensity that is as a relation of material use to gross national product (GDP).

The figure 8 shows the development of RMC, GDP and their quotient RMC/GDP as volume indexes from the year 2000.

The material intensity of the Finnish economy increased from the start of the period to the peak of the economy. This was because in the rapid growth period the construction investments accelerated and the construction is material intensive activity. In the economic slowdown construction fell steeply but then construction of new mining sites rise the material use somewhat again.

RMC intensity of Finland rose under the rapid growth period 2000 – 2008 but turned down after the economic recession.

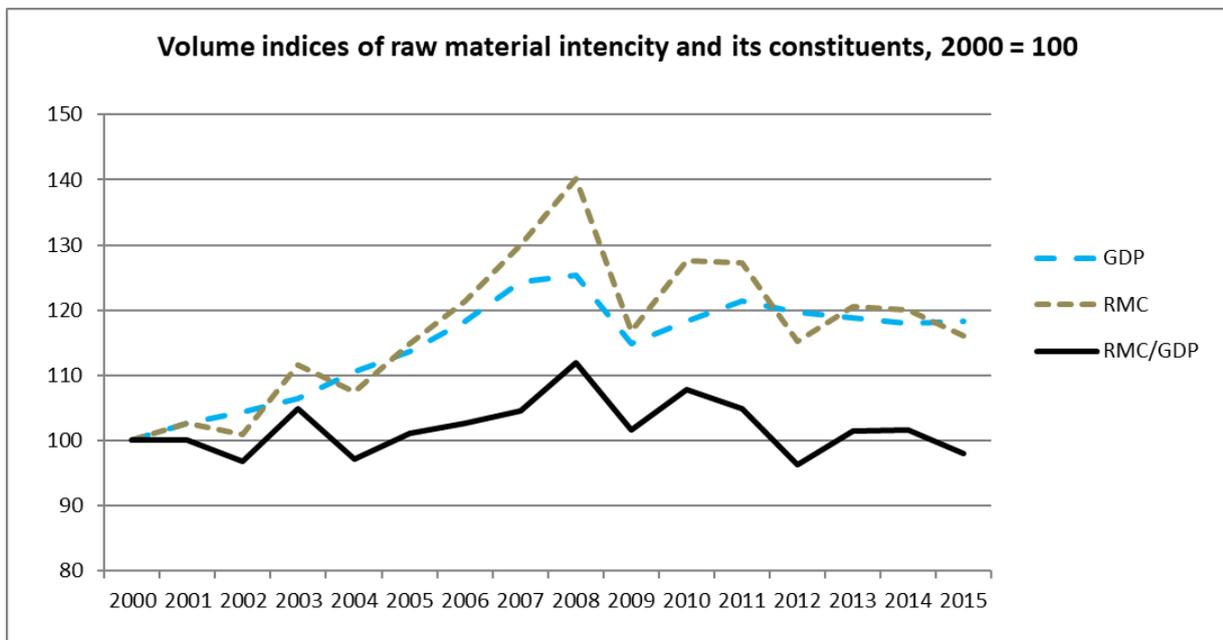


Figure 8. Development of material intensity (RMC/GDP) and its constituents in Finland 2000 – 2015, volume indices, 2000 = 100.

European Commission uses material productivity, GDP/RMC - reciprocal on material intensity – as the main material efficiency indicator. Material productivity development is shown in Figure 8.

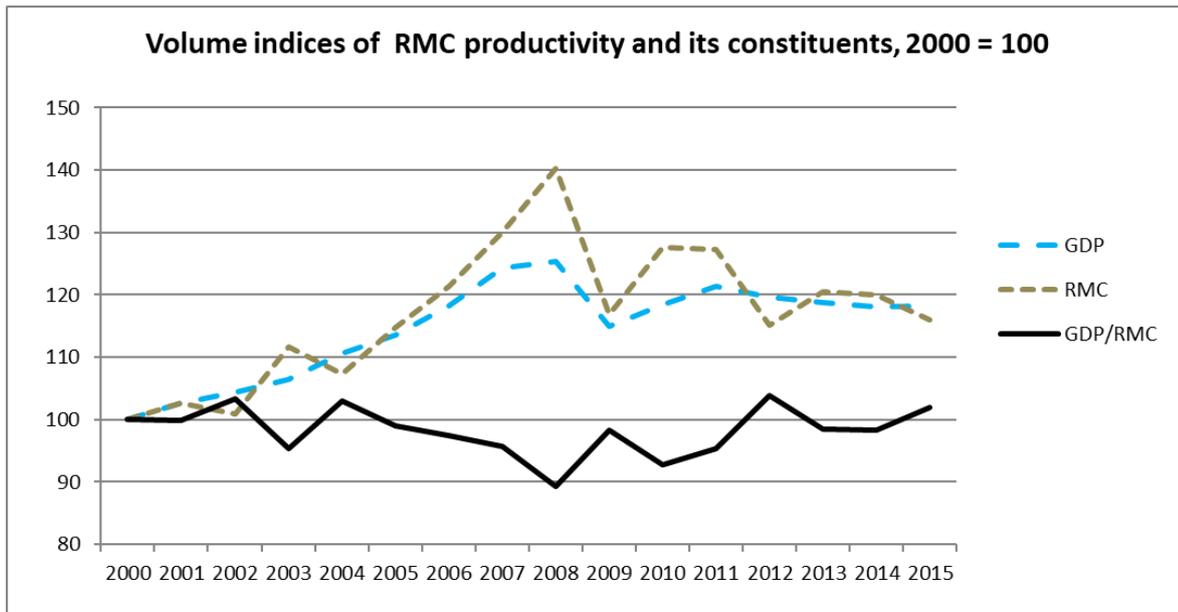


Figure 8. Development of material productivity (GDP/RMC) and its constituents in Finland 2000 – 2015, volume indices, 2000 = 100.

The material productivity concept when it is used with the RMC is misleading. RMC is a consumption – not production – oriented indicator. In GDP the value added created in production of exported products is important but from RMC the material use of exports is excluded. If we want to use the productivity term, then the RMR in place of RMC would be better. The interpretation of the changes in GDP/RMC is also often strange. The slowing down of the GDP/RMC had to be interpreted as follows: the slowing down of the material productivity in the rapid economic growth period was due to accelerated construction investments where the material productivity is low. But the concept that material productivity in construction is low is strange.

4 PHYSICAL EXPORTS AND IMPORTS

The development of exports and imports of Finland in monetary terms are shown in Figure 9. Before the economic recession the growth of foreign trade were rapid and thereafter the growth slowed down. In same time the surplus of the foreign trade (exports greater than imports) turned into a slight deficit.

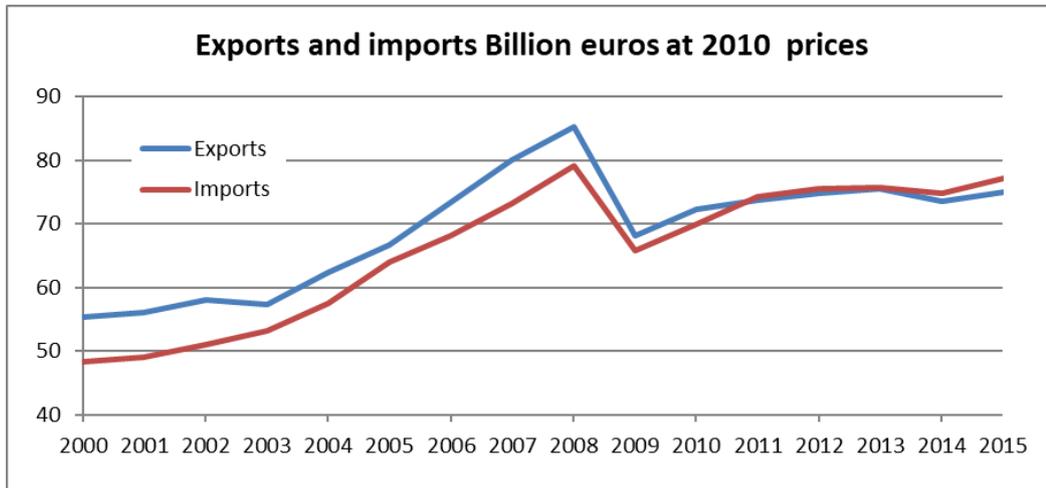


Figure 9. Exports and imports Billion euros at 2010 prices

In Figure 10 the development of exports and imports are measured in mass flows, both as direct mass of imported and exported products and as raw material equivalents. The direct material imports have greater than direct material exports on the whole period even if the monetary value of imports were less than exports in the first part of the period. The reason for this is that in imports the share of less processed products with low prices per kilogram has been greater than in exports.

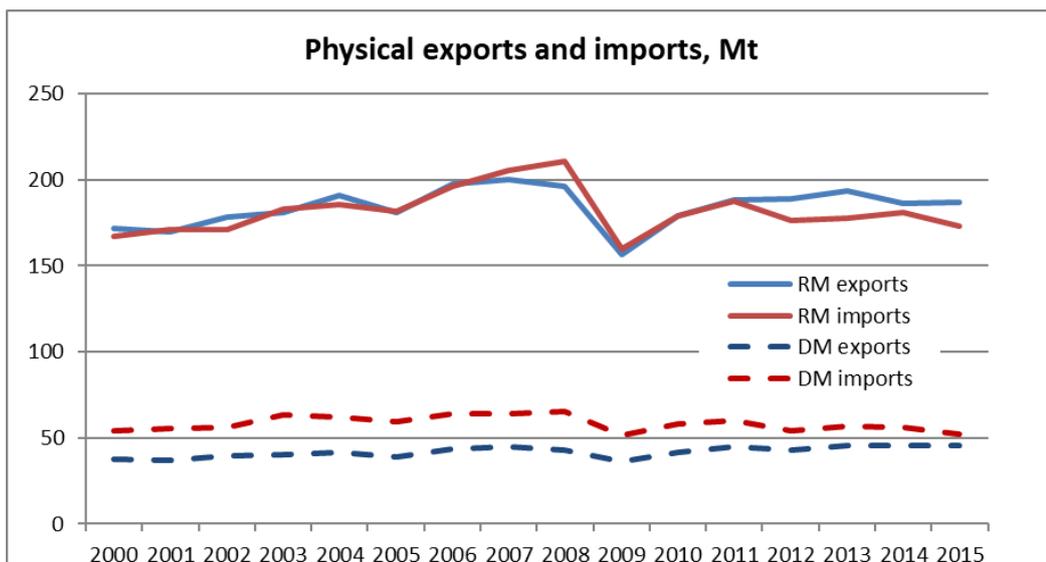


Figure 10. Physical exports and imports, million tonnes

In raw material equivalents the mass of exports and imports have been rather equal. However in the last years the physical amount of exports have been exceeded the physical amount of imports.

The material intensities (kg/eur at 2010 prices) of exports and imports are depicted in the Figure 11. The direct material intensity of imports has been higher than exports on the whole period. The difference, however, has been diminishing. In raw material equivalents the difference between exports and imports have been less than in direct material flows. After the year 2011 the material intensity of exports has been exceeded the material intensity of imports. The reasons for this have been the shrinking of the share of high tech electronic products and increase of metal mining products in exports.

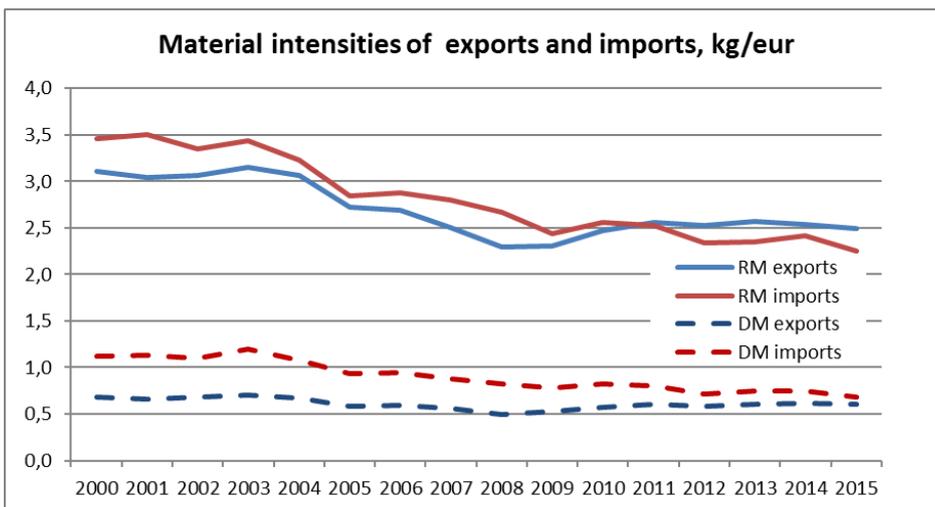


Figure 11. Material intensity of exports and imports, kg/eur at 2010 prices

The trade balances of exports and imports in raw material equivalents in the year 2015 are presented in Figure 12. The greatest material group is metal ores, where the RME of imports are a little bit higher than RME of exports.

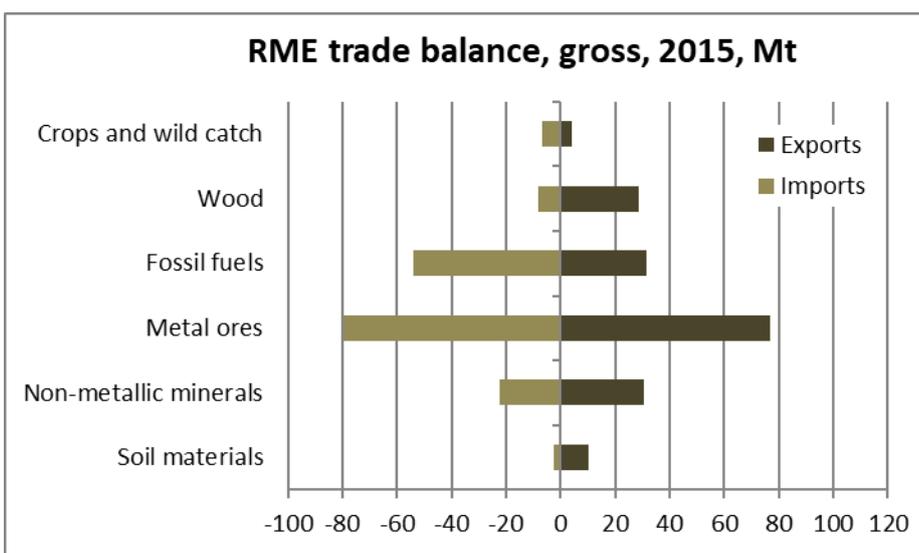


Figure 12. Physical trade balances, gross, by material type in raw material equivalents 2015, million tonnes

The physical net trade balances (exports – imports) by the main material groups in the years 2000 and 2015 are presented in Figure 13. The physical surplus is highest in round wood and the surplus has been increased somewhat. The greatest deficit is in fossil fuels, the deficit has been decreased somewhat, however. Metal ores have been in deficit, the deficit, however, has been reduced considerable. Non-metallic minerals, which exports and imports were at balance in the year 2000, has increased its trade surplus as to the second highest of the material groups. The deficit of crops and wild catch has been grown. The total physical trade balance has been turned from the deficit to the surplus.

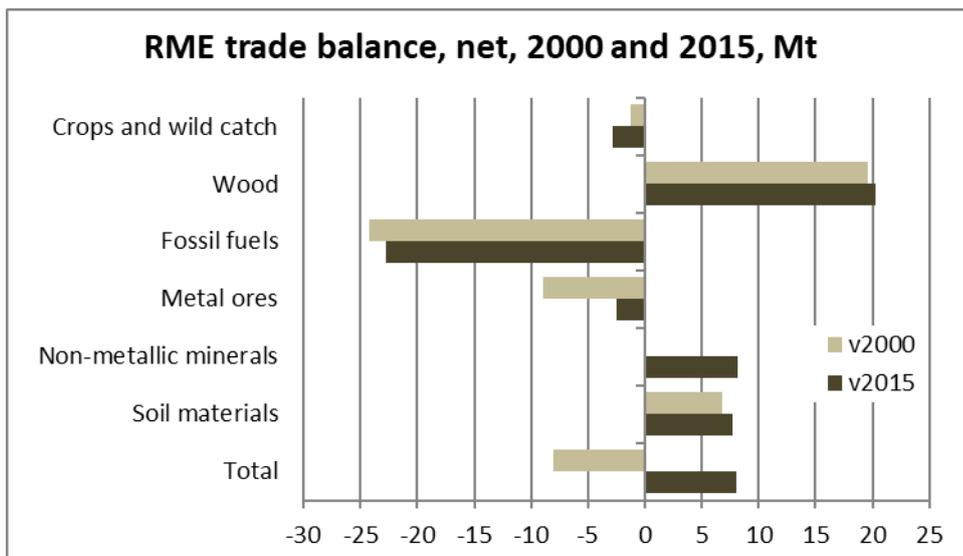


Figure 13. Physical trade balances, net (exports - imports), by material type in raw material equivalents 2010 and 2013, million tonnes

SOURCES

Eurostat 2017. Material flow accounts - flows in raw material equivalents.
[http://ec.europa.eu/eurostat/statistics-explained/index.php/Material_flow_accounts -
_flows_in_raw_material_equivalents](http://ec.europa.eu/eurostat/statistics-explained/index.php/Material_flow_accounts_-_flows_in_raw_material_equivalents)