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# TOWARDS A CIRCULAR ECONOMY MONITOR FOR FLANDERS: AN INITIAL INTERPRETATION BY OVAM

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**TOWARDS A CIRCULAR**  
**ECONOMY MONITOR FOR**  
**FLANDERS: AN INITIAL**  
**INTERPRETATION BY OVAM**

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In this report, the Public Waste Agency of Flanders (OVAM) presents, in cooperation with the Circular Economy Policy Research Centre (CE Centre), an initial selection of indicators for the Flemish circular economy. It comprises a selection of existing macro indicators and in-house indicators from OVAM for the societal needs: nutrition, housing and consumer goods. This report is not the Circular Economy Monitor for Flanders. The CE Policy Research Centre has been asked to produce this monitor by the end of 2021. This selection of indicators is an invitation to the partners involved in the Flemish circular economy to complete the Circular Economy Monitor for Flanders together with the CE Policy Research Centre. In this report, OVAM also presents some results of its own research into the impacts of sustainable materials management and the circular economy.
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# 1 INTRODUCTION

What progress has been made towards a circular economy in Flanders and how fast is progressing? To find out, a detailed set of indicators is needed.

The Circular Economy Policy Research Centre (CE Centre), established in 2017 as a consortium of the Catholic University of Louvain, University of Antwerp, University of Ghent and Flemish institute for technological research (VITO) and financed by the Public Waste Agency of Flanders (OVAM) and the Flemish Department of Economy, Science and Innovation (EWI), its main objective is to develop a monitor for the progress of the circular economy (CE monitor) by the end of 2021. As a partner in the Circular Economy Transition, OVAM is hereby presenting a report with an initial selection of indicators that might possibly feature in this CE monitor. This selection was made in cooperation with the CE Centre. In addition, the report discusses some of the results of OVAM's research into the impacts of sustainable materials management and the circular economy. These are included in a number of boxes throughout the report.

## **Chronological structure of the Monitor of the Circular Economy for Flanders**

The CE Centre produced a framework for the CE monitor at the end of 2018. This is a framework within which we can select and develop indicators so that we can provide the most direct feedback on policy. The concept consists of a top layer with macro indicators, which summarise the progress towards the circular economy for Flanders. Below this top layer are the indicators for four societal needs: housing, nutrition, consumer goods and mobility. These lower-level indicators provide more detail and insight.

The CE Centre is developing the indicators for the societal needs, one by one. The inventory of the available data has already been completed for the mobility system. The full Policy Research Centre report on indicators for circular mobility can be found on the CE Centre website. A preview of this is included in this report (paragraph 4.4). The CE Policy Research Centre expect to deliver the indicators for the housing and consumer goods systems by the end of 2020. The indicators for the nutrition system are expected in 2021. The CE monitor should be completed by the end of 2021.

## **New OVAM report provides input for the Circular Economy Monitor for Flanders**

As a partner in the Circular Economy Transition, OVAM is hereby presenting a report with an initial selection of indicators for the Flemish circular economy. These indicators could figure in the CE monitor. For the top layer (economy-wide indicators or macro indicators) of the monitor, we based the selection on already existing indicators. The selection was made in a project group of OVAM in which the CE Policy Research Centre also participated. For the societal needs, housing, nutrition and consumer goods, the selection consists of indicators available within OVAM. The report also provides a preview of the indicators for the mobility system.

### **Further cooperation for a supported set of indicators**

This OVAM report and the work of the CE Policy Research Centre on indicators form the basis for the further completion of the CE monitor (both the macro indicators and the indicators for the societal needs). In order to map the data for the various societal needs and to arrive at a supported indicator set, the CE Policy Research Centre will enter into discussion with the relevant policy entities, sectors and other stakeholders. OVAM report is therefore an invitation to the partners in the Flemish Circular Economy Transition to further complete the CE monitor together with the CE Policy Research Centre and OVAM.

## **2 CONCEPTUAL BASIS**

At the end of 2018, the CE Policy Research Centre published a concept for the CE monitor for Flanders. Two publications are dedicated to this concept: one that explains in detail the structure of the monitor and the development process (Alaerts *et al.*, 2019a) and another that focuses on its scientific basis (Alaerts *et al.*, 2019b). The CE Policy Research Centre developed the approach of societal needs to meet an important requirement for an effective CE monitor: the opportunity to provide feedback as directly as possible with regard to the policy being conducted. The concept was finally approved at a workshop in the presence of thirty representatives from different policy areas, industry federations and civil society organisations.

### **Towards more direct policy feedback**

The CE Policy Research Centre developed a concept based on systems that meet social needs to enable more direct feedback with regard to the policy conducted or to be conducted. The basic principle here is that in the transition to the circular economy, the fulfilment of needs through products and services will be completely different. This will be done in different ways, depending on the specific need that is being met: for example, compare housing, where the emphasis will be on the very large material flows, with communication, where, for example, the emphasis will be on specific ingredients such as rare earth metals in smartphones. By specifically linking data from specific products or product groups to societal needs, a bridge will be built between the micro and the macro level. This approach is not exhaustive, but it does ensure that the relevant evolutions are taken into account at the micro level and that it can become clear over time how these evolutions will affect the economy. A diagram of the CE monitor is shown in Figure 1.

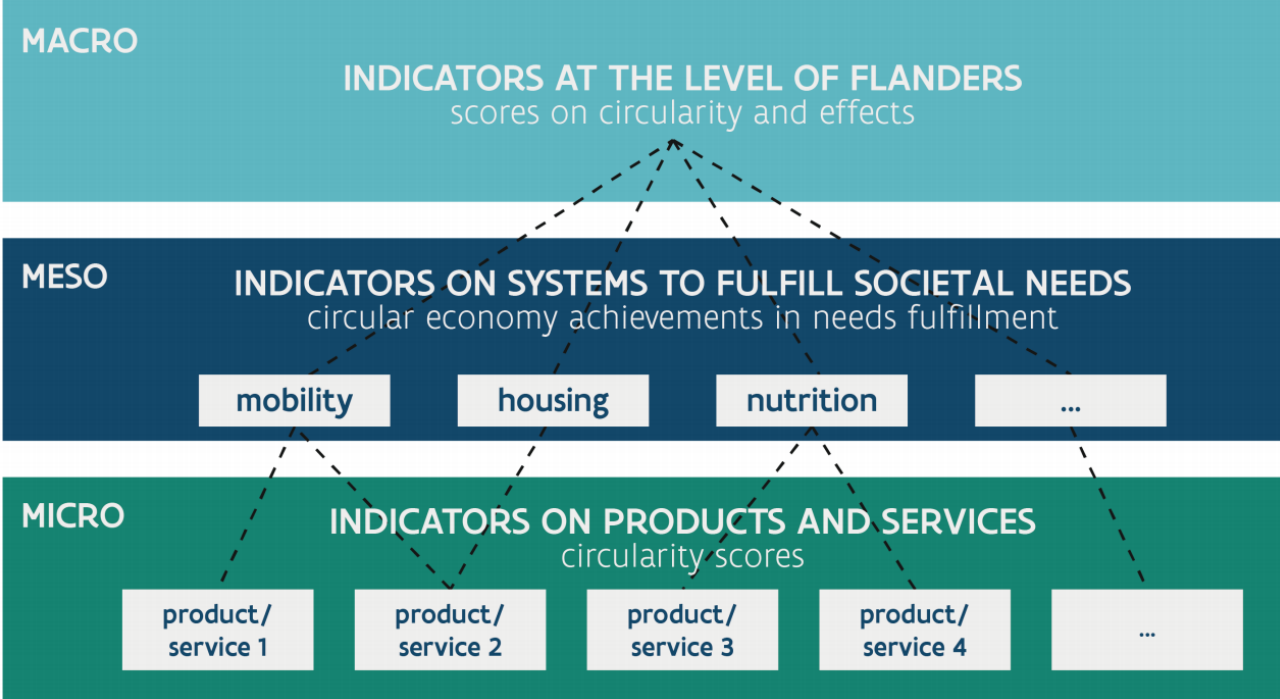


Figure 1. Overview of the circular economy monitor, to be supplied with indicators and data. Source: OVAM after the example of Alaerts *et al.* (2019a & 2019b).



### What do we want to know and measure?

We want to know how well our economy is shifting towards a circular economy. An economy provides services in the form of food, mobility, comfort, housing, etc. In order to provide these services, our economy uses natural resources (raw materials, water, space, energy ...). Our economy spits out these (used and transformed) resources in the form of waste and emissions. A linear economy consumes resources inefficiently (high resource use for each service provided) and will return the resources in a polluted form to the environment after one-time usage (e.g. as waste, as polluted water, air or soil). An economy that is organised in a more circular way will use fewer natural resources (dematerialising) per service provided and will keep the resources that are still needed for longer in circulation (closing material cycles). The consequence is that the consumption of natural resources and the leaks from the material cycle in the form of waste and emissions will go down. This is necessary because we want to reduce the depletion of natural resources and our dependence on them and we also want to reduce the negative environmental impacts of exploiting resources, waste and polluting emissions to a level that remains within the ecological capacity of our living environment (and, by extension, the entire planet) . Figure 2 illustrates the transition from a linear to a more circular economy.



Figure 2. Schematic representation of the transition from a linear to a circular economy.

So, we want to measure:

- (1) How well we manage to reduce our natural resource use (Chapter 3.1);
- (2) How well we manage to minimize waste and emissions from our economy as a result of our natural resource use (Chapter 3.2);
- (3) How well our economy is organised to keep resources in circulation for longer (Chapter 3.3).

These three elements must go in the right direction. After all, if our economy only succeeds in keeping resources in circulation for longer but does not sufficiently limit the amounts of waste and emissions, we will not achieve our environmental goals. That would be the case, for example, if our economy reuses and recycles many products but fails to dematerialise the fulfilment of societal needs. Conversely, we cannot limit our indicators to measuring quantities of waste and emissions because, for example, if these decrease without the consumption of primary raw materials going down, there will be (temporary) accumulation in the economy whereby the (environmental) impact of the resource use will remain high. Moreover, this stock will eventually be released as waste without re-use or high-quality recycling.

### Input for the monitor

The indicators for the macro level of the monitor will be mainly existing indicators or new indicators based on available data for Flanders as a region. An initial selection of indicators is shown in chapter 3 of this report.

The societal needs for housing, nutrition, consumer goods and mobility have been selected to bridge the gap to more detailed information in order to illustrate the transition as directly as possible. The selection of these societal needs is based on an analysis of the material and the carbon footprint of Flemish consumption. Each of these societal needs makes an impressive contribution to these footprints and together they account for the biggest part of them (Figure 3). The indicators, which show the progress of the CE in these systems from macro to product (group) level, are currently being developed at the CE Policy Research Centre. In chapter 3.3.7 OVAM presents indicators for the societal needs nutrition (chapter 4.1), housing (chapter 4.2), consumer goods (chapter 4.3), based on data available within OVAM. For the societal need 'mobility', we focus in the CE monitor on the material aspects linked to the production and the use of transport means. In chapter 4.4, we give a preview of the final input of these indicators. The full report on indicators for circular mobility can be found on the CE Centre website.

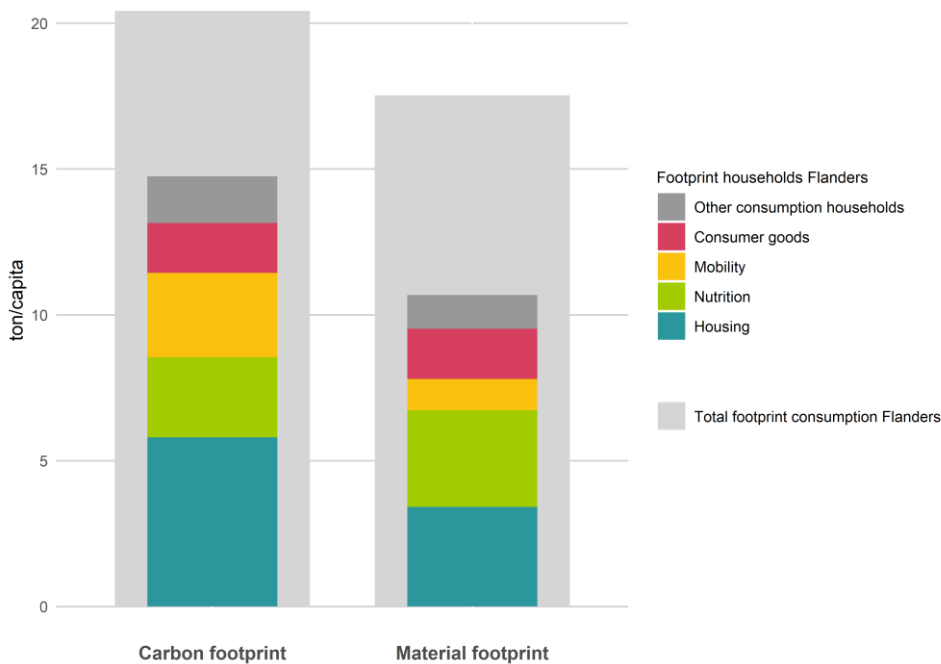


Figure 3. Carbon and material footprint of Flemish households in 2010 per consumption domain based on the Flemish IO [Input-Output] model. Source: Vercauteren *et al.* (2017) & Christis *et al.* (2019).

### 3 MACRO INDICATORS

#### 3.1 USE OF NATURAL RESOURCES

##### 3.1.1 Direct Material Input

###### What do we measure?

Direct Material Input or DMI describes the input of materials (classified in the material categories of biomass, metal ores, fossil energy carriers and non-metallic minerals) into the economy. No distinction is made in this regard according to the destination of the imports. Both the imports by Flemish companies and the imports by Flemish households are included in the figures. For the imports by Flemish companies, no distinction is made between imports as input in production for domestic consumption or as input in production for foreign consumption.

The input side of the economy consists of the domestic extraction of raw materials and the harvesting of biomass (DEU, Domestic Extraction Used) on the one hand, and physical import of raw materials and goods<sup>1</sup> on the other (IMP) (Figure 4). DEU only includes the raw materials used within the economy.

$$\text{Direct Material Input (DMI)} = \text{Domestic Extraction Used (DEU)} + \text{Import of goods (IMP)}$$

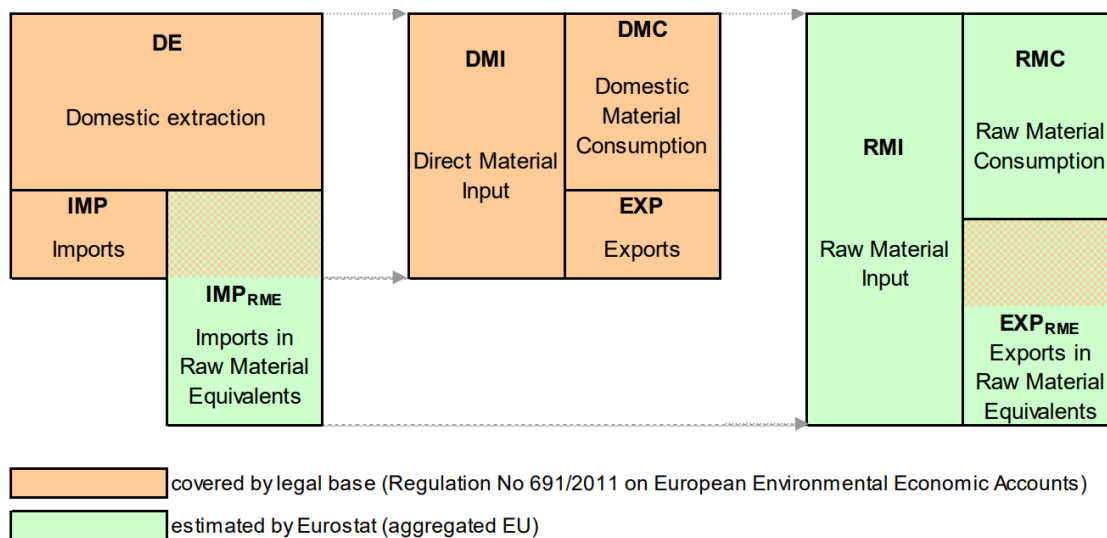


Figure 4. Overview of indicators from Economy-Wide Material Flow Accounting and Analysis (EW-MFA). Source: Eurostat (2018).

<sup>1</sup> Imports follow the national concept (as opposed to the community concept). Import and export transactions of non-residents that do not involve inhabitants are not included in the statistics, as is the non-inclusion of despatches followed by returns. It only includes the import and export movements involving inhabitants.

IMP includes all imported goods in tons from raw materials to fully finished products. To split products into material groups, each product is assigned to one material category. This is done by identifying the main material component of the product and thus assigning the product to the corresponding material category. For example, an exported car with metal as its main component is fully assigned to the material category “metal ores”. This does not affect the total trade flow however it does affect the internal relationships of material categories within imports.

In contrast to RMI (paragraph 3.1.2), DMI does not take into account the raw materials extracted upstream during the entire production chain of the imported product. DMI only looks at the imported mass<sup>2</sup> of products when they cross borders. The trade of services and electricity, for example, has no mass and is not expressed in weight so these are not included in DMI.

Domestic Extraction (DEU) and physical Imports of Goods (IMP) are part of the Economy-Wide Material Flow Accounting and Analysis (EW-MFA). Every European Member State must report its Material Flow Accounts (Eurostat, 2019). For the Flanders region, the DEU and IMP must be estimated as no official EW-MFA for Flanders have been drawn up. To determine the DMI for Flanders, an estimate is needed of international trade (trade of Flanders with foreign countries) and inter-regional trade (trade of Flanders with Brussels, Wallonia and the extra-regional area). Approximately 25% of Flemish imports come from the Walloon Region or the Brussels-Capital Region expressed in monetary units<sup>3</sup>. The other 75% comes from abroad. In physical units, interregional imports account for about 18% of total imports.

### **Why do we measure?**

DMI describes all materials that physically enter the economic system, i.e. all materials of economic value that are available for the domestic production system. This indicator shows which raw materials form the basis of the domestic economic system. The comparison between DEU and DMI illustrates how dependent we are on imports of raw materials, semi-finished products and finished products from abroad to run our economy compared to the raw materials that are mined or grown within Flanders.

A common criticism of DMI is that it is not robust against so-called outsourcing. A country that imports a relatively large number of finished products is expected to have a smaller DMI than a country that processes a lot of raw materials into products (more information in paragraph 3.1.2).

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<sup>2</sup> The net mass is the mass of the merchandise expressed in kilograms, which corresponds to the weight of the goods without the packaging.

<sup>3</sup> SERV (2016). The interregional input-output table, 2010. An analysis for Flanders. SERV\_20160912\_RIOT\_RAP.

### What do we see?

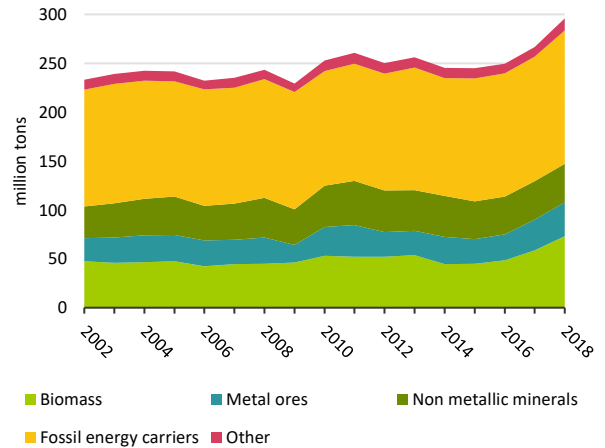
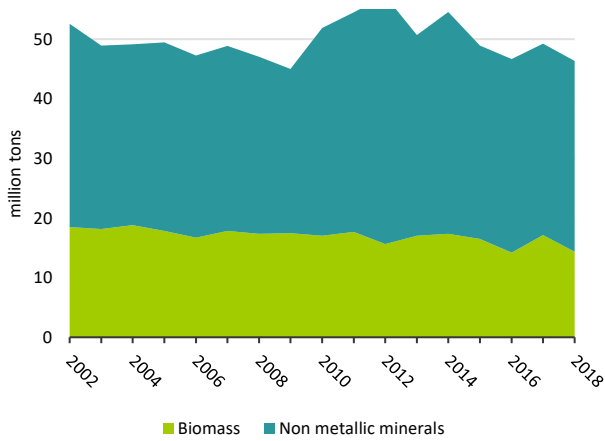


Figure 5 : Domestic extraction by category of material (DEU) (in millions of tons) in Flanders, 2002-2018. Source: CE Centre (2020). Figure 6: Imports (IMP) by category of material (in millions of tons) in Flanders, 2002-2018. Source: CE Centre (2020).

The DEU of Flanders fluctuates and fell slightly from 53 to 46 million tons in the period 2002-2018 or 8.8 to 7.1 tons of per capita. In 2018, 69% of the DEU consisted of non-metallic minerals and 31% was biomass. Metal ores and fossil energy carriers are not extracted in Flanders.

Flemish imports (IMP) increased from 233 million tons in 2002 to 296 million tons in 2018. This corresponds to 39.1 in 2002 and 45.2 tons per capita in 2018. Fossil energy carriers are the most important category (by weight) in imports with a share of 46% in 2018 followed by biomass with a share of 25%. Metal ores and non-metallic minerals have a lower and comparable share of 12% and 13% respectively. The material category “other” has a share of 4%. For example, timepieces are in the category “other” because they cannot be assigned to one of the four material categories.

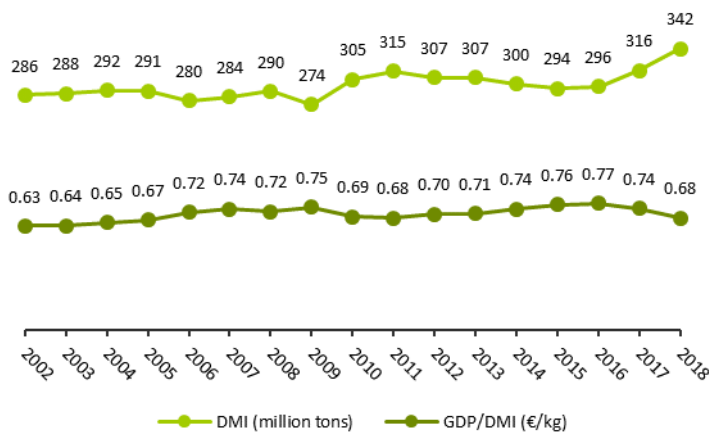


Figure 7. DMI (in million tons) & GDP DMI (in euros per kilogram) for Flanders, 2002-2018. Source: CE Centre (2020). GDP in chain-linked volumes (reference year 2010).

DMI (the sum of DEU and imports) in Flanders increased from 286 million tons (47.9 kg/cap.) to 342 million tons (52.5 kg/cap.) in the period 2002-2018. The decrease in own extraction of materials was therefore offset by an increase in the import of materials. DMI is sometimes expressed in relation to GDP to gain insight into material performance of an economy. Material productivity expressed in GDP (in chain-linked volumes) compared to DMI shows no trend.

Flanders is highly dependent on the direct import of materials (as raw material or product) to run its economy. Imports (IMP) accounted for 86.5% of the direct input of materials into the Flemish economy (DMI) in 2018, compared to 81.6% in 2002.

### **Outside Flanders?**

Eurostat does not publish figures for GDP/DMI. Eurostat (2020) does however publish the share of imports (IMP) in the total input of materials (DMI) for the various Member States (i.e. Material import dependency). The share of imports in total material input is estimated at 23.9% for the European Union (EU-28).

The Belgian EW-MFA shows a DMI of 365 million tons in 2017 of which 96 million tons are DEU and 270 million tons are imports. The figure for Belgian imports is close to the figure for Flemish imports. This can be explained by the high share of Flanders in total Belgian imports (approx. 83% in monetary units) and the substantial share of interregional trade by Flanders that is counted on top of this.

### **More information & sources**

- Eurostat (2019). Material flow accounts (env\_ac\_mfa). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_ac\\_mfa&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_mfa&lang=en)
- Eurostat (2020). Material import dependency (env\_ac\_mid). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_ac\\_mid&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_ac_mid&lang=en)
- CE Centre (2020). Material flow analysis – Flanders 2002-2018. VITO on behalf of Circular Economy Policy Research Centre, OVAM & EWI. Mol.

### 3.1.2 Raw Material Input

#### What do we measure?

Raw Material Input or RMI describes the primary raw materials (classified into the material categories biomass, metal ores, fossil energy carriers, non-metallic minerals) that are required both directly and indirectly for consumption activities in the economy and export-oriented production. The indicator includes the amount of primary raw materials needed along the entire production chain as input for the production system to meet consumption, investments and exports by Flanders. As with DMI (paragraph 3.1.1), no distinction is made as to whether the input to the production system is necessary to meet domestic or foreign demand.

RMI is equal to the sum of domestic extraction (DEU) and imports expressed in Raw Material Equivalents (RME) (Figure 4).

Raw Material Input (RMI) = Domestic Extraction Used (DEU) + Import in Raw Material Equivalents (IMP-RME)

The RMI is based on Economy-Wide Material Flow Accounts (EW-MFA) for the entire economy, which must be reported by every Member State of the European Union (Eurostat, 2019). The physical import flows (IMP) are converted into raw material equivalents (IMP-RME) using of European aggregated RME coefficients. Eurostat annually estimates the RME coefficients for nearly 190 European product groups based on a European model. The RMI must be estimated for Flanders as no official EW-MFA for Flanders have been drawn up. To determine the RMI for Flanders, an estimate is required of the Flemish extraction, the Flemish international trade (trade of Flanders with foreign countries) and interregional trade (trade of Flanders with Brussels, Wallonia and the extra-regional area). This Flemish trade must then be expressed in raw material equivalents.

#### Why do we measure?

A common criticism of DMI is that it is not robust against so-called outsourcing. A country that imports a relatively large number of finished products is expected to have a smaller DMI than a country that processes a lot of raw materials into products. This is due to the asymmetrical nature of DMI, in particular due to the difference in weighting between imports of raw materials, semi-finished and finished products. In the process from raw materials to finished products, waste and emissions are created (e.g. through energy consumption) so that the mass of raw materials is greater than the mass of the finished product. Domestic extracted is weighted in terms of materials mined or crops harvested while imports are measured by the weight of goods crossing land borders regardless of how they are produced.

RMI is however robust against so-called outsourcing. RMI expresses imports in raw material equivalents. It describes all the raw materials that are needed along the entire production chain for the Flemish economic system. Unlike DMI, the RMI also measures the indirect materials needed for the production of the goods, services and energy that Flanders imports from abroad. The RMI illustrates the extent to which the material basis of the Flemish economy is outsourced to other countries.

### What do we see?

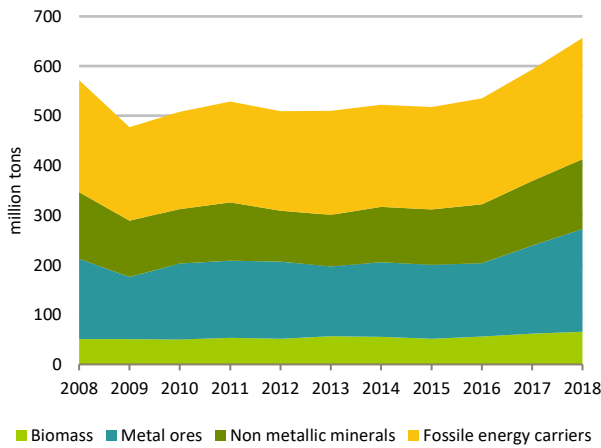


Figure 8. Import expressed in raw material equivalents (IMP-RME) (in million tons) per material category in Flanders, 2008-2018. Source: CE Centre (2020).

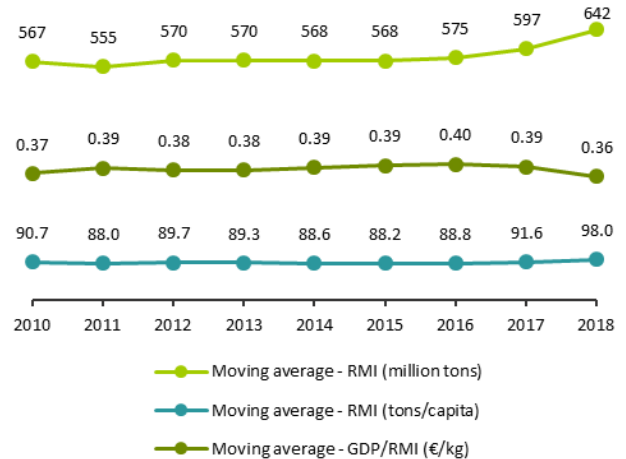


Figure 9: Moving average (N = 3) of the RMI (in million tons and tons/capita) and GDP/DMI (in euros per kilogram) for Flanders, 2010-2018. Source: CE Centre (2020). GDP in chain-linked volumes for Flanders, derived from the Belgian figures in chain-linked volumes (reference year 2010).

The direct and indirect import of materials (IMP-RME) for the Flemish economic system increased from 572 to 657 million tons or 92.8 to 100.2 tons per capita in the period 2008-2018. The direct physical import of materials of 45.2 tons per capita (paragraph 3.1.1) is therefore accompanied by an indirect material backpack of 55.0 tons per capita in 2018.

In 2018, fossil energy carriers make up 37% of the materials needed in the production processes of the imported goods and services (IMP-RME). Worldwide, 244 million tons of fossil energy carriers are extracted for the production of the goods/services imported by Flanders while only 136 million tons actually cross the Flemish border (IMP) (Figure 6). 108 million tons of fossil energy carriers are therefore consumed abroad to produce and deliver products & services for Flanders. 32% or 207 million tons of the materials needed in the production networks of Flemish imported products (IMP-RME) are metal ores. The direct input of goods (IMP) allocated to metal ores is only 35 million tons (Figure 6). 21% of the required raw materials are non-metallic minerals and 10% are biomass.

To determine the RMI, more than 9,000 trade flows (at product level) are aggregated using 182 RME coefficients (at product group level). Consequently, the estimate of the RMI is less reliable than the DMI. It is therefore more important to monitor the moving average of RMI (Figure 9) than to evaluate the absolute value of each year. The moving average was calculated every three years (N = 3).

The moving average of the RMI for Flanders increased in the period 2010-2018 from 567 million tons (90.7 kg/cap.) to 642 million tons (98.0 kg/cap.). The decrease in own extraction (Figure 5) of materials was thus offset by a sharp increase in direct and indirect imports of materials from abroad. The moving average of material productivity expressed in GDP relative to RMI (GDP in chain-linked volumes) shows no trend.



As indicated in paragraph 3.1.1, Flanders is highly dependent on the direct import of materials (as raw material or product) to run its economy. If imports are expressed in raw material equivalents, its dependence only increases. Imports in RME equivalents (IMP-RME) accounted for 93.4% of the direct and indirect input of materials into the Flemish economy (RMI) in 2018 compared to 92.2% in 2008.

#### **Outside Flanders?**

Eurostat does not publish figures for GDP/RMI nor for the share of imports in RME equivalents (IMP-RME) in total direct and indirect input of materials (RMI).

#### **More information & sources**

- Eurostat (2019). Material flow accounts in raw material equivalents - modelling estimates (env\_ac\_rme). [ec.europa.eu/eurostat/product?code=env\\_ac\\_rme&language=en&mode=view](https://ec.europa.eu/eurostat/product?code=env_ac_rme&language=en&mode=view)
- CE Centre (2020). Material flow analysis – Flanders 2002-2018. VITO on behalf of Circular Economy Policy Research Centre, OVAM & EWI. Mol.

### 3.1.3 Domestic Material Consumption

#### What do we measure?

Domestic Material Consumption or DMC describes the use of materials for the domestic production and consumption by an economy but also takes into account the export of materials. DMC measures the total amount of materials directly used by an economy (classified into the material categories of biomass, metal ores, fossil energy carriers and non-metallic minerals). The consumption indicator DMC is obtained (Figure 4) by subtracting all exports of goods (EXP) from the Direct Material Input or DMI (see paragraph 3.1.1).

$$\text{Domestic material consumption (DMC)} = \text{Direct material input (DMI)} - \text{Physical export (EXP)}$$

As discussed in paragraph 3.1.1, traded products are assigned to one specific material category by identifying the main material component of each product and assigning that product to the corresponding material category. This does not affect the total trade flow, but it does affect the internal relationships of material categories within import and export.

In the DMC, like RMC (paragraph 3.1.4), the focus is on domestic consumption of materials. In DMC, the focus is on the materials used by Flemish companies and consumers. The use of materials by Flemish companies only concerns these materials that are not exported. For export-oriented companies, therefore, only those materials that remain within the Flemish economy count – for example, their own energy consumption and generation of waste. In addition, the consumer side is also important within the DMC. Therefore, we look at the final demand for end products of a region/country. It is the sum of materials necessary for the final demand for goods by households, governments, non-profit institutions, investments and changes in the stocks of companies in a region/country.

Unlike RMC, DMC does not take into account the raw materials extracted upstream throughout the production chain of the traded product. DMC only looks at the actual quantities of products traded when they cross the borders. For example, the trade of services and electricity has no mass and is not expressed in weight, so they are not included in DMC.

DMC is calculated using official statistics, which are Economy-Wide Material Flow Accounting and Analysis (EW-MFA), which must be reported by each Member State of the European Union (Eurostat, 2019). The DMC must be estimated for Flanders as no official EW-MFA for Flanders has been drawn up. To determine the DMC for Flanders, an estimate is needed of international trade (trade of Flanders with foreign countries) and interregional trade (trade of Flanders with Brussels, Wallonia and the extra-regional area). Approximately 25% of Flemish imports come from the Walloon Region or the Brussels-Capital Region expressed in monetary units<sup>4</sup>. The other 75% comes from abroad. In physical units, interregional imports account for about 18% of total imports.

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<sup>4</sup> SERV (2016). The interregional input-output table, 2010. An analysis for Flanders. SERV\_20160912\_RIOT\_RAP.

### **Why do we measure?**

For CE policy, it is relevant to monitor both DMC and RMC (paragraph 3.1.4). DMC and RMC answer two different questions. DMC examines which materials are consumed directly within Flanders. DMC is an important measure of the future amount of waste and emissions because sooner or later, all consumed materials will be converted into waste or emissions. RMC describes which materials are required both directly and indirectly along the entire production chain for the final consumption of goods and services in Flanders. RMC makes it possible to calculate the global impact of the final demand within Flanders. The indirect materials are mainly important for an open economy such as Flanders, to take into account the effects of international trade. There is a risk that we will outsource production to countries with lower material productivity.

Both DMC and RMC are so-called consumption indicators. They describe which materials are used during economic activities throughout the value chain, starting from the consumption by the end user. This has a significant advantage over input indicators such as DMI & RMI (paragraph 3.1.1 and paragraph 3.1.2), which take into account the amount of material used in an economy regardless of whether this is intended for own (domestic) consumption or for export. Please note, the DMC also depends on the materials used in the domestic production activities, with the exception of the mass of exported goods. These can be decisive if the economy has industries with high use of energy or materials.

A common criticism of DMC is that it is not robust against so-called outsourcing. For example, with the same domestic demand, which is met by more imports with the same production structure, the DMC indicator will go down. This is due to the asymmetrical nature of DMC, in particular due to the difference in weighting between domestic extraction of raw materials and the importation of goods. Domestic withdrawal is weighted in terms of materials mined or crops harvested while imports are measured by the weight of goods crossing borders regardless of how they are produced. A country that imports a relatively large number of finished products is therefore expected to have a smaller DMI and therefore DMC than a country that processes a lot of raw materials into products. RMC is robust against so-called outsourcing.

### What do we see?

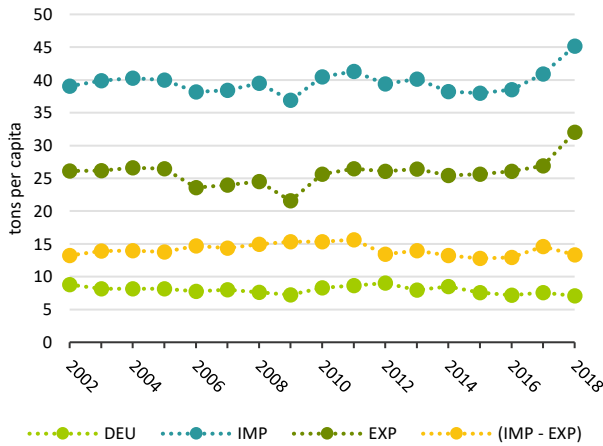


Figure 10. The different building blocks of the DMC (DEU, IMP-RME, EXP-RME) (in tons per capita), Flanders, 2002-2018. Source: CE Centre (2020).

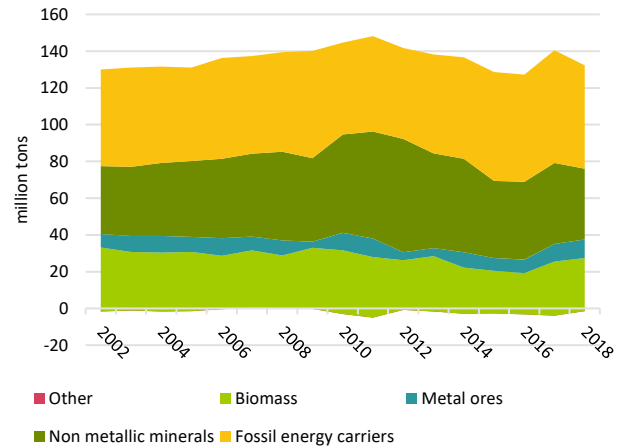


Figure 11. Domestic material consumption (DMC) (in million tons) per material category for Flanders, 2002-2018. Source: CE Centre (2020).

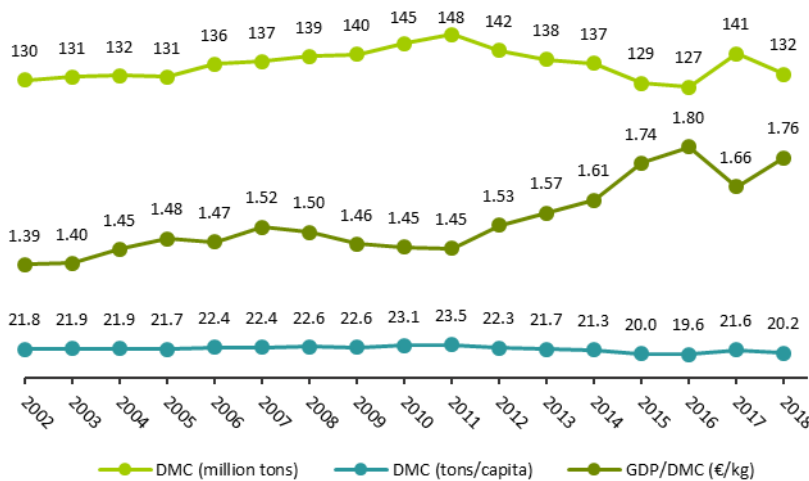


Figure 12. DMC (in million tons and tons per capita) and GDP/DMC (in euros per kilogram) for Flanders, 2010-2018. Source: CE Centre (2020). GDP in chain-linked volumes for Flanders derived from the Belgian figures in chain-linked volumes (reference year 2010).

The DMC shows a slight increase from 130 million tons in 2002 to 132 million tons in 2018 (Figure 11). The DMC dropped from 21.8 tons per capita to 20.2 tons per capita between 2002 and 2018 (Figure 10). Imports rose from 39 to 45 tons per capita in the period 2002-2018. Exports rose from 26 to 32 tons per capita in the period 2002-2018. Exports are therefore significantly smaller than imports, which means that Flanders has a negative trade balance (based on weight). In 2018, the largest material category in the DMC is fossil fuels (8.6 tons per capita), followed by non-metallic minerals (5.9 tons per capita), biomass (4.4 tons per capita) and metals (1.5 tons per capita) (Figure 11).

When GDP is expressed relative to DMC, we measure the material productivity of a region: the ability to meet the same consumption with less material consumption. For example, an increase in material productivity indicates an improved environmental performance of production chains. Material productivity (GDP/DMC) for Flanders rose in the period 2002-2018 (Figure 10). For Flanders one can therefore speak of a relative decoupling. However as discussed above, DMC can also be reduced by outsourcing the material-intensive production abroad.

### **Outside Flanders?**

An international comparison (per capita or per GDP) is possible because Eurostat works with standardised methodology for determining the DMC indicators. During the analysis of the Flemish DMC (CE Centre, 2020), this methodology and its interpretation were followed as much as possible. Obviously, data sources and the quality between regions are different. This means that we are dependent on regional and regionalised national statistics for Flanders since Eurostat departs from standardised statistics. However, it should be noted that the reporting/non-reporting of certain flows can have a major impact on these indicators. For example, when the domestic extraction of excavated soil, clearance and dredging sludge results are not included, the Flemish DMC (in 2016) drops from 19.6 tons/cap. to 16.0 tons/cap.

Flanders has a higher DMC per capita and lower material productivity (GDP - adjusted for purchasing power parity) in 2016 than the European Union (EU-28) (13.1 kg/capita and 2.24 €/kg) according to Eurostat (2019). The figures for 2017 and 2018 are a preliminary estimate. However, several factors play an important role in international comparability including: size and productivity of an economy, population and density, consumption patterns, climate, structure (type of activities) of an economy, availability of primary raw materials or alternative raw materials and available technologies affect the DMC (and RMC). The comparison with Belgian figures also requires caution because interregional trade is a substantial part of the Flemish figures. Therefore, in figure 13 and Figure 14, only the trend is compared. The DMC per capita in the European Union (EU-28) decreased just as in Flanders between 2002 and 2018. Material productivity (GDP/DMC) in the European Union (EU-28) is increasing faster than in Flanders.

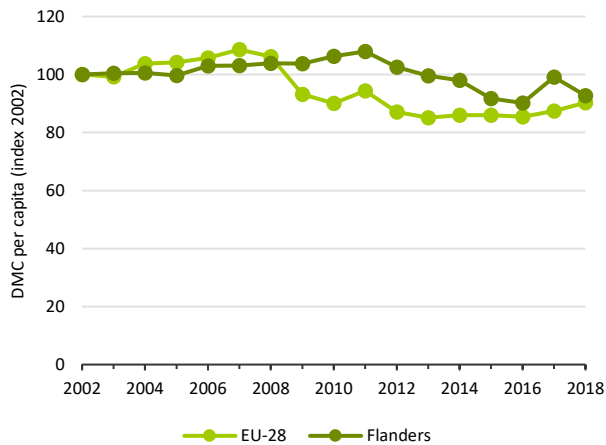


Figure 13. DMC per capita (index 2002) for Flanders and the European Union (EU-28), 2002-2018. Source: CE Centre (2020) and Eurostat (2019).

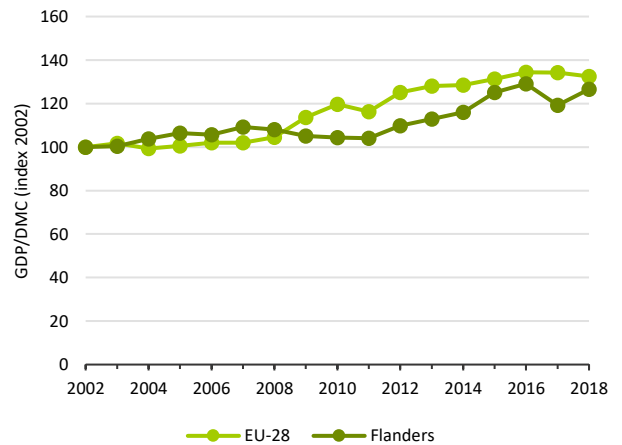


Figure 14. Material productivity (index 2002) (GDP/DMC) for Flanders and the European Union (EU-28), 2002-2018. Source: CE Centre (2020) and Eurostat (2019). GDP in chain-linked volumes for Flanders, derived from the Belgian figures in chain-linked volumes (reference year 2010).

#### More information & sources

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### 3.1.4 Raw Material Consumption and material footprint of Flemish consumption

#### What do we measure?

The Raw Material Consumption (RMC) and material footprint of Flemish consumption (MF) describe the total amount of primary raw materials that are extracted worldwide for the final consumption of goods and services in Flanders. These primary raw materials are divided into four material categories: non-metallic minerals, fossil energy carriers, biomass and metals. Both RMC and MF provide an overview of the global impact of Flemish needs. They not only describe the actual quantities of products traded over the borders but also the indirect raw materials extracted upstream throughout the production chain of these traded goods and services. RMC and MF describe the same thing by definition but differ in the calculation method:

Raw Material Consumption (RMC) is based on Economy-Wide Material Flow Accounts (EW-MFA), which must be reported by every Member State of the European Union (Eurostat, 2019). Therefore, the physical import (IMP) and export flows (EXP) are converted into raw material equivalents (IMP-RME & EXP-RME) using European aggregated RME coefficients<sup>5</sup> (Figure 4).

$$\begin{aligned} \text{Raw Material Consumption (RMC)} = \\ \text{Domestic Extraction Used (DEU)} + \text{Imports in Raw Material Equivalents (IMP-RME)} \\ - \text{Export in raw material equivalents (EXP-RME)} \end{aligned}$$

Eurostat annually estimates the RME coefficients for nearly 190 European product groups based on a European model. The RMI must be estimated for Flanders as no official EW-MFA for Flanders has been drawn up. To determine the RMI for Flanders, an estimate is required of the Flemish extraction and Flemish international trade (trade of Flanders with foreign countries) and interregional trade (trade of Flanders with Brussels, Wallonia and the extra-regional area). This Flemish trade must then be expressed in raw material equivalents.

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<sup>5</sup> Raw Material Equivalents

Material footprint of Flemish consumption (MF) starts from final consumption and calculates the total primary raw materials needed upstream in the global production network. An environmental input-output model (IO model) is used for this. This model links economic data from the Flemish economy to the world economy in a scientific manner with associated environmental data. The monetary input-output tables map the flows of goods and services expressed in euros, between the various economic sectors and end users. The extraction of primary raw materials is allocated to the various sectors using the environmental extension tables. With the Leontief-inverse methodology, the use of primary raw materials by the economic sectors in Flanders and abroad is linked to the final consumption of goods and services in Flanders.

The RMC calculation is easier to repeat and follows a standardised Eurostat methodology. The calculation of the MF enables expression of the environmental pressure in terms of type of economic activity, final demand category (government, households, investments, stock differences) and household consumption domains (transport, food, construction, consumer goods). In addition, MF allows a breakdown to where the extraction took place by country/region. RMC is easier to track over time. MF gives more insight into the production chain from the beginning to the end. However, none of these indicators provides information about the scarcity or impact of materials; they merely provide an indication of the mass of primary raw materials consumed by an economy.

#### **Why do we measure?**

In a circular economy with a more closed material cycle, the needs of Flanders are met with less input of primary raw materials. To monitor the circular economy, it is therefore important to measure and evaluate how much material we consume directly and indirectly through the upstream production chains.

DMC (paragraph 3.1.3) does not provide a complete picture of the global material footprint as it only looks at the actual volumes of raw materials and products traded when crossing the national borders. DMC does not take into account the indirect raw materials extracted upstream in the production chain for the production and transport of the traded goods. A common criticism of DMC is that it is not robust against so-called outsourcing.

RMC and MF illustrate the extent to which the material basis of Flemish consumption is outsourced to other countries. The indirect materials are especially important in an open economy such as Flanders, to take into account the effects of international trade. There is a danger that we will outsource production to countries with lower material productivity. RMC and MF are robust against so-called outsourcing (paragraph 3.1.4).

The Flemish material footprint must be reduced. Flanders aims to reduce the material footprint of Flemish consumption by 30% by 2030 and by a 75% by 2050 (Flemish Energy and Climate Plan 2021-2030 & Environment Policy Paper 2019-2024). This will be done through less and more efficient use of materials and by closing material cycles.



## What do we see?

### Raw Material Consumption (RMC)

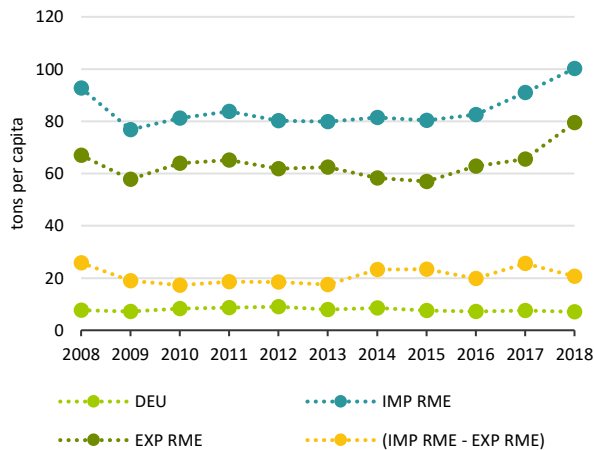


Figure 15. The different building blocks of the RMC (DEU, IMP-RME, EXP-RME) (in tons per capita), Flanders, 2008-2018. Source: CE Centre (2020).

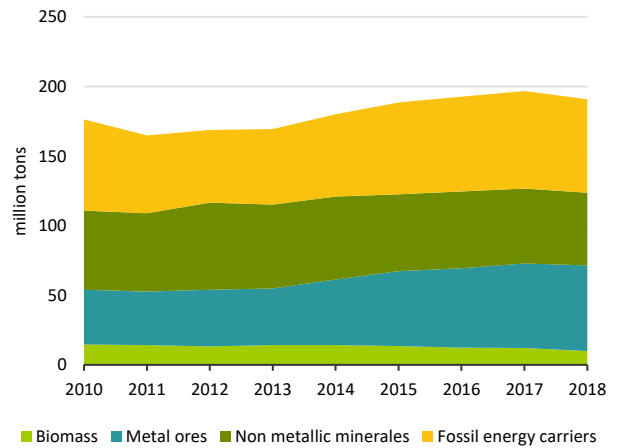


Figure 16. RMC moving average (N = 3) (in millions of tons) per material category for Flanders, 2010-2018. Source: CE Centre (2020).

Imports expressed in raw material equivalents (IMP-RME) and exports expressed in raw material equivalents (EXP-RME) follow the same path in the period 2008-2018 (Figure 15). The difference between imports and exports expressed in raw material equivalents varies between 17 and 26 tons per capita. Domestic extraction (DEU) fell from 8.8 to 7.1 tons per capita in the same period (paragraph 3.1.1). The drop in DEU is offset by an increase in the net trade balance (IMP-RME minus EXP-RME) resulting in an increase in the RMC.

To determine the RMC, more than 9,000 trade flows (at product level) are aggregated using 182 RME coefficients (at product group level). Consequently, the estimate of the RMC is less reliable than the DMC. It is therefore more important to monitor the moving average of RMC (Figure 16 and figure 17), then evaluate the absolute value of each year. The moving average was calculated every three years (N=3).

The moving average of the Flemish RMC rose in the period 2010-2018 from 176 million tons to 191 million tons. This corresponds to 28.2 and 29.1 tons per capita (Figure 17). When GDP is expressed relative to RMC, we measure the material productivity of a region: the ability to meet the same consumption with less primary raw material including the indirect consumption of materials. An increase in material productivity indicates an improved environmental performance of the production chains. The moving average of material productivity expressed in GDP/RMC doesn't show a clear trend in the period 2010-2018 (Figure 17). For Flanders, therefore, we cannot speak of a (relative) decoupling of GDP from RMC.

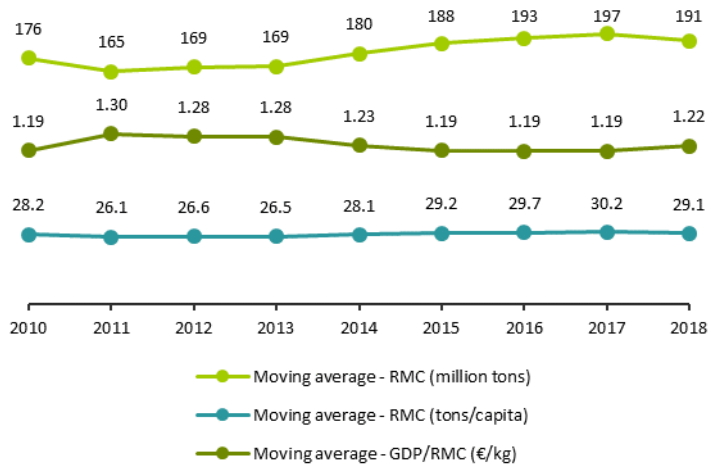


Figure 17 : Moving average (N = 3) of the RMC (in million tons and tons per capita) and GDP/RMC (in euros per kilogram) for Flanders, 2010-2018. Source: CE Centre (2020). GDP in chain-linked volumes for Flanders derived from the Belgian figures in chain-linked volumes (reference year 2010).

The RMC of Flanders determined for LNE (2016) for the period 2002-2015 differs from the RMC determined by CE Centre (2020). The differences can be explained by methodological changes in the RME coefficients of Eurostat, by updates in the trade statistics of the National Bank of Belgium and because excavated soil, clearance and dredging sludge used in Flanders (DEU) have been included in the calculation of DEU for CE Centre (2020) (paragraph 3.1.1). The RMC determined for CE Centre (2020) and for LNE (2016) show the same trend.

The indicators for Flanders show that between 2010-2018, the RMC indicator increases faster than the DMC indicator. One of the reasons for the wider gap between the DMC and RMC is the outsourcing of material-intensive production. Outsourcing causes a decrease (or decrease in growth) in the DMC but not in the RMC. Another observation is that the DMC is smaller than the RMC in the period 2010-2018. This is only possible if the net physical trade is lower than the net trade expressed in RMEs. However, neither indicator makes it possible to look in detail at other reasons for the observed trend line.

#### Material footprint of Flemish consumption (MF)

MF is only available for 2010. VITO is currently working on behalf of OVAM and the Flanders Environment Agency (VMM) on an updated IO model, which can be used to estimate the material footprint for Flanders for the period 2010-2016. MF has been thoroughly investigated using the Flemish environmental input-output model (Christis *et. al*, 2019). According to this methodology, the total material footprint of Flemish consumption (MF) in 2010 is 17.8 tons per capita. A breakdown of this MF per final consumption category is shown in figure 3. 63% of the Flemish footprint is linked to household consumption. The material footprint of these households is 31% linked to food and 32% to housing. Consumer goods (including mobility) account for 26% of the material footprint of households. Mobility itself accounts for 10% of the material footprint of households.

In figure 18, the materials extracted (or grown) outside Flanders for Flemish final consumption (MF) have been split off. This shows that almost 90% (99 million tons in 2010) of the materials extracted for Flemish final consumption (MF) come from outside Flanders. 11% of these materials are extracted (or grown) within Flanders. Flanders itself extracts (and cultivates) more primary raw materials (33 million tons in 2010) but only 38% of these materials are used in production for Flemish final consumption. The rest is used in the production of exported products.

### Primary raw materials

Figures in Mt; data for 2010

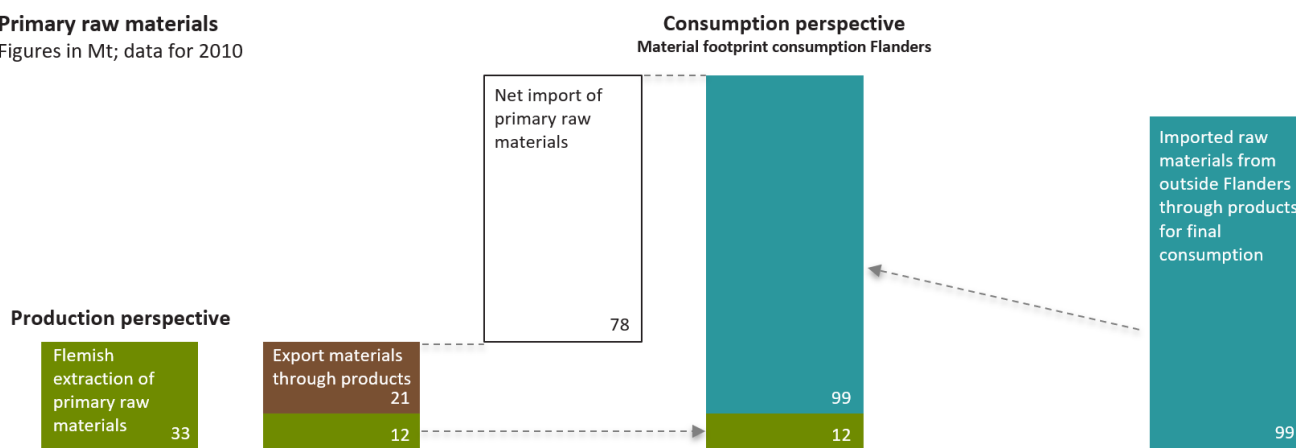


Figure 18. Extraction of materials in Flanders (33 Mton) and for Flemish consumption (111 Mton) in 2010 according to the Flemish IO model. Source: Christis *et al.* (2019).

### Outside Flanders?

Worldwide extraction of materials in 2017 was over 90 billion tons. Global extraction of raw materials has increased by 20% compared to 2010 and is expected to double by 2050 (IRP, 2019). This means an increase per person from 11.0 tons in 2010 to 12.1 tons in 2017 (IRP, 2019 & UN, 2019).

### Raw Material Consumption (RMC)

An international comparison (per capita or per GDP) is possible because Eurostat works with a standardised methodology for building up the RMC indicators. During the analysis of the Flemish RMC (CE Centre, 2020), this methodology and its interpretation were followed as much as possible. Obviously, data sources and the quality between regions are different. This means that we depend on regional and regionalised national statistics for Flanders, since Eurostat departs from standardised statistics. However, it should be noted that the reporting/non-reporting of certain flows can have a major impact on these indicators. For example, the non-inclusion of the domestic extraction of excavated soil, clearance and dredging sludge results in a decrease in the moving average of Flemish RMC (in 2016) from 29.7 tons/cap. to 26.0 tons/cap.

In 2016, Flanders had a higher RMC per capita and lower material productivity (GDP – adjusted for purchasing power parity) than the European Union (EU-28) (13.7 kg/capita and 2.14 €/kg) according to Eurostat (2019). The figures for 2017 and 2018 are a preliminary estimate. Several factors play an important role in international comparability: among others, the size and productivity of an economy, population and density, consumption patterns, climate, the structure (type of activities) of an economy, the availability of primary raw materials or alternative raw materials and the available technologies all influence the RMC (and DMC). Therefore, in figure 19 and Figure 20, only the trend is compared. The RMC per capita in the European Union (EU-28) decreased between 2010 and 2018, which is not the case for Flanders. Material productivity (GDP/RMC) in the European Union (EU-28) is increasing, the trend for Flanders is unclear.

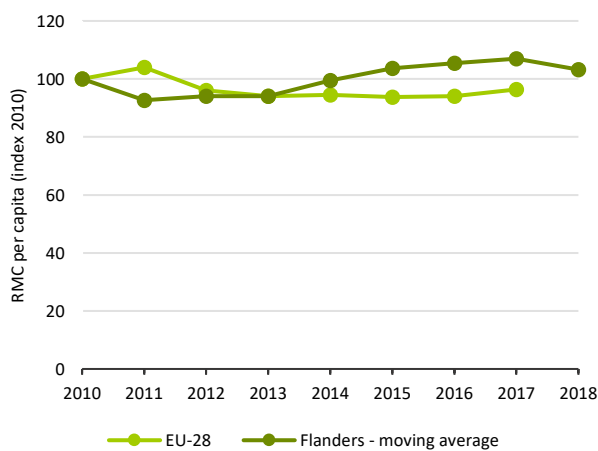


Figure 19. RMC per capita (index 2010) for Flanders and the European Union (EU-28), 2010-2018. Moving average (N = 3) for Flanders. Source: CE Centre (2020) and Eurostat (2019).

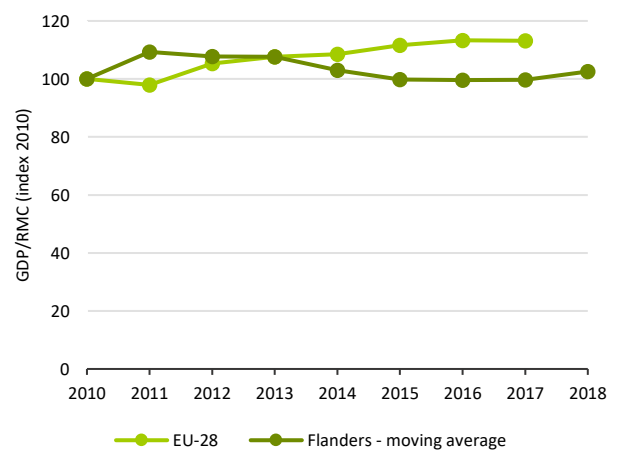


Figure 20. Material productivity (GDP/RMC) (index 2010) for Flanders and the European Union (EU-28), 2010-2018. Moving average (N = 3) for Flanders. Source: CE Centre (2020) and Eurostat (2019). GDP in chain-linked volumes for Flanders, derived from the Belgian figures in chain-linked volumes (reference year 2010).

### Material footprint of Flemish consumption (MF)

The MF of Belgium is one of the highest in the world. With the IO model, on which the calculation of the material footprint of Flemish consumption (MF) is based, the material footprint of 2010 has been determined for several countries (Figure 21). In general, countries with greater prosperity also have a higher material footprint. Why a specific country performs better than another country has not been investigated.

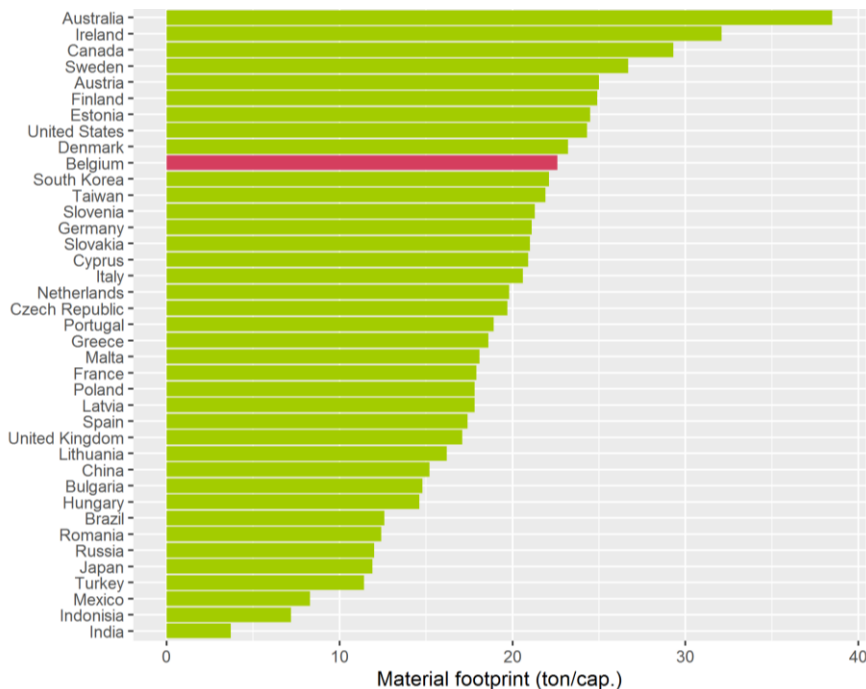


Figure 21. Material footprint of consumption (MF) (in tons per capita) for some 40 countries in 2010 according to IO model EXIOBASE 3. Source: Giljum *et al.* (2019).

### More information & sources

For more information about the update of the RMC of Flanders, please refer to the new CE Centre report on DMC and RMC (CE Centre, 2020). This report also describes in detail the difference between Raw Material Consumption (RMC) and the material footprint of Flemish consumption (MF).

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### 3.1.5 Water consumption

#### **What do we measure?**

The total water consumption (excluding cooling water) illustrates the consumption of water for human activities in Flanders. The water consumed can be divided into different types such as groundwater, tap water or surface water. Consumption is calculated annually and based on surveys, invoiced consumption, tax data and assumptions (VMM, 2019). The cooling water consumption is of a larger order of magnitude and fluctuates greatly between different years. That is why it is generally not included in the calculations for Flanders.

#### **Why do we measure?**

Water is a finite resource that is essential for people and the economy. Closing water cycles by focusing on purification and reuse and a reduction in consumption, for instance, is closely in line with the circular mindset. Although there are no objectives linked to water consumption at Flemish level, it may be interesting to strive for a reduction in water consumption. The recent water scarcity during the dry summer months illustrates the importance of this problem. Flanders currently uses a combination of awareness-raising, levies and permits to steer water consumption in the right direction.

#### **What do we see?**

There is no clear trend for total water consumption (excluding cooling water) over the period 2000 to 2017. However, there was a clear decline from 2006 to 2009. Afterwards, an increase is visible that can be attributed to surface water consumption for a new liquid gas installation in Zeebrugge. This increase did not continue in 2016 and 2017. The consumption of both mains and groundwater has been evolving in the desired direction from 2000 to 2017 with a decrease of 8% and 31% respectively. For this consumption, the current measures at Flemish level seem to be succeeding in their design. In contrast to the decrease in tap water and groundwater consumption, there is an increase in the consumption of rainwater and other water (water from products, ice, etc.). (VMM, 2019).

#### **Outside Flanders?**

Water consumption is also being monitored at the European level, albeit with alternative methods. This makes a comparison impossible. Figures for water consumption in the Netherlands show that water consumption for the various categories is generally higher than for Flanders. However, total consumption for both regions cannot be compared due to differences in the measurement methodology. A comparison for tap water in 2016 shows that the consumption per capita is higher in the Netherlands (approx. 64 m<sup>3</sup>/person compared to approx. 58 m<sup>3</sup>/person). Furthermore, in contrast to Flanders, Dutch water consumption in the form of groundwater and tap water is not decreasing. The consumption of rainwater is not measured separately in the Netherlands. It is therefore not possible to determine whether there is an increase in this regard. Surface water consumption is not taken into account in this comparison because this mainly concerns cooling applications. As in Flanders, it therefore fluctuates greatly and falls within a different order of magnitude.

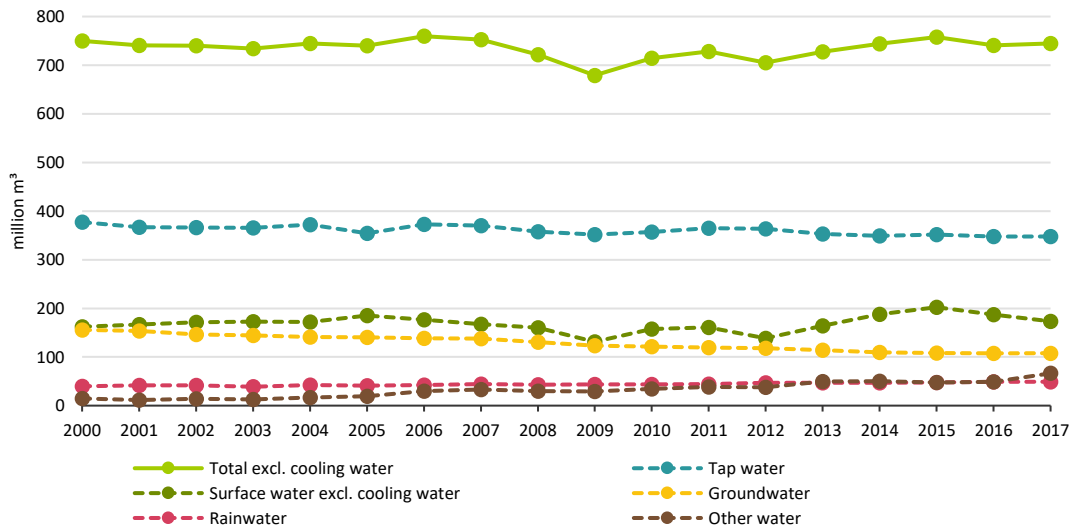


Figure 22. Water consumption (in million m<sup>3</sup>) in Flanders, 2000-2017. Source: VMM (2019) ([www.milieurapport.be](http://www.milieurapport.be)).

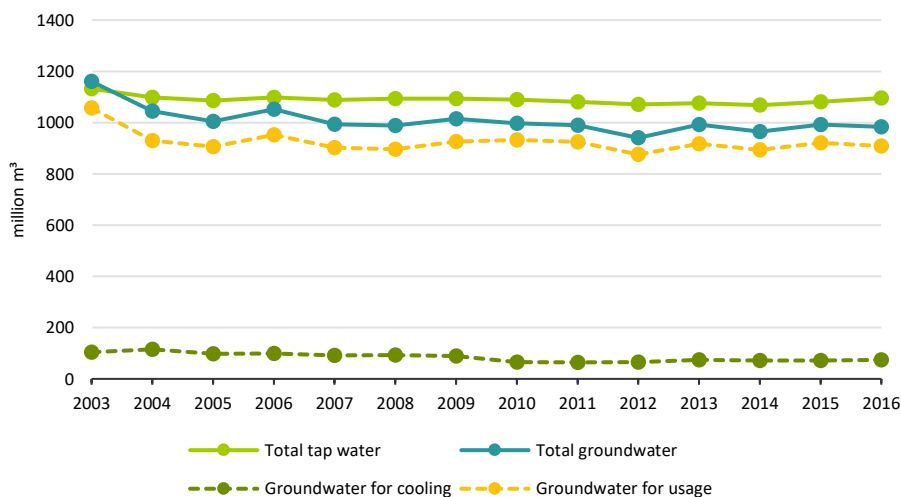


Figure 23. Water consumption (in million m<sup>3</sup>) in the Netherlands, 2003-2016. Source: CBS (2019).

### More information & sources

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- VMM (2019). Water consumption. Flanders environmental report. Flanders Environment Agency, Aalst. [only available in Dutch] [milieurapport.be/milieuthemas/waterkwantiteit/waterverbruik-beschikbaarheid/waterverbruik](https://milieurapport.be/milieuthemas/waterkwantiteit/waterverbruik-beschikbaarheid/waterverbruik)

### 3.1.6 Built-up areas

#### What do we measure?

This indicator describes the percentage of built-up areas in Flanders and is based on information on built-up cadastral plots. It indicates how much space is used in Flanders to accommodate different functions (e.g. housing, industry).

#### Why do we measure?

In highly urbanised environments, such as Flanders, it is often complex to accommodate all different land uses (e.g. housing, industry, agriculture, nature). Space can therefore be seen as a finite resource that is claimed from different sides. In a circular economy, the aim can be to reduce the increase in built-up area (for example by combining functions) or to increase spatial efficiency.

Due to the great pressure on open space in Flanders, Flemish policy is intervening on several levels. For example, the [Spatial Policy Plan for Flanders](#) [only available in Dutch] formulates several objectives and aims to stimulate the efficient use and reuse of space. The strategic vision of the Spatial Policy Plan for Flanders aims to reduce the further occupation of space to 0 hectares per day by 2040. Increasing spatial efficiency is one of the main features of this vision. The occupation of additional space can be avoided by compacting and interweaving functions. Flanders aims to further embed spatial efficiency within our building culture.

Increasing spatial efficiency means that we will do more with the space that is already occupied. The creation of greater spatial efficiency will be achieved by organising more activities on the same surface area, in the best located places and without compromising on the quality of life. This will be done by choosing the most suitable, mutually reinforcing, combination of intensification, interweaving, reuse and temporary use of space (Flemish Department of Environment, 2019).

#### What do we see?

The proportion of built-up area in Flanders is continuously increasing over time. Whereas it was still below 25% in 1999, it has now risen to more than 28%. The majority of the built-up area consists of plots occupied by houses and roads. The increase in land cover can mainly be attributed to residential areas and business parks (industry, trade and government) (VMM, 2018). Despite the will to evolve into a region where built-up area does not increase, the figures clearly show that there is no shift to an alternative use of space in Flanders. It should be noted here that the built-up area indicator does not directly correspond to spatial efficiency or land cover.



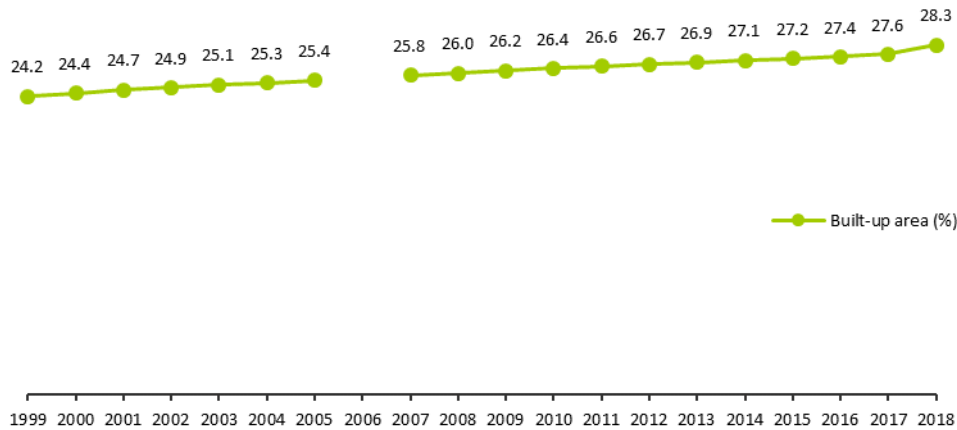


Figure 24. The share of built-up area (%) in Flanders, 1999-2018. Source: VMM (2018).

### Outside Flanders?

The proportion of built-up area is not only being monitored at Flemish level. Data are also available at European level although they are measured with an alternative method (Eurostat, 2019). A direct comparison with the Flemish figures above is therefore not recommended.

For the European method, however, (alternative) Flemish figures are available that do allow a comparison. These indicate that a larger share of the Earth's surface in Flanders is covered with artificial surfaces than the average for Europe. This percentage is also considerably lower in our neighbouring countries. However, a similar increase in artificial surface cover is noticeable for all the neighbouring countries and regions from 2009 to 2015.

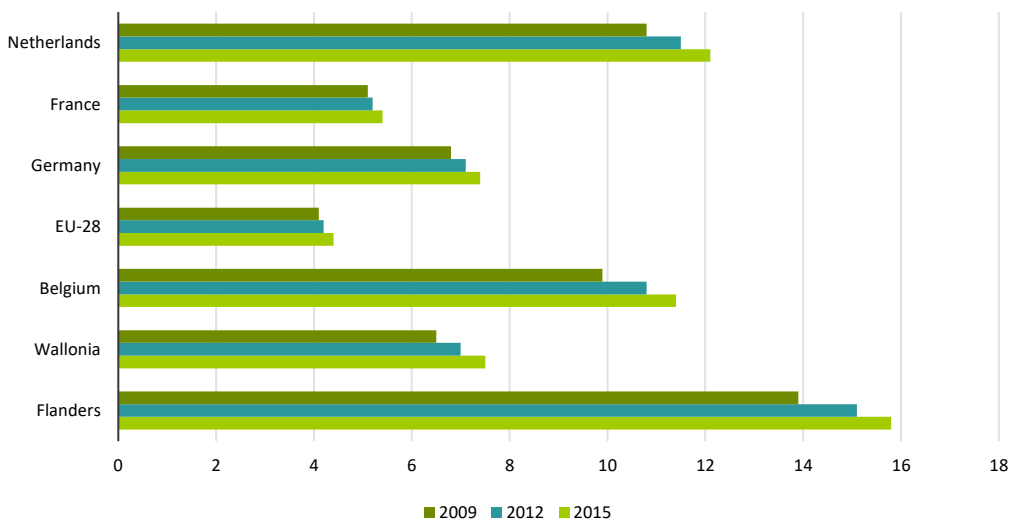


Figure 25. The share of the Earth's surface covered by artificial surfaces in Flanders (%), neighbouring countries and regions and the European Union for 2009, 2012 and 2015. Source: Eurostat (2019).

### More information & sources

- VMM (2018). Built up area. Flanders environmental report. September 2018. Flanders Environment Agency, Aalst. [only available in Dutch] [milieurapport.be/milieuthemas/bodem/bodembedekking-gebruik/bebouwde-oppervlakte](https://milieurapport.be/milieuthemas/bodem/bodembedekking-gebruik/bebouwde-oppervlakte)
- Eurostat (2019). Land cover statistics. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Land\\_cover\\_statistics](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Land_cover_statistics)
- Statbel (2018). Land use in Belgium from 1980. Statbel, Brussels. <https://statbel.fgov.be/en/themes/environment/land-cover-and-use/land-use#figures>
- Flemish Department of Environment (2019). Examples of spatial efficiency projects. Flemish Department of Environment, Brussels. [only available in Dutch] [omgeving.vlaanderen.be/voorbeeldprojecten-ruimtelijk-rendement](https://omgeving.vlaanderen.be/voorbeeldprojecten-ruimtelijk-rendement)

## 3.2 LOSSES AND EMISSIONS FROM THE MATERIAL CYCLE

### 3.2.1 Production of household waste

#### **What do we measure?**

Household waste is all the waste that is collected by, on behalf of or in cooperation with the municipalities. This is both waste from households and comparable industrial waste from commercial enterprises.

Comparable industrial waste is industrial waste that is comparable to household waste in terms of nature, composition and quantity. Only comparable waste collected by municipalities is considered in the context of this indicator. The portion of comparable industrial waste that is collected by private collectors is not included.

#### **Why do we measure?**

Reduced household waste production can imply that more materials and products are given a second life, that products are consumed with more awareness or that more products are repaired. Furthermore, a reduction can also mean that products are used longer or that discarded materials get a high-quality application.

In order to compare the relationship between household waste production and economic reality, it is interesting to compare the real evolution of the expenditure of Flemish households (Figure 27). This evolution is approximated by correcting the nominal expenditure of Flemish households (from the household budget survey) by the index of consumer prices in Belgium. According to the Implementation Plan for Household Waste and Comparable Industrial Waste, the decoupling between expenditure and the total amount of household waste including comparable industrial waste must continue in relation to 2012.

#### **What do we see?**

The evolution of the total amount of household waste in Flanders is shown in Figure 26. This evolution is an indicator for the prevention of household waste.

The total amount of household waste decreased in 2018 by 53.15 kg per capita or 257,159 tons compared to 2013. In the period 2013-2018, we note a downward trend for both selectively collected waste and residual waste. This decrease started in 2008. Prior to 2013, figures are only available according to the old calculation method.

Total waste production decreased more than the household budget in 2018. Thus, the decoupling occurs. The decoupling index was relatively high in 2014 because the amount of waste fell noticeably. This decrease was mainly due to the decrease in the collected construction and demolition waste.

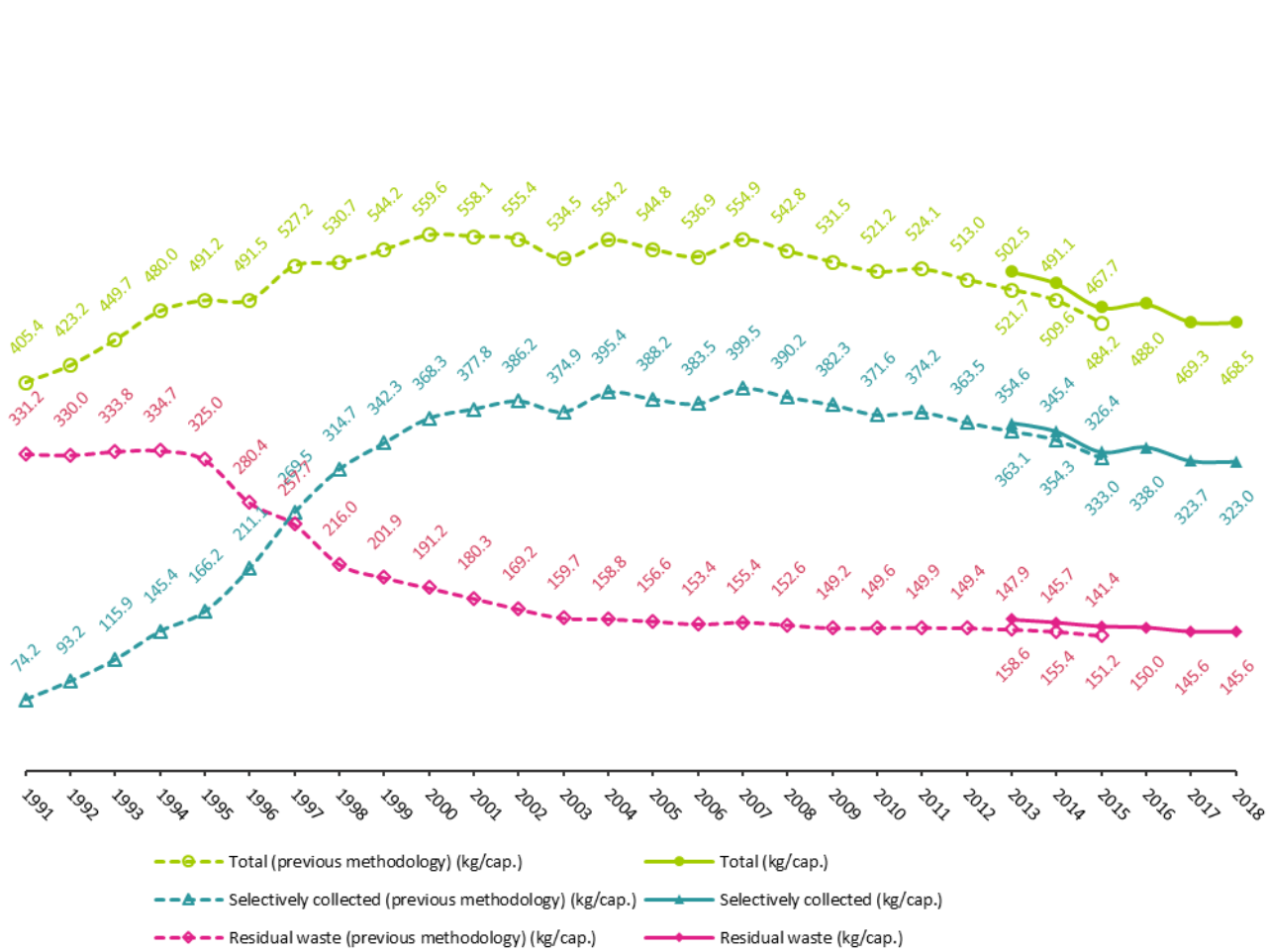


Figure 26. Evolution of the amount of selectively collected waste, residual waste and total household waste (in kg per capita) for Flanders, 1991-2018. Source: OVAM (2019).

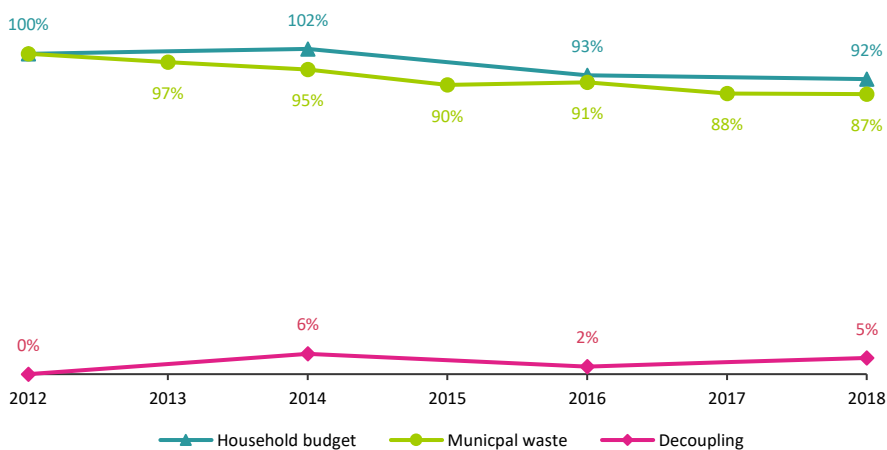


Figure 27. Evolution of the amount of household waste per capita collected by municipalities in Flanders and the Flemish household budget (index 2002), 2012-2018. The decoupling is calculated as follows:  $100\% - [(\% \text{ evolution of household waste}) / (\% \text{ evolution of household budget})]$ . Source: OVAM (2019).

### Outside Flanders?

There is a European obligation for all Member States to report the total quantities of household waste produced and processed per capita (Figure 28). Construction and demolition waste from households is not included in these reported quantities. There are no targets for the total amount of household waste. However, there are recycling targets for household waste (paragraph 3.3.1).

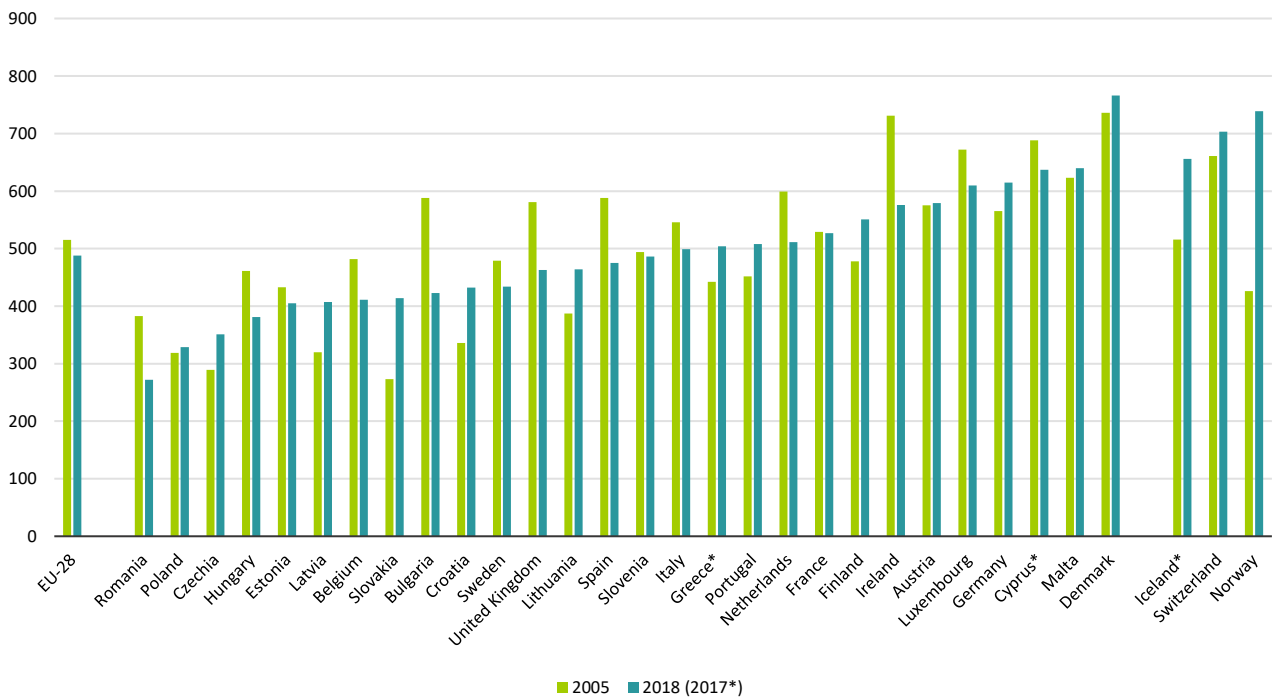


Figure 28. Production of household waste per EU Member State (in kg per capita), 2005 & 2018. Source: Eurostat (2020).

Figure 28 shows the amount of household waste per Member State. For comparison: in Flanders, 417 kg per person was collected in 2018 (excluding construction and demolition waste).

### More information & sources

- Eurostat (2020). Municipal waste by waste management operations (env\_wasmun). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_wasmun&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasmun&lang=en)
- OVAM (2019). Household waste and similar industrial waste 2018 – monitoring the indicators in the Implementation Plan. OVAM, Mechelen. [only available in Dutch] [ovam.be/inventarisatie-huishoudelijke-afvalstoffen](https://ovam.be/inventarisatie-huishoudelijke-afvalstoffen)

### 3.2.2 Production of household residual waste

#### What do we measure?

Residual household waste is household waste that is not collected selectively. This concerns household waste, bulky waste, mechanically swept-up waste, street litter bin waste, littering, illegal dumping and manually swept-up waste.

#### Why do we measure?

The residual waste – in combination with the sorting analysis - shows that there is still potential to further focus on sorting. Reduced residual waste production can indicate that more materials and products are given a second life, that there is more consumer awareness, that more products are repaired and that they are used longer, and that discarded materials are given a high-quality application.

The Flemish target by 2022 according to the Implementation Plan for Household Waste and Comparable Industrial Waste is 138 kg of residual household waste per capita. The Flemish Energy and Climate Plan 2021-2030 includes the target of 100 kg residual household waste per capita by 2030.

#### What do we see?

The evolution of the total amount of residual household waste in Flanders is shown in Figure 26. This evolution is an indicator for the prevention of household waste. The amount of residual household waste in 2018 (145.57 kg/capita) remains roughly the same as in 2017 (145.56 kg/capita) and decreases compared to 2013 (158.58 kg/capita).

The amount of bulky waste in particular fell sharply by 8.4 kg/capita or 27% in the period 2013-2018. The cause is a very focused policy: mandatory minimum rates for bulky waste, the obligation for municipalities to provide a separate container for hard plastics at recycling centres and a tailor-made approach for and follow-up of the municipalities lagging behind. The household waste decreased by 4 kg/capita or 4% in the period 2013-2018.

In the period 2013-2018, a significant decrease of 13 kg per capita had already been achieved (from 158.6 kg to 145.6 kg per capita). Another drop of 7.57 kg/capita will be needed by 2022 to achieve the objective of the Implementation Plan for Household Waste and Comparable Industrial Waste.

#### Outside Flanders?

European obligation for all Member States to report the total quantities of household waste produced and treated per capita (paragraph 3.2.1). There are no targets for the amount of residual household waste. However, there are European objectives for the recycling of household waste (paragraph 3.3.1).

#### More information & sources

OVAM (2019). Household waste and similar industrial waste 2018 – monitoring the indicators in the Implementation Plan. OVAM, Mechelen. [only available in Dutch] [ovam.be/inventarisatie-huishoudelijke-afvalstoffen](https://ovam.be/inventarisatie-huishoudelijke-afvalstoffen)

### 3.2.3 Production of primary industrial waste

#### What do we measure?

The amount of primary waste produced annually by Flemish industries. The waste from the waste treatment sector is not included here. It is therefore a matter of waste generated by the original producer and not in the subsequent treatment of the waste. The amount of soil, sewage sludge, and construction and demolition waste are often not included because the aim is not to reduce these quantities. They can be a sign of a good environmental policy.

OVAM estimates the production of primary industrial waste by means of an extrapolation based on data from a sample of companies. The selected companies report their waste via the Integrated Annual Environmental Report (IMJV).

The primary industrial waste can be further broken down by sector, by type of waste (“waste flow”), by treatment method and by company size (“dimension”). Extrapolations based on combinations of these 4 formats are also possible. However, the sample is optimised for extrapolations based on sector and dimension. The greater the level of detail of the extrapolation, the lower the reliability.

#### Why do we measure?

Because reduced waste production can mean that more materials and products are being given a second life, that they are produced more material-efficiently, that the lifespan of products is extended, that discarded materials are being given a high-quality application...

#### What do we see?



Figure 29. Evolution of primary industrial waste excluding soil, sludge, and construction and demolition waste (in kiloton) in Flanders, 2004-2018. Source: OVAM (2019).

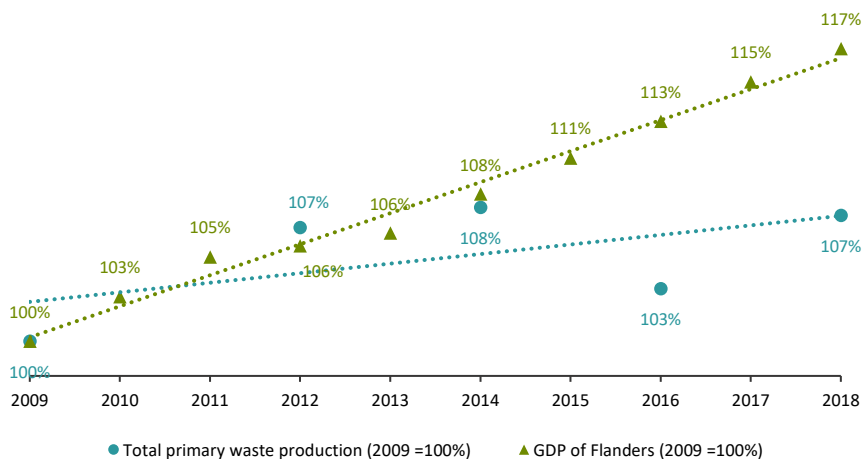


Figure 30. Evolution of the amount of primary industrial waste and the gross domestic product (GDP) (index 2009) in Flanders, 2009-2018. Source: OVAM (2019).

The first graph shows that the total amount of primary industrial waste excluding construction and demolition waste, sludge from wastewater treatment and contaminated soil, decreased at the beginning of the period. After that, there is a slight increase year after year in the amount of primary industrial waste without construction and demolition waste, sludge from wastewater treatment and contaminated soil.

The first and second figures clearly show the effects of the economic crisis in the period 2007/2011. Afterwards, we see a steady increase in the amount of primary industrial waste. Since this mainly consists of process-related waste, the quantity increases as the economy picks up.

### Outside Flanders?

Reporting on industrial waste to Europe is mandatory. There is no European objective. Member States and regions themselves decide how they calculate the statistics. Whereas the Flemish Government opts for extrapolation, other Member States only question the large companies, others question the collectors instead of the producers of waste or choose to fully question a certain sector.

In the following figure, waste production is expressed in kg per capita. Belgium thus has a relatively high waste production. An important reason for this is that the Belgian economy produces a lot for export.



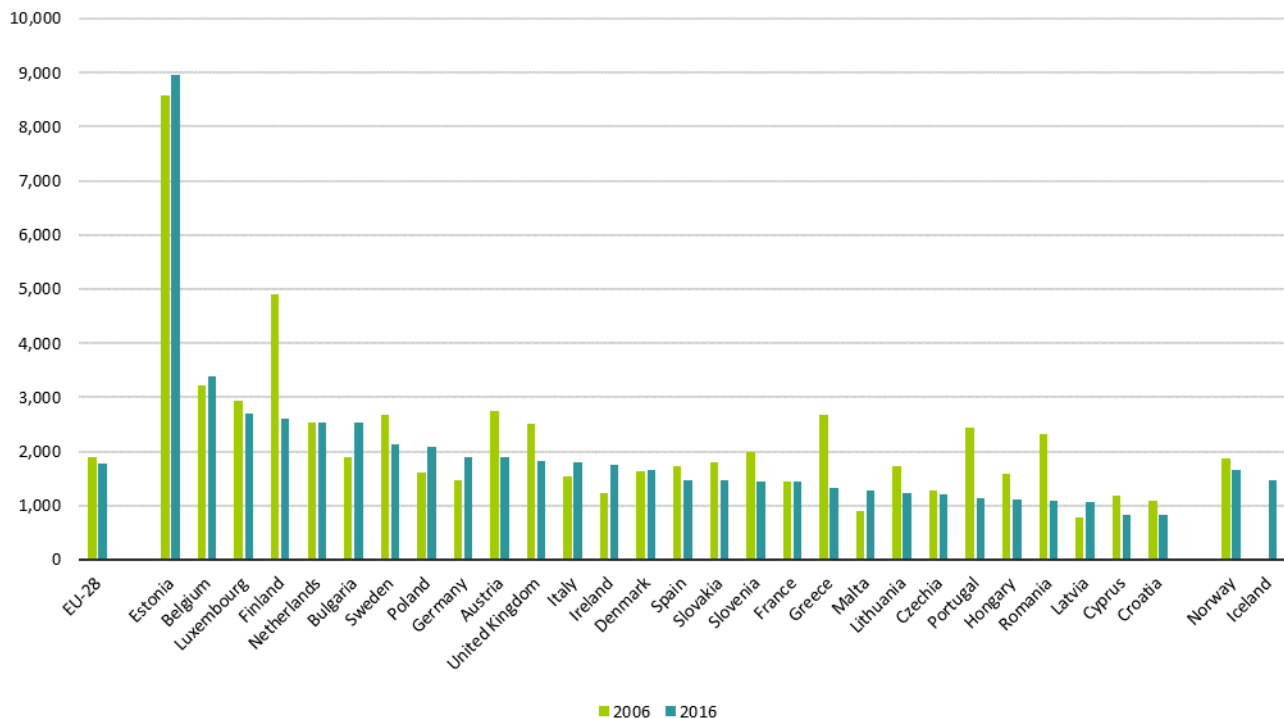


Figure 31. Production of industrial waste excluding construction and demolition waste per EU Member State (in kg per person), 2006 & 2016. Source: Eurostat (2020).

**More information & sources**

- Eurostat (2020). Generation of waste by waste category, hazardousness and NACE Rev. 2 activity (env\_wasgen). [ec.europa.eu/eurostat/product?code=env\\_wasgen&language=en&mode=view](https://ec.europa.eu/eurostat/product?code=env_wasgen&language=en&mode=view)
- OVAM (2019). Industrial waste and secondary raw materials from 2004-2018. OVAM, Mechelen. [ovam.be/bedrijfsafvalstoffen](https://ovam.be/bedrijfsafvalstoffen)

### 3.2.4 Production of primary industrial residual waste

#### What do we measure?

The fraction of primary industrial waste that is not selectively presented or collected. “Primary” is interpreted as the waste generated by the various industries excluding the waste from the waste processing sector. It is therefore a matter of waste generated by the original producer and not in the subsequent treatment of the waste. OVAM estimates the production of primary industrial waste by means of an extrapolation based on data from a sample of companies. The selected companies report their waste via the Integrated Annual Environmental Report (IMJV). Valipac calculates the amount of residual industrial waste using data from the waste collectors that are affiliated with them.

The primary residual industrial waste can be further broken down by sector, by treatment method and by company size (“dimension”).

#### Why do we measure?

By 2022, industrial residual waste should decrease by 15% compared to 2013 taking into account the evolution of employment in Flanders. This objective must be achieved through prevention and better sorting at the source.

#### What do we see?

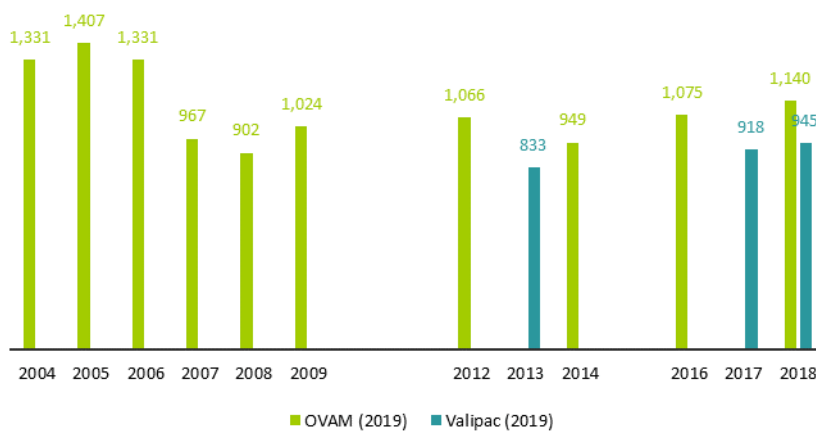


Figure 32. Evolution of primary mixed industrial residual waste (in kiloton) in Flanders, 2004-2018. Source: OVAM (2019) & Valipac (2019).

The amount of mixed primary industrial residual waste, estimated on the data collected via the IMJV, has fluctuated around 1 million tons since 2007. In recent years, however, the amount of residual industrial waste seems increase slightly. The break in the trend between 2006 and 2007 is due to the estimation method.

According to Valipac's calculations, the amount of residual industrial waste has also increased by 14% in the period 2013-2018. Because these studies define the residual waste less broadly than in the Integrated Annual Environmental Report (IMJV) and because not all waste collectors are affiliated with Valipac, the amount of residual waste in this study is slightly less than the mixed industrial waste based on the IMJV. To assess the -15% target, we take into account an increase in employment of 7% in the period 2013-2018. Even when adjusted for the increase in employment, there was still an increase of 6% in the production of residual waste.

### Outside Flanders?

European Member States are obliged to report waste statistics to Eurostat every 2 years. Member States and regions decide for themselves how they calculate the data. The figure below shows the waste category “mixed waste”. This includes residual waste as well as sorting residues and a number of waste flows that cannot be classified elsewhere.

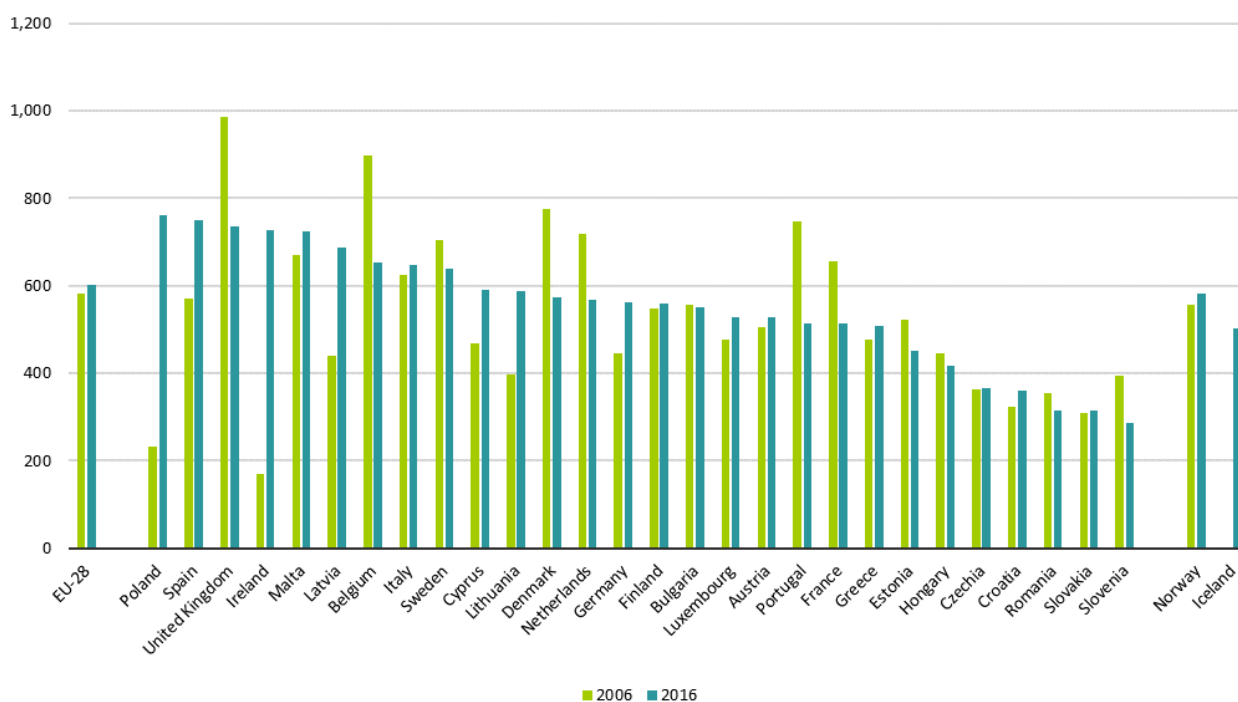


Figure 33. Mixed waste production from industry and households (in kg per capita) by EU Member State, 2016. Source: Eurostat (2020).

### More information & sources

- Eurostat (2020). Generation of waste by waste category, hazardousness and NACE Rev. 2 activity (env\_wasgen). [ec.europa.eu/eurostat/product?code=env\\_wasgen&language=en&mode=view](https://ec.europa.eu/eurostat/product?code=env_wasgen&language=en&mode=view)
- OVAM (2019). Industrial waste and secondary raw materials from 2004-2018. OVAM, Mechelen. [ovam.be/bedrijfsafvalstoffen](https://ovam.be/bedrijfsafvalstoffen)
- Valipac (2019). Monitoring production of industrial residual waste in Belgium. Reference year 2017. [only available in Dutch] Valipac, Wemmel.

### 3.2.5 Incinerated, co-incinerated and landfilled waste of Flemish origin

#### **What do we measure?**

This indicator summarises the amount of incinerated, co-incinerated and landfilled waste of Flemish origin. The indicator contains both household and industrial waste. The indicator includes the waste that is processed in Flanders or elsewhere.

OVAM has a global picture of the amount of Flemish waste that is incinerated, co-incinerated or landfilled. For waste incinerated or landfilled in Flanders, we use the supply of waste to incineration plants and landfill sites (OVAM, 2019c). The waste is weighed when entering the incineration plants and the landfill sites. The operators report the weights yearly to OVAM.

We estimate the amount of Flemish waste that is co-incinerated in Flanders using data on environmental levies on the incineration and landfilling of waste (OVAM, 2019b). We also do this for waste that is treated outside Flanders (“shipments”). However, this is only possible if the tax rate abroad is lower than in Flanders. In that case, the difference between the Flemish and the foreign rate must be paid in Flanders.

The quantity of waste that is incinerated, mainly wood waste, is underestimated by using this methodology as the incineration of wood waste by small scale installations (e.g. cabinetmakers, greenhouse horticulture ...) and the export of wood waste for incineration is not included in these figures. Therefore, it is more important to follow the trend than the absolute quantity of waste for this indicator.

#### **Why do we measure?**

Material that is (co-)incinerated or landfilled “disappears” from the material cycle of the circular economy. They are leakage flows. The functionality of landfilled and incinerated materials is therefore very low. Landfilled materials are no longer usable unless they are extracted and reused in the future. The functionality of incinerated materials is limited to energy recovery and possible recovery of the incineration ashes.

We must avoid leakage flows as much as possible so as not to waste valuable raw materials. Hence, landfill is the least desirable way for waste disposal according to the European Waste Framework Directive (2008/98/EC) and the Flemish Materials Decree.

The government of Flanders 2019-2024 aims to phase out waste incineration gradually (Flemish Government Agreement 2019-2024). This may not give rise to a shift from incineration to landfilling. Environmental levies play an important role in preserving the waste treatment hierarchy. By way of illustration: landfilling *flammable* waste is much more expensive than incinerating it. And the levy rate for the incineration of recycling residues is lower than the general rate for waste incineration. The differentiation in rates has a guiding effect on waste producers and waste treatment facilities.

Flanders also wants to encourage the reuse (in future or not) of raw materials from landfills (Flemish Energy and Climate Plan 2021-2030).

### What do we see?

The total amount of Flemish waste that is incinerated, co-incinerated or landfilled has remained relatively stable since 2012. In the period 2012-2018, the total quantity varied between a minimum of 4.1 million tons (in 2014) and a maximum of 4.4 million tons (in 2018).

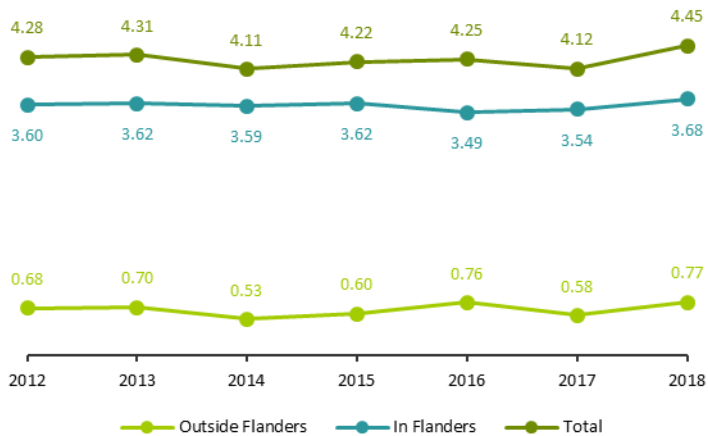


Figure 34. Amount of waste of Flemish origin that is incinerated, co-incinerated or landfilled (in million tons), 2012-2018. “Outside Flanders”: in Brussels, Wallonia or abroad. Source: OVAM (2019c).

How do these figures relate to the total amount of household and industrial waste? An example: in 2016, approximately 4.25 million tons of Flemish waste were incinerated, co-incinerated or landfilled. In the same year, an estimated 3.2 million tons of household and 15.7 million tons of primary industrial waste were produced in Flanders (OVAM, 2019a).

### Outside Flanders?

Member States report to Eurostat on waste production and treatment every two years, (Eurostat, 2020). Member States and regions decide for themselves how they calculate the data. This shows that on average 53% of the waste is landfilled or incinerated in Europe (with or without energy recovery).

### More information & sources

- Eurostat (2020). Treatment of waste by waste category, hazardousness and waste management operations (env\_wastrt). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_wastrt&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wastrt&lang=en)
- OVAM (2019a). Detailed information on industrial waste 2004-2016. OVAM, Mechelen. [only available in Dutch] [ovam.be/rapportering-en-consultatie-bedrijfsafval-en-materialengegevens](https://ovam.be/rapportering-en-consultatie-bedrijfsafval-en-materialengegevens)
- OVAM (2019b). Environmental levy reporting, 2018, fourth quarter. OVAM, Mechelen. [only available in Dutch] [ovam.be/afval-materialen/storten-verbranden-en-landfill-mining/milieuheffingen](https://ovam.be/afval-materialen/storten-verbranden-en-landfill-mining/milieuheffingen)
- OVAM (2019c). Tariffs and capacities for landfill and incineration Update to 2018. OVAM, Mechelen. [only available in Dutch] [ovam.be/tarieven-en-capaciteiten-voor-storten-en-verbranden](https://ovam.be/tarieven-en-capaciteiten-voor-storten-en-verbranden)

### 3.2.6 Litter and illegal dumping

#### What do we measure?

This indicator describes the amount of litter and illegal dumping that is collected annually in Flanders. The quantities are estimated with a biennial, voluntary survey of local and supra-local authorities. The same method has been used since 2015 to allow comparison of quantities between different years. For this indicator, we consider the data for litter excluding correctly deposited waste in public waste bins.

#### Why do we measure?

Litter and illegal dumping are usually not recycled. That is why both collected and uncollected litter and illegal dumping ensure that the material cycle is broken. Finally, they have a negative impact on the environment. That is why the quantities are monitored at the Flemish level and targets are defined. The amount of litter should decrease by 20% by 2022, to about 16,000 tons. There is currently no quantitative target for illegal dumping.

#### What do we see?

The amount of litter decreased slightly between 2015 and 2017 (by about 500 tons). We are currently not achieving the -20% target for litter. Significant additional efforts will be required in 2020, 2021 and 2022 to achieve the target. We see a sharper decrease for illegal dumping. It seems advisable to await the results of the 2019 survey for both litter and illegal dumping before drawing conclusions about whether or not objectives will be achieved. More information is also required for the monitoring of the trends in illegal dumping and litter figures.

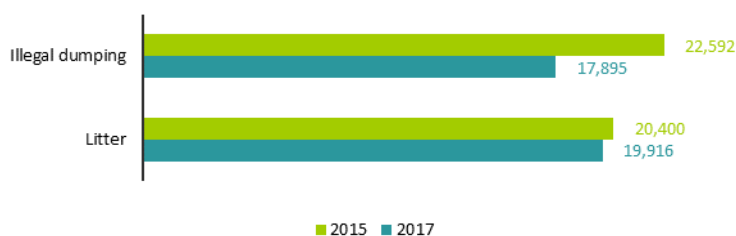


Figure 35. Evolution of the quantities of litter and illegal dumping (in tons) in Flanders, 2015 & 2017. Source: OVAM (2018).

#### Outside Flanders?

A comparison of the figures with neighbouring countries is not possible for both litter and illegal dumping. No data are available at European level, either.

#### More information & sources

- OVAM (2019). 2018 Report on household waste and similar industrial waste. OVAM, Mechelen. [only available in Dutch] [ovam.be/inventarisatie-huishoudelijke-afvalstoffen](https://ovam.be/inventarisatie-huishoudelijke-afvalstoffen)
- OVAM (2018). Litter and illegal dumping 2017 – Questioning quantity and Policy costs – Final report. OVAM, Mechelen. [only available in Dutch] [ovam.be/zwerfvuilbeleid](https://ovam.be/zwerfvuilbeleid)

### Box 1. Major loss of materials for products with a short lifespan, even with high collection and recycling rates

Products with a short turnaround time result in major losses of precious materials despite a high collection and high recycling rate. So, we can no longer only focus on the collection and recycling rate of wastes and on “waste” as such. If we want to make Flanders circular, we must tackle the leakage flows. And to map the leakage flows, we have to look at material loss.

Here, we give the example of aluminium used in cans. However, the conclusions also apply to other materials and applications.

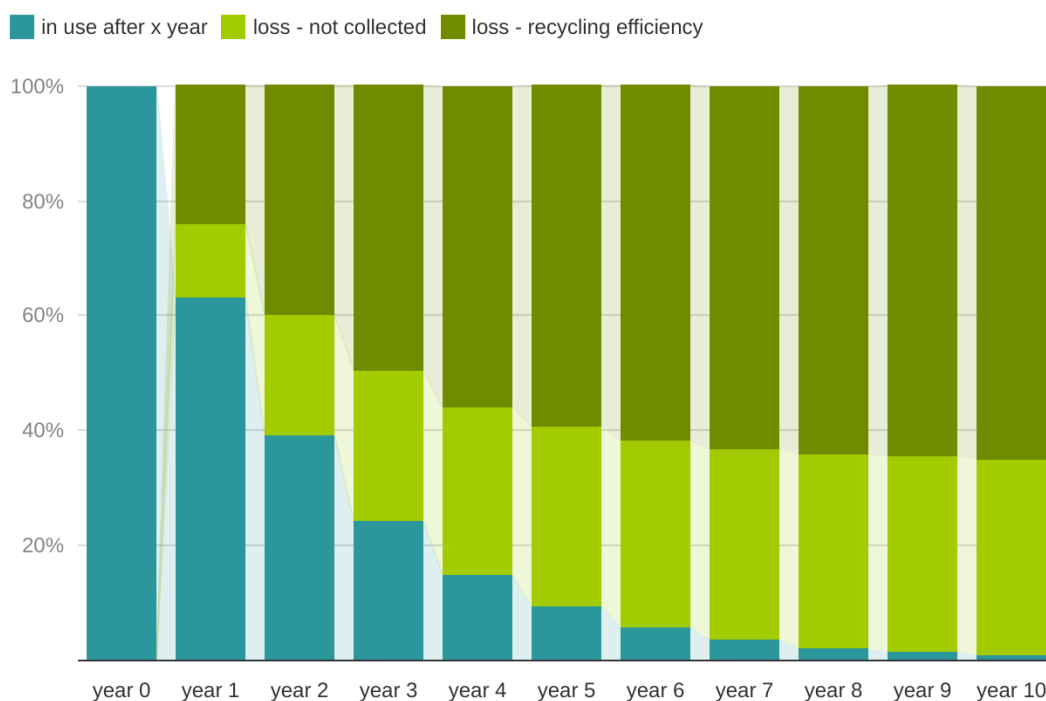


Figure 36. Aluminium loss when used in cans. 100% = put into use on “year 0” in Flanders. Source: Van der Linden, Vercalsteren & Boonen (2015).

The figure shows how quickly the **aluminium in cans**, which are put into use in year 0 (100%) is lost after several life cycles. A can has a short lifespan of several weeks. A small amount of aluminium is lost during every cycle from production to consumption and recycling. Consequently, even at a collection and recycling rate of more than 95%, there is a sizeable loss of aluminium in a short time. In concrete terms, after 4 years approximately 85% of the aluminium used in cans is lost due to the cumulative loss after each life cycle.

The cans are the fourth largest use of aluminium in Western Europe (8%), after cars and small trucks (27%), buildings and construction (17%) and machinery and equipment (9%).

Although aluminium is common in the Earth's crust, technically and economically exploitable aluminium stocks are limited. Worldwide, an estimated 85,079 kilotons of aluminium were put into use in 2016, of which 12,842 kilotons were destined for Western Europe (The International Aluminium Institute, 2018).

To support the circular economy in Flanders, OVAM strives for the sustainable management of metals such as aluminium, in consumer goods. To this end, OVAM strives for high material efficiency in industry and for a small material footprint from Flemish consumption. That is why OVAM tries to gain better insight into the loss of precious, finite materials from our economy.

**More information?** Visit the OVAM website:

[ovam.be/circulaire-materialenverhalen](https://ovam.be/circulaire-materialenverhalen) [PDFs available in English]



### 3.2.7 The carbon footprint of Flemish consumption

#### What do we measure?

The carbon footprint of a country's or region's consumption (CF) includes all greenhouse gas emissions that arise worldwide as a result of the consumption by its inhabitants over a one-year period. The Flemish final consumption consists on the one hand of products that are produced in Flanders for Flemish consumption and on the other hand of materials and products that are imported for Flemish consumption. The carbon footprint of Flemish consumption therefore includes:

- the indirect greenhouse gas emissions that arise during the production and transport of the goods and services consumed, in other words the emissions "in the backpack" of the consumed products (production phase);
- the direct greenhouse gases generated during the consumption activities of households. These are the greenhouse gas emissions from the chimneys of homes and from the exhaust pipes of motor vehicles (use phase).

The calculation of the CF starts from an environmental input-output model (IO model). This model links economic data from the Flemish economy to the world economy in a scientific manner with associated environmental data. The monetary input-output tables map the flows of goods and services expressed in euros between the various economic sectors and end users. Greenhouse gas emissions are allocated to the various sectors in the environmental extension tables. Using the Leontief-inverse methodology, greenhouse gas emissions by the economic sectors at in Flanders and abroad are linked to the final consumption of goods and services in Flanders. The carbon footprint of Flemish consumption (CF) is available for the years 2003, 2007 and 2010 (Vercalsteren *et al.*, 2017).

#### Why do we measure?

Targets for the Flemish climate policy are based on territorial emissions. As a result, policy initially focuses on measures to limit greenhouse gas emissions within Flanders. If we only look at greenhouse gas emissions within Flanders, the effects of circular strategies (purchasing policy, re-use, recycling...) on the climate may seem negative (see [7](#) and box 7). By taking into account the greenhouse gas emissions outside Flanders as a result of Flemish consumption, the environmental benefits of the circular economy are made explicit.

In addition, the consumption domains with the highest material footprint (transport, food and housing) also have the highest carbon footprint (Figure 37). Moreover 84% of the carbon footprint from consumption (107 Mton) arises during the production and distribution of the goods and services purchased worldwide. The other 16% (20 Mton) is created in the use phase. The way we handle materials therefore largely determines our climate impact. Or better, circular strategies should also lead to a drop in carbon footprint.

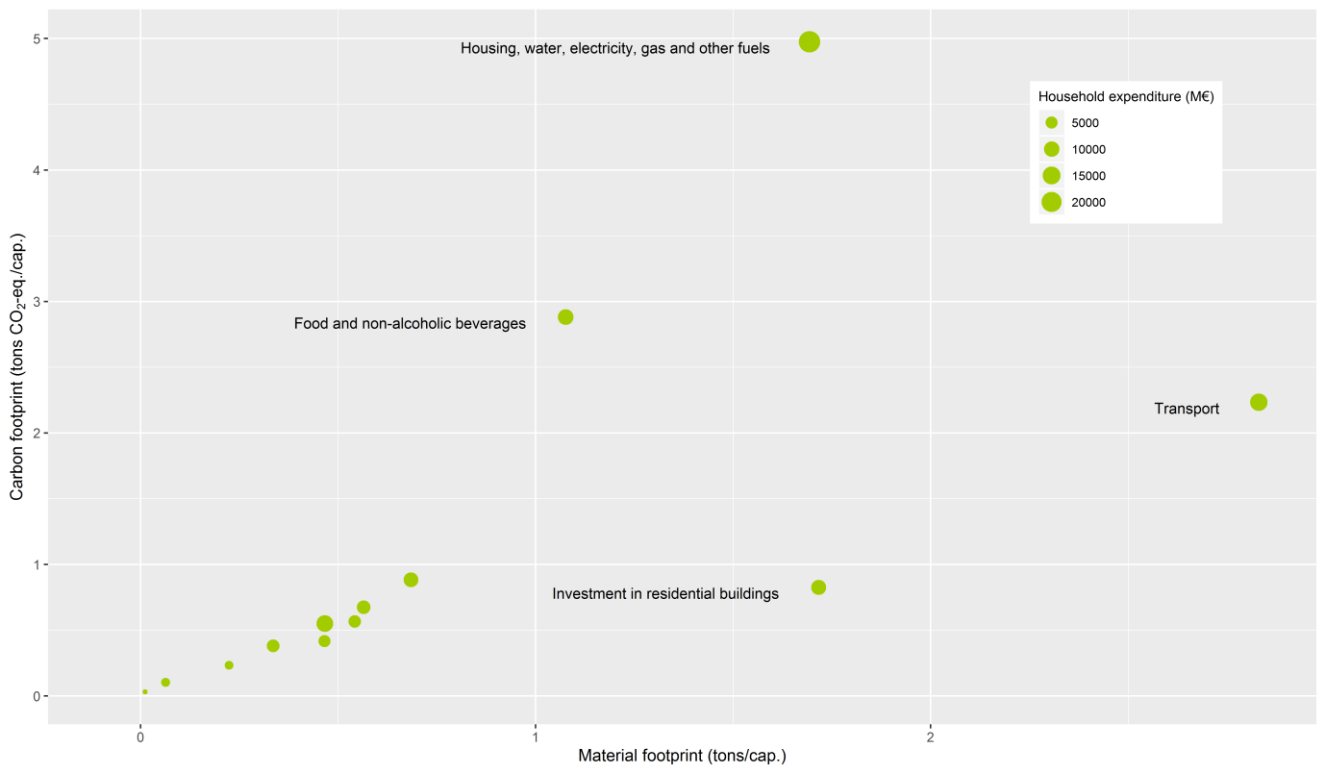


Figure 37 . Carbon and material footprint of Flemish households per consumption domain according to the Flemish IO model in 2010. Source: Vercaesteren *et al.* (2017) & Christis *et al.* (2019).

### What do we see? Outside Flanders?

The total carbon footprint of Flemish consumption amounted to 127,684 kiloton of CO<sub>2</sub> equivalents or 20.4 tons CO<sub>2</sub> equivalents per capita in 2010. To limit the average global temperature increase to 2°C, greenhouse gas emissions must be reduced by an average of 2 tons per capita worldwide by 2050. The Flemish carbon footprint is therefore ten times too high. Most of the carbon footprint consists of CO<sub>2</sub> emissions (91%). The rest are CH<sub>4</sub> emissions (6%) and N<sub>2</sub>O emissions (3%) (Vercaesteren *et al.* 2017).

A breakdown of this CF per final consumption category is shown in Figure 3. 63% of the Flemish footprint is linked to household consumption. 19% of the carbon footprint from these households is linked to nutrition and 39% to housing. Consumer goods (including mobility) account for 31% of the carbon footprint of households. Mobility itself accounts for 20% of the carbon footprint of households.

The total carbon footprint of Flemish consumption shows an increasing trend with an increase of 23% between 2003 and 2007 and of 2% between 2007 and 2010 (Figure 38). The rise in the carbon footprint is due to an increase in the production phase, the greenhouse gas emissions in the use phase did not change much. However, this evolution should be interpreted with caution due to methodological changes in the monetary tables and the environmental extension tables linked to imports and in the Flemish IO monetary tables.

The share of non-European emissions in the carbon footprint increased significantly between 2003 and 2010. The increase in the carbon footprint may be the result of (1) a higher emission intensity of non-European sectors and (2) a greater importance of these sectors in the production chains of Flemish consumption in 2010 compared to 2003. An increased consumption volume and changes in the consumption mix can also contribute to the increase in the carbon footprint.

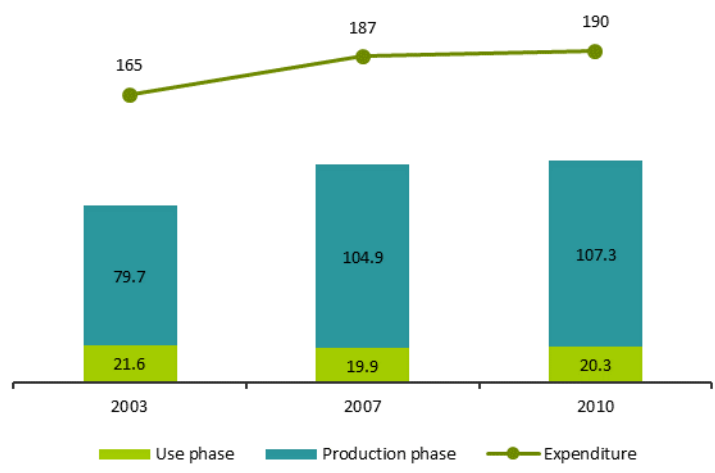


Figure 38. Evolution of the carbon footprint of Flemish consumption (in million tons of CO<sub>2</sub> eq.) with a breakdown into the use phase and the production phase and the evolution of Flemish expenditure in constant prices (in million euros; base year 2010), 2003-2010. Source: Vercauteren *et al.* (2017).

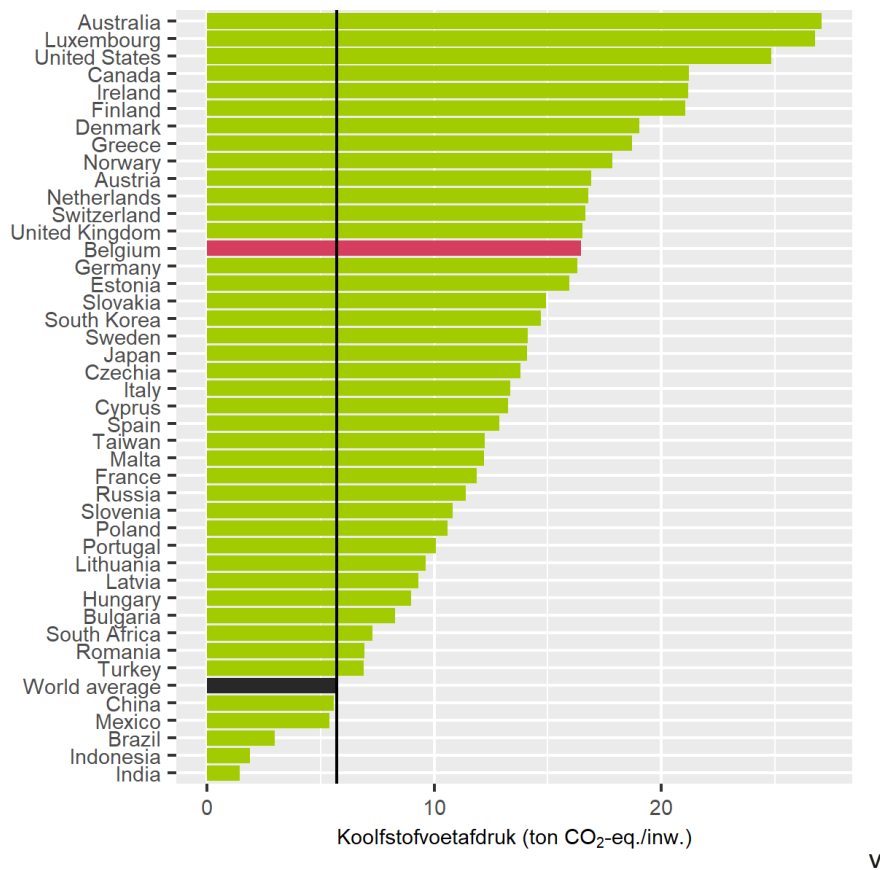


Figure 39. Carbon footprint of consumption (CF) according to IO model EXIOBASE 2.1 for some 40 countries in 2007. Source: Tukker *et al.* (2014).

With the IO model on which the carbon footprint of Flemish consumption is based, the carbon footprint of 2007 has been determined for several countries (Figure 39). The carbon footprint of Belgian consumption is three times higher than the world average. In general, countries with greater prosperity also have a higher carbon footprint. Why a specific country performs better than another country has not been investigated.

**More information & sources**

- Tukker, A., Bulavskaya, T., Giljum, S., de Koning, A., Lutter, S., Simas, M., Stadler, K., Wood, R. (2014). The Global Resource Footprint of Nations. Carbon, water, land and materials embodied in trade and final consumption calculated with EXIOBASE 2.1. Leiden/Delft/Vienna/Trondheim.
- Vercauteren A., Boonen K., Christis M., Dams Y., Dils E., Geerken T. & Van der Linden A. (VITO), Vander Putten E. (VMM) (2017). Carbon footprint of Flemish consumption, study commissioned by the Flanders Environment Agency (VMM), MIRA. [English summary available] VMM, Aalst, June 2017.
- VMM (2017) Carbon footprint. Flanders environmental report. Flanders Environment Agency, Aalst. [only available in Dutch] [milieurapport.be/systemen/vlaanderen/vlaanderen/koolstofvoetafdruk](http://milieurapport.be/systemen/vlaanderen/vlaanderen/koolstofvoetafdruk)

## Box 2. Which materials are needed for the Flemish energy transition?

A sustainable Flemish energy transition is an important component in the achievement of the Flemish climate objectives. The Flemish Energy Plan and the Flemish Government Agreement 2019-2024 set out the outlines of the Flemish energy transition from 2020 to 2030. Central to this energy transition are the further expansion of the Flemish onshore wind farm, the increase in solar panels and the roll-out of energy storage systems. However, these technologies contain different (critical) metals, which means that this energy transition also entails a significant demand for these materials. Given the global importance of the energy transition in the various economies, potential pressure on the supply of materials is therefore an important point for attention. Greater demand for these crucial and scarce materials leads to a higher price. Over time, this can be an important burden on the further implementation of certain technologies. In addition, demand is accompanied by increased extraction, which also exerts pressure on the environment.

VITO carried out a study commissioned by OVAM (VITO, 2020). This study starts from the composition and lifespan of the various sustainable energy technologies coupled with the planned expansion of the energy generation capacity of these technologies as provided for in the Flemish energy plan. Based on this, an estimate is made of the demand for different materials until 2030. This demand is compared to the global stocks of these materials. More specifically, the study looks at the reserves to which Flanders is entitled based on the number of inhabitants. In addition, it examines what can be achieved in terms of reducing the primary demand for the different raw materials through the recycling of the energy technologies that reach the end of their functional life.

In the case of **silver, gold, copper, indium and tellurium**, it is clear that the cumulative demand under the Flemish Energy Plan will already exert considerable additional pressure on the reserves to which Flanders is entitled by 2030. In addition, this demand for silver, copper and gold is added to the demand for these elements as part of electrical and electronic equipment and other applications. In this context, **focusing on collection and recycling is an important factor** given the high recycling efficiency for these materials. The wide range of applications implies a high stock of these materials in the urban mine which can ease the pressure on primary extraction.

In the case of **nickel, lead, zinc, lithium, cobalt and various materials from the rare critical metal group** (neodymium, terbium, dysprosium and praseodymium), the additional pressure on the reserves to which Flanders is entitled is limited. Although the rare critical metals are widespread in the Earth's crust, they are concentrated in only a limited number of places to make mining economically viable. This can create **supply risks**. Therefore, these elements need extra attention. It is important to map out their application in the broad economy. Nickel and zinc are also used for different types of metallurgical applications. Here too, a considerable stock is already available in current applications, so it is important to **collect** these materials when disposed and to **recycle** them efficiently.

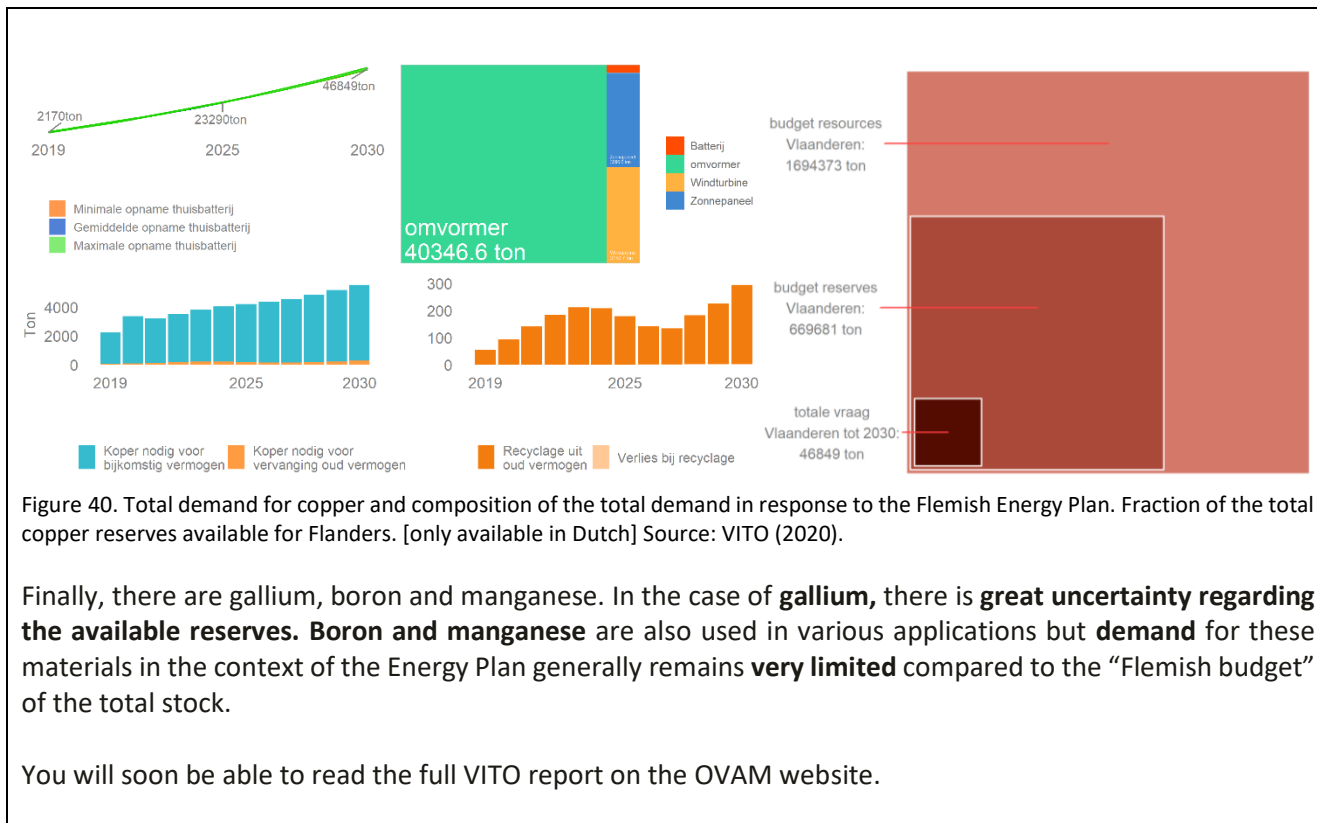


Figure 40. Total demand for copper and composition of the total demand in response to the Flemish Energy Plan. Fraction of the total copper reserves available for Flanders. [only available in Dutch] Source: VITO (2020).

Finally, there are gallium, boron and manganese. In the case of **gallium**, there is **great uncertainty regarding the available reserves**. **Boron and manganese** are also used in various applications but **demand** for these materials in the context of the Energy Plan generally remains **very limited** compared to the “Flemish budget” of the total stock.

You will soon be able to read the full VITO report on the OVAM website.

## 3.3 ABILITY TO KEEP RESOURCES IN THE MATERIAL CYCLE

### 3.3.1 Recycling of household waste

#### **What do we measure?**

The proportion of household waste including comparable industrial waste collected by or on behalf of the municipality excluding construction and demolition waste, which is recycled or composted.

Until now, for European reporting, the selectively collected waste, treated in a facility for recycling, could be considered as recycled. Thus, recycling losses did not have to be calculated and could be ignored. The data below have been determined in this way.

#### **Why do we measure?**

Because an increase in the recycling rate indicates that the transition to a circular economy is underway.

#### **What do we see?**

Figure 41 shows the distribution of household waste over the different treatment methods. 65.7% of the total amount of household waste goes to a recycling or composting facility. Without the selectively collected construction and demolition waste as shown in the figure, this percentage amounts to 62.5% in 2018. In addition, 37.0% was incinerated and 0.5% landfilled.

The amount of recycled household waste rose sharply until 2007. After that, it gradually declined as the amount of selectively collected waste flows decreased. The main cause probably is stricter access control to the recycling companies, which means that less industrial waste ends up in the household recycling centres.

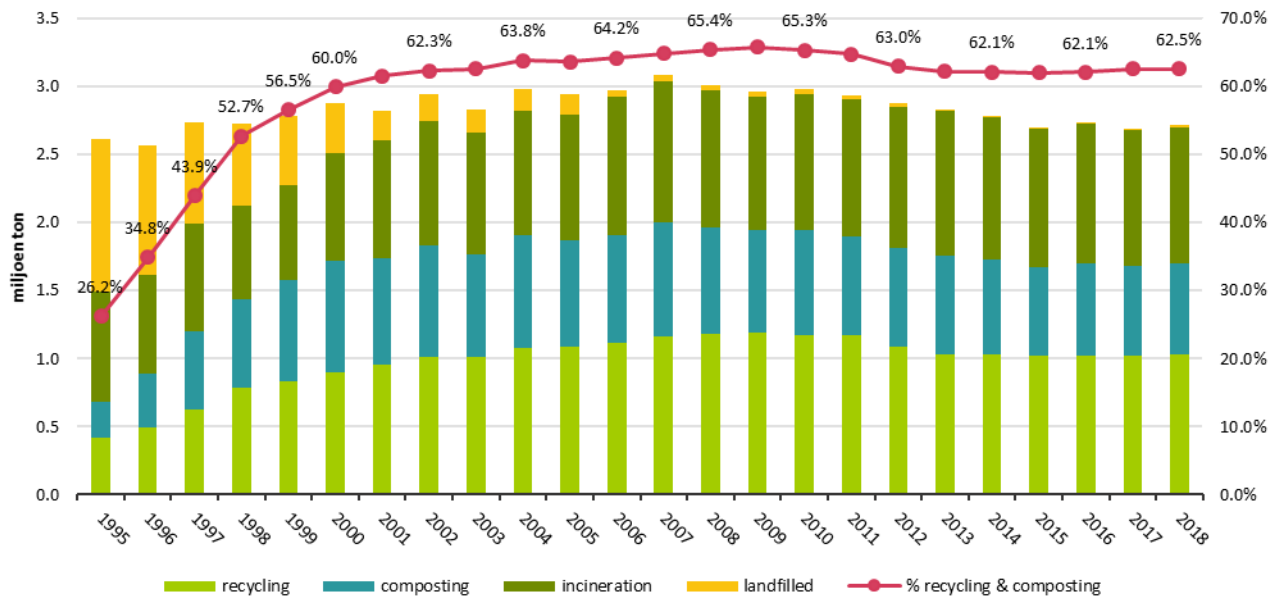


Figure 41. Evolution of the treatment of household waste (excl. construction and demolition waste) (in million tons) and the percentage of recycling and composting (%) in Flanders, 1995 to 2018. Source: OVAM (2019).

### Outside Flanders?

European Member States are obliged to report on the recycling of household waste (Figure 42). It does not include construction and demolition waste. Flanders is at the top with a recycling rate of 62.5%. By 2020, 50% of household waste must be recycled. When calculating this (old) target, Member States may assume that sorting residues are negligible with selectively collected flows.

Following its revision in 2018, the Waste Framework Directive now includes new objectives and a stricter calculation method. The amount of recycled waste must now be determined at the input to the recycling operation. More accurate recycling figures will therefore be available for the year 2020 onwards. The Flemish number will therefore also be lower because more (sorting) residues will be taken into account. The new recycling targets are: 55% in 2025, 60% in 2030 and 65% in 2035.

In addition, the EU has the binding target of sending a maximum of 10% of household waste to landfill by 2035. In Flanders, only 0.5% of household waste (excluding construction and demolition waste) was landfilled in 2018.



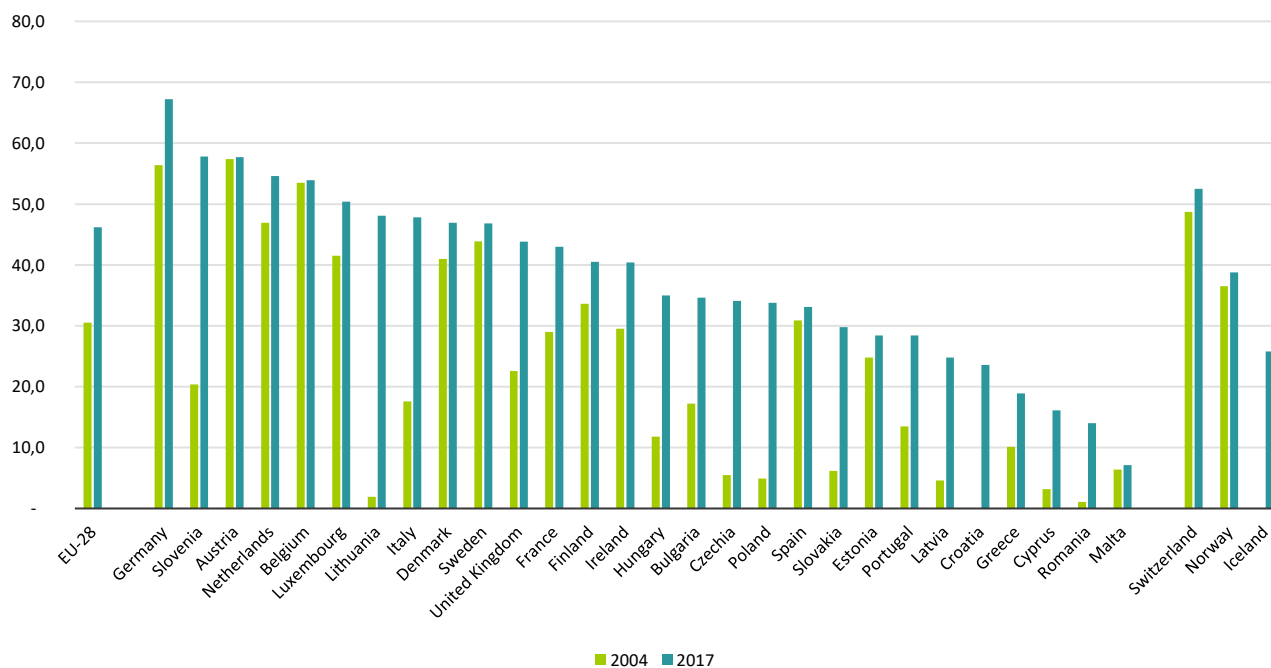


Figure 42. Household waste recycling rate (%) per European Member State, 2004 & 2017. Source: Eurostat (2020).

**More information & sources**

- Eurostat (2020). Recycling rate of municipal waste (cei\_wm011). [ec.europa.eu/eurostat/web/products-datasets/product?code=cei\\_wm011](https://ec.europa.eu/eurostat/web/products-datasets/product?code=cei_wm011)
- OVAM (2019). Household waste and similar industrial waste 2018 – monitoring the indicators in the Implementation Plan. OVAM, Mechelen. [only available in Dutch] [ovam.be/inventarisatie-huishoudelijke-afvalstoffen](https://ovam.be/inventarisatie-huishoudelijke-afvalstoffen)

### 3.3.2 Recycling of industrial waste

#### What do we measure?

The recycling rate shows what proportion of primary industrial waste is recycled in a calendar year. Primary industrial waste is interpreted as the waste produced by companies excluding waste from the waste treatment sector. By recycling we mean every form of waste treatment in which waste is converted into products and materials: composting, fermentation, re-use, material recycling and use as secondary materials. Incinerating with or without energy recovery and landfill are not recycling.

This can be calculated based on the total amount of primary industrial waste or on the primary industrial waste excluding construction and demolition waste.

#### Why do we measure?

Because an increase in the recycling rate indicates that the transition to a circular economy is underway.

#### What do we see?

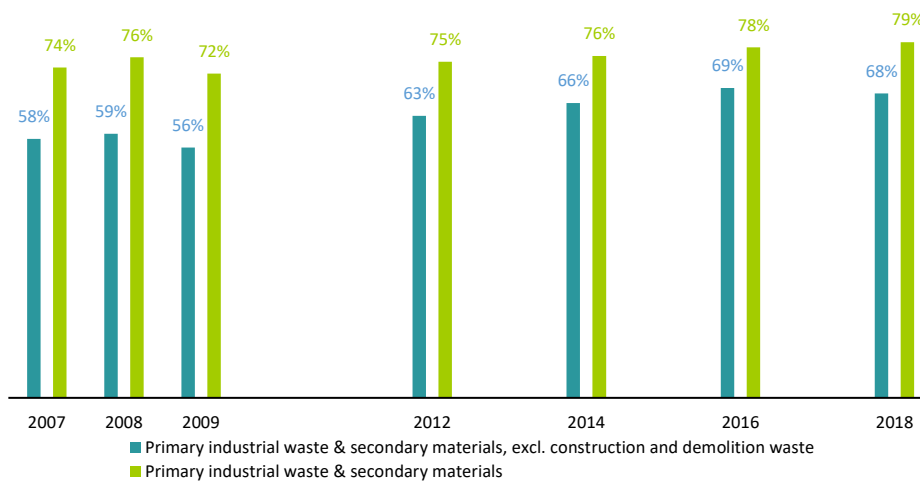


Figure 43. Percentage of primary industrial waste given a second life after two treatment stages in Flanders, excluding and including construction and demolition waste, 2007-2018. Source: OVAM (2019).

The share of primary industrial waste (excluding construction and demolition waste) that was given a second life after two treatment stages via re-use, recycling, composting or use as a secondary material in 2018 was 68%. That is a slight drop compared to 2016.

The gradual increase in industrial waste that is given a second life after two treatment stages is partly due to the secondary materials that were not reported or were reported incompletely before 2012 but also to a real rise in the amount of secondary materials as a result of economic growth.

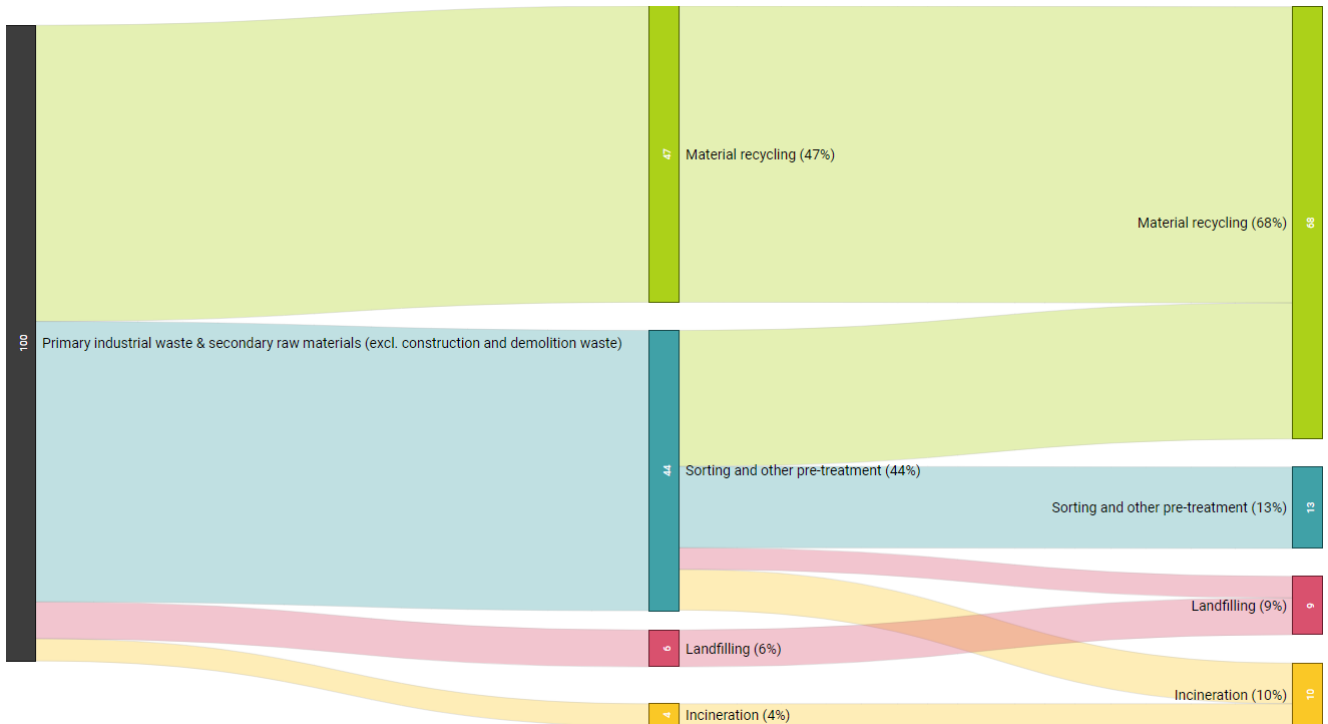


Figure 44. Flowchart with indication of the processing of primary industrial waste and secondary materials (excl. construction and demolition waste) after one or two treatment stages in Flanders, 2018. Source: OVAM (2019).

The black bar on the left in the figure shows the primary industrial waste (excluding construction and demolition waste) and the secondary materials of companies other than waste treatment companies. This is shown in the figure as 100%. The vertical bars in the middle of the figure show what percentage in the first processing stage goes directly to material recycling (47%; re-use, use as secondary material, recycling and composting), to incineration (4%) or to a landfill (6%). The remaining 44% goes to a sorting installation or other pre-treatment of the waste. For that 44%, it also shows what happens to it in the second treatment stage (right). If we take the results of the first and second treatment stages together, 68% of the primary industrial waste and secondary materials excluding construction and demolition waste after 2 processing stages goes to a form of material recycling.

### Outside Flanders?

The second life indicator for industrial waste describes the waste treatment method for the waste from Flemish companies. There is no comparable indicator available for other regions of countries.

Eurostat does calculate the recycling rate for waste (excluding major mineral wastes) treated within each EU Member State (Eurostat, 2020a). This indicator includes all the waste treated within a country, independent of the origin of this waste. As such, this recycling rate only tell you something about the recycling capacity within this EU Member State. The average EU-28 recycling rate was 56% in 2016. The recycling rate of our neighbouring countries is 72% in the Netherlands, 64% in Luxembourg, 54% in France en 53% in Germany.

Hence Eurostat monitors the amount of waste treated within a EU Member State per treatment method. As also indicated in the indicator “production of industrial waste”, waste production per capita in Belgium is high because the Belgian economy also produces a lot for export. Compared to other countries, the share of recycling in Belgium is high while the share of waste that is landfilled is very low.

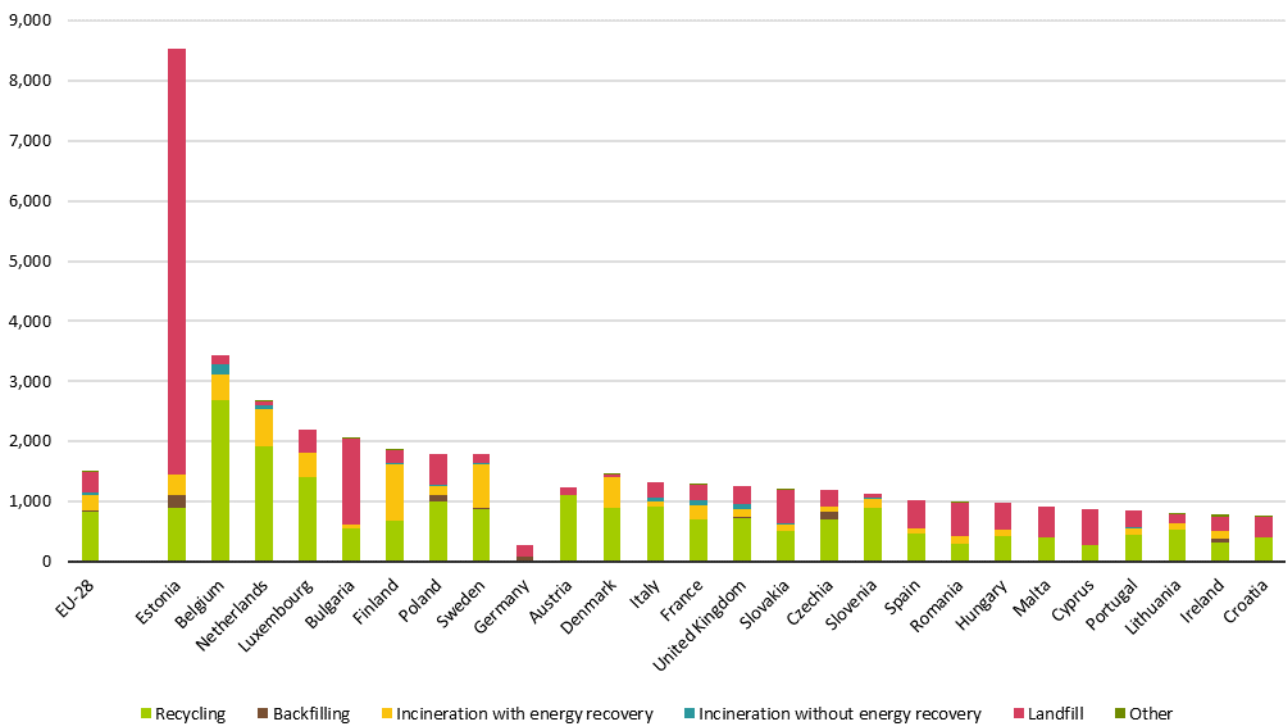


Figure 45. Waste treatment excluding major mineral wastes (in kilograms per capita) per treatment method and per EU Member State in 2016. Source: Eurostat (2020b).

### More information & sources

- Eurostat (2020a). Waste management indicators. [ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste\\_management\\_indicators](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_management_indicators)
- Eurostat (2020b). Management of waste excluding major mineral waste, by waste management operations (env\_wasoper). [ec.europa.eu/eurostat/product?code=env\\_wasoper&language=en&mode=view](https://ec.europa.eu/eurostat/product?code=env_wasoper&language=en&mode=view)
- OVAM (2019). Industrial waste and secondary raw materials from 2004-2018. OVAM, Mechelen. [ovam.be/bedrijfsafvalstoffen](https://ovam.be/bedrijfsafvalstoffen)

### 3.3.3 Production of secondary materials

#### **What do we measure?**

Primary raw materials (minerals) have been extracted from the soil or water for their first application. In this report, secondary materials are understood to mean all other materials that meet the requirements for composition and use as determined in paragraphs 2 and 5 of VLAREMA, respectively. Secondary materials are by-products or materials that have reached the end of the waste phase in accordance with article 36, 37 or 39 of the Materials Decree and article 1.2.1 of VLAREMA.

The focus is on material flows that fall within the framework of the secondary materials in VLAREA (until production year 2010) and VLAREMA (since production year 2012) and for which sufficient data are available. As of 2012, the secondary materials produced are all materials that have reached the end-of-waste phase in accordance with European regulations. In addition, the list also consists of materials for which there is no European regulation and for which the Flemish government has itself determined criteria (former secondary materials according to VLAREA and material flows that are produced and used in metallurgy). These criteria include the origin, collection, nature and composition and method of application of the material in question.

#### **Why do we measure?**

In a circular economy, all secondary materials are returned to the material cycle as raw materials. Thus, the use of primary raw materials is limited. This reduces the environmental impact of the production and consumption of primary raw materials. Circularity, however, is not so much evident from the production of secondary materials but rather from the avoidance of the use of primary raw materials or from the replacement of primary raw materials by secondary materials.

## What do we see?



Figure 46. Production of secondary materials (in kiloton) in Flanders, 2004-2018. Source: OVAM (2019).

The production of secondary materials increases (Figure 46). It is possible that flows are now reported as raw material, which were neither reported as waste nor as secondary material prior to the modification of Vlarema so that the increase in secondary materials may be overestimated.

In addition, an administrative/practical choice also plays a role. A number of materials can only be reported as a secondary material if the producer has a Resource Certificate.

OVAM supports the sale of secondary materials via the [online symbiosis platform](#), which was launched at the end of 2019. OVAM will be able to report on an aggregated level how many secondary materials are actually used to replace primary raw materials.

### Outside Flanders?

No comparable data are available.

### More information & sources

- OVAM (2019). Industrial waste and secondary raw materials during production years from 2004-2018. OVAM, Mechelen. [ovam.be/bedrijfsafvalstoffen](https://ovam.be/bedrijfsafvalstoffen)

### 3.3.4 Barometer of separate collection of industrial waste

#### **What do we measure?**

The separate collection barometer gives an indication of the behaviour of Flemish companies with regard to the separate offering of waste to the private collection sector. It is based on the waste data from individual companies that are collected annually by Valipac via the affiliated operators. This concerns packaging-related waste flows (wood, metals, plastics, glass, paper and cardboard). Data are also collected for residual waste. For these material flows, the Valipac operators provide fairly good market coverage of the “post-consumer” waste. These material flows provide a good indication of the behaviour regarding separate collection of “post-consumer” waste.

In this barometer, we focus on the collection of waste by private collectors. However, companies with small quantities of waste can also use the public waste collection service but the data that Valipac collects via its operators is a good approximation of the evolution of separate offering from Flemish companies.

The data have only been reported since 2017. The data are currently available for 2017 and 2018.

#### **Why do we measure?**

Separate collection at the source is still the best guarantee for high-quality material recycling. For that reason, OVAM pursues a policy that aims to keep as much recyclable waste out of the residual waste from companies as possible. The policy focuses not only on waste collectors who play a role in raising awareness and monitoring their customers but also aims to encourage producers of industrial waste to offer their recyclable waste materials as much as possible separately to waste collectors. That is an important reason why in this barometer of separate collection we focus on the behaviour of suppliers of industrial waste.

The Implementation Plan for Household Waste and Comparable Industrial Waste as well as the Policy Paper for the Environment place great emphasis on reducing the amount of residual waste from companies and increasing separate collection from industrial sources.

In this separate collection barometer, we focus on the behaviour of the producers rather than on the quantities collected. An important reason for choosing this approach is the fact that the amount of industrial waste is dominated by the production related waste that typically occurs in large quantities and is low in contaminants. The policy focuses mainly on reducing residual waste from companies by offering post-consumer waste separately for recycling. Because it is difficult to make a clear distinction between production-related waste and post-consumer waste, we opt for behavioural indicators (numbers of companies that offer waste separately) when monitoring separate collection from industry rather than indicators that show the separately collected tonnages in Flanders.

### What do we see?

The Flemish economy consists largely of companies with small business units (collection points).

The proportion of companies that offer only residual waste decreases with the size class. The Flemish average approaches the value of the smallest size class because this class predominates in the number of collection points. We note in the detailed data that in addition to the size class of the companies, the economic sector is also a determining factor. For example, we note that a number of sectors are clearly under-performing, such as the catering and hospitality sector, the health sector, administrative services and education. The location of the companies (Belfius clusters) is much less of a determining factor for separate collection. We see only very small differences between the Belfius clusters. There seems to be a trend that companies in urban areas are doing somewhat better (a few per cent) than those in more rural areas.

The current evolution in separate collection is that companies that rely on a private collector usually start with residual waste. This is followed by the collection of paper and cardboard and soft plastics (film and EPS). The collection of paper and cardboard is actively stimulated by Valipac through start-up premiums. OVAM has created a framework for the collection of soft plastics whereby companies can offer their soft plastics together with the paper and cardboard in one container if the plastics are packed in separate bags. The fact that no separate collection round is required reduces the cost of separate collection. Since cardboard boxes are usually bound together with plastic film on delivery, we can assume that most companies that dispose of paper and cardboard also produce plastic film waste. However, the figures show that only a small proportion of companies that have residual waste and paper and cardboard collected also produce film and/or EPS for collection. There is still great potential for improvement here. For large companies, we note that the collection of paper and cardboard is fairly well established while that is less the case for smaller companies. They probably use the municipal collection circuit for paper and cardboard more often. This nuances the very large difference between the categories of 0-9 employees and more than 50 employees.

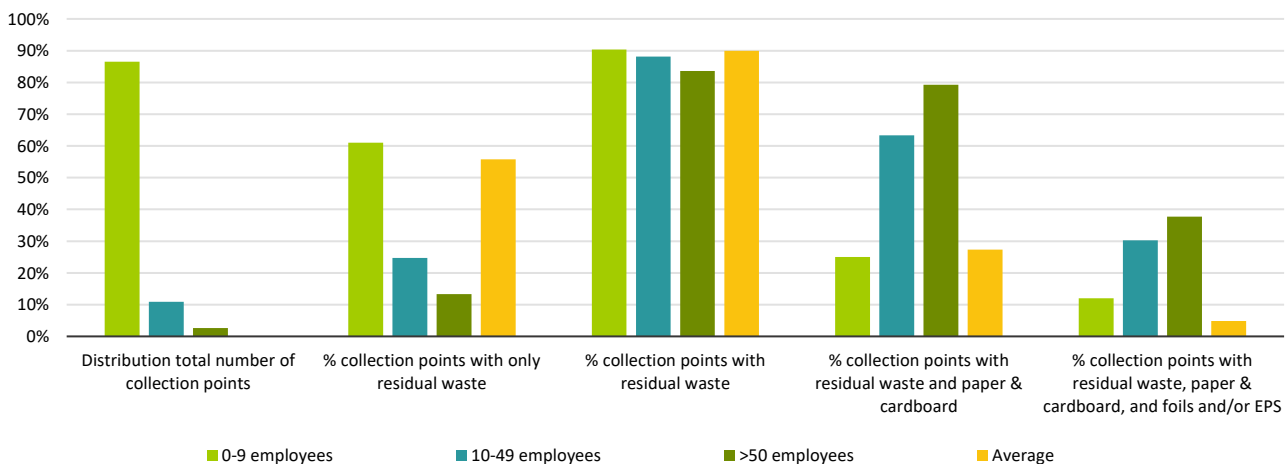


Figure 47. Collection points with residual waste and separate collection according to the size class of the company (in number of employees) in Flanders, 2017. Source: IVC; Valipac’s annual reporting under article 18 of the Valipac accreditation.



The behaviour of waste producers in separate offering of waste remained broadly unchanged between 2017 and 2018. This is not surprising since the existing policy on separate collection from companies was reactivated from 2017 and was placed on the policy agenda with high priority. The effects of this will only become visible in the future.

Total waste quantity increased by about 2.5% between 2017 and 2018 while residual waste increased by about 3%. In a detailed analysis, Valipac monitored 100,000 permanent collection addresses in 2017 and 2018. This shows that the increase in the amount of separately collected material flows was accompanied by a slight increase in the number of collection addresses while the increase in the amount of residual waste was accompanied by a stagnation in the number of collection addresses. This indicates a slight increase in separate collection. The increase in the quantities of waste is probably also linked to economic growth. It indicates that in addition to separate collection, we will also have to focus on waste prevention.

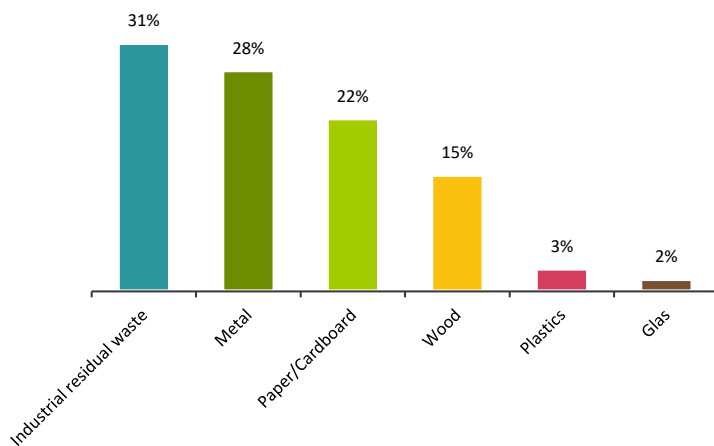


Figure 48. Separate collection from Flemish companies. Source: IVC; Valipac’s annual reporting under article 18 of the Valipac accreditation.

The level of separate collection in tonnage of waste collected per average company also remains constant between 2017 and 2018. The amount of industrial residual waste accounts for 31% of the total amount of packaging-related waste flows (industrial residual waste, wood, metals, plastics, glass and paper and cardboard).

### Outside Flanders?

This indicator is typically Belgian and there is no comparable indicator at EU level.

### More information & sources

For more information, please refer to Valipac’s report to the IVC in the context of article 18 of the Valipac accreditation.

### 3.3.5 Soil pollution and remediation

#### What do we measure?

This indicator shows the number of contaminated soils per remediation phase.

The soil is contaminated by all kinds of human influences with environmentally hazardous substances such as heavy metals, organic substances and pesticides. There are an estimated **85,000 soils** with an increased risk of soil pollution (so-called high-risk sites), which account for 11.2% of the area in Flanders. An exploratory soil survey (ESS) is compulsory for all high-risk sites and provides information about the soil quality. A descriptive soil survey (DSS) examines the extent and risks of soil contamination and determines the remediation technique. If remediation is required, a soil remediation project (SRP) is drawn up. After the SRP is declared to be in compliance with the Flemish regulation by OVAM soil remediation works (SRW) can start.

#### Why do we measure?

This indicator fits into a broad definition of the circular economy in which value retention and re-use are applied to space and land. The remediated soils can be re-used as space for all kinds of functions (living, working, nature, recreation, climate adaptation ...).

By **2036**, OVAM wants at least to start remediation for all historical contaminations. To this end, the exploratory soil surveys (ESSs) for the 85,000 high-risk sites must be completed by 2028 at the latest. Since 2017, OVAM has pursued a targeted activation and mediation policy to achieve that objective. For example, owners of unexamined high-risk sites are contacted and encouraged to start an investigation.

#### What do we see?

At the end of 2018, for **49%** of the Flemish high-risk sites (41,699 soils) exploratory soil surveys (ESS) were available. A descriptive soil investigation (DSS) was carried out for a third of the ESSs (or 14,010 soils). A total of 5,405 SRPs were submitted and declared conform in the period 1997-2018.

3,913 soil remediation works were completed (SRW completed) at the end of 2018. That is **more than a third** (36%) of the estimated number of necessary soil remediation projects that should be started by 2036. Compared to 2005, the number of completed soil remediation works has increased considerably. The longer the Soil Remediation and Soil Protection Decree is in effect, the more remediation projects will be started and completed. The turnaround time – between the research phase and a completed remediation project can be eight years - has a delaying effect.

In 2017, the surface area of the soils already remediated and to be remediated in Flanders was 85 km<sup>2</sup> (0.63% of Flanders) and 120 km<sup>2</sup> (0.89% of Flanders). These figures are estimates based on the area for which an SRP has appeared to be necessary.

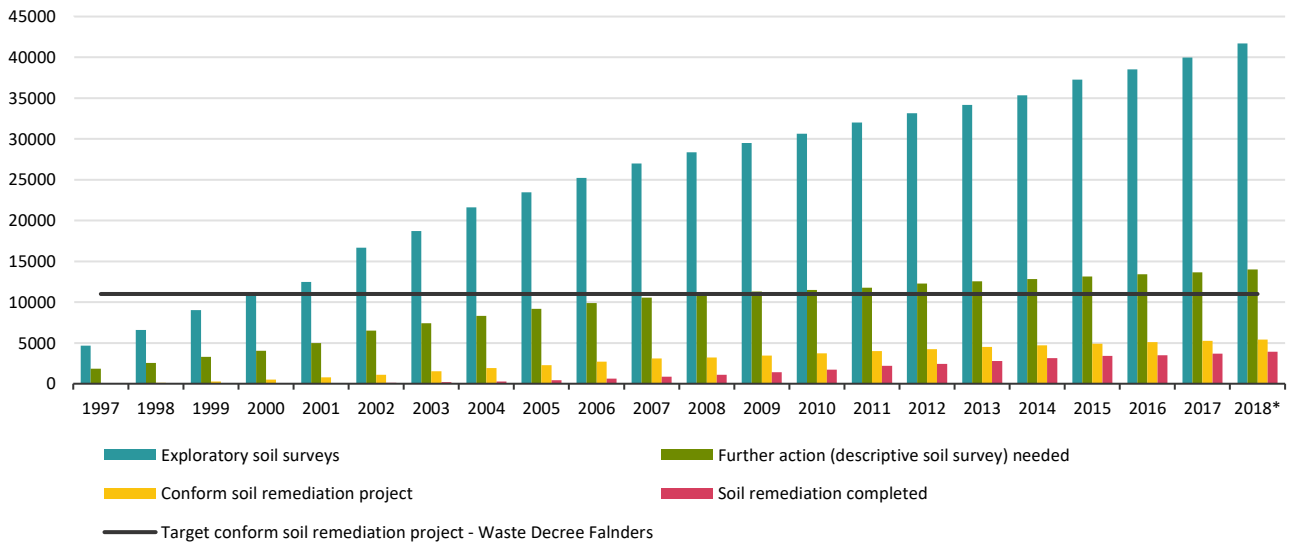


Figure 49. Number of contaminated soils per remediation phase in Flanders, 1997-2018. Source: OVAM (2020)

### Outside Flanders?

The indicator is used in a European context as a sub-indicator “Progress in the management of contaminated sites” of the European Environment Agency (EEA). This indicator was calculated based on a survey of European countries.

With regard to contaminated sites in the reporting countries (19 European countries), about a third of the estimated total of 342,000 sites have already been identified and about 15% of the estimated total have already been remediated (58,300 sites). Comparisons between countries are not possible due to very different interpretations of the relevant definitions by individual countries.

### More information & sources

- OVAM (2020). Report on the implementation of the soil decree for the year 2018. Public Flemish Waste Agency, Mechelen. [only available in Dutch] [ovam.be/sites/default/files/atoms/files/Verslag%20uitvoeringsplan%20bodemdecreet%202018.pdf](https://ovam.be/sites/default/files/atoms/files/Verslag%20uitvoeringsplan%20bodemdecreet%202018.pdf)
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### 3.3.6 Size of the circular economy (proxy)

#### What do we measure?

Size of the circular economy (CE) is commonly described by the **employment, turnover/added value** or the **investments** of the private “circular” sectors.

The employment and turnover of the re-use centres in Flanders are discussed in paragraph 3.3.6. These are an important addition to the indicators in this paragraph. In the future, other indicators must be looked at to estimate the size of the circular economy. The Policy Research Centre for Circular Economy is currently researching the amount and social benefits of re-use in Flanders. The results of this research are expected in 2020.

There are currently insufficient data to fully describe the size of the CE. In the data sources, there is no clear circular sector. However, the circular activities are spread across many branches of industry. As a result, the number of jobs, the turnover/added value and the private investments of the circular sectors are usually approximated using a selection of NACE codes. The selection of NACE codes gives a narrow definition of the CE with a pronounced focus on repair, waste collection and recycling. The public and informal economies are not taken into account either. Companies that are committed to reducing the use of materials, extending the life of products and re-use are also fully included. These indicators therefore underestimate the real size of the CE and should be considered as proxies. Because the figures are an underestimate of the size of the CE, it is important to focus less on the absolute figures but rather on the trend in the analysis.

Once a selection of NACE codes has been made, the number of jobs, turnover/added value and private investments for these “circular” NACE codes are usually determined based on the Structural Business Statistics of the different EU Member States. No detailed Structural Business Statistics are available at Flemish level. As an alternative, Flanders uses the data from the [Bel-First](#) database. This database contains extensive information about companies in Belgium and Luxembourg including financial and economic data.

Depending on the methodology, other NACE codes are considered to be circular (see Annexe 1). There is no standardised internationally agreed definition or delineation of CE activities. Hence, the size of the CE may be larger or smaller depending on the economic activities that may or may not be considered part of the CE. The selection of NACE codes from the study by Bachus & Willeghems (2018) closely matches that by Eurostat (2020).

Circle Economy (2020) determined the number of direct and indirect circular jobs linked to the CE. The direct jobs are divided into core and enabling circular jobs. Core circular jobs include activities relating to renewable energy, recycling and recovery. Enabling circular jobs support the acceleration and upscaling of primary circular activities and include activities such as leasing, engineering and digital technology. Finally, indirect circular jobs provide services to the core and enabling circular activities through work in education, logistics and government administration. Strong assumptions were needed to determine the enabling and indirect circular jobs. The figures for Bachus & Willeghems (2018) and Eurostat (2020) are best comparable to the core circular jobs determined by Circle Economy (2019).

### Why do we measure?

The number of jobs, turnover/added value or investments in the CE sectors endorse the social importance of the CE. It shows that the CE can also offer economic opportunities. These indicators provide insight into the socio-economic effects of the transition. CE can also contribute to job creation and economic growth. As indicated earlier, these indicators are a narrow approach to the CE and should be considered proxies. The circular economy goes beyond the economic opportunities of the recovery and recycling economy.

Sectors closely relating to the CE such as maintenance, reuse, repair and recycling are often labour-intensive. In addition, these activities are characterised by limited economies of scale so that they contribute to the local economy. Estimates of the economic benefits of the circular economy for Flanders point to material cost-savings of 3.4 billion to 6.1 billion euros (2% to 3.5% of Flemish GDP). The transition to a CE in Flanders could potentially generate 2.3 billion euros in extra added economic value for Flanders (1.3% of the Flemish GDP) (Dubois & Christis, 2014) and create 30,000 additional jobs net (1.1 % of Flemish employment) (Bachus & Willeghems, 2018).

### What do we see? Outside Flanders?

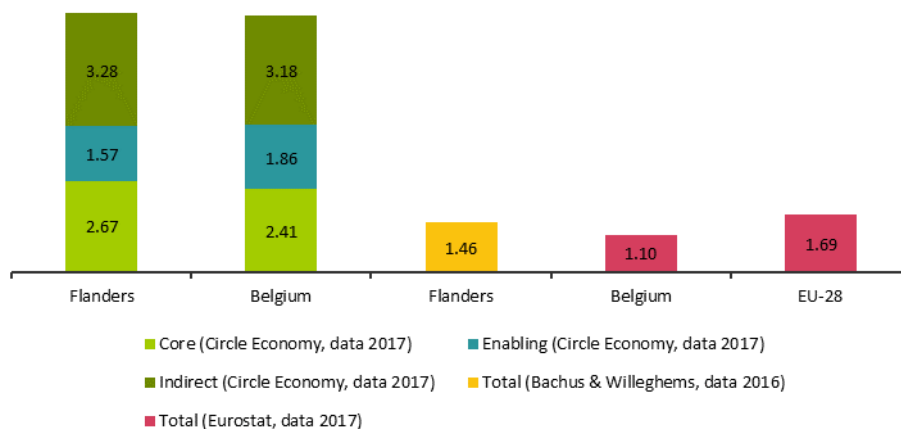


Figure 50. Share of employees in the circular sectors (%) in Flanders and Belgium according to Circle Economy (2019) and Bachus & Willeghems (2018). Share of persons employed in the circular sectors (%) in Belgium and the European Union (EU-28) according to Eurostat (2020). The share according to Bachus & Willeghems (2018) was calculated using the total number of employees in Flanders in 2016 (source: Statbel).

The results of the different sources differ greatly because other NACE sectors are considered to be circular (see appendix 1). Moreover, Eurostat (2020) describes the number of people employed in the circular sectors while Circle Economy (2019) and Bachus & Willeghems (2018) only calculate the number of employees.

According to Circle Economy (2019), there were approximately 85,000 primary circular jobs in Flanders in 2017 (2.67% of all jobs). According to Bachus & Willeghems (2018), the number of Flemish employees in the circular sectors in 2016 was approximately 33,000 (1.67% of all jobs). Compared to Belgium, there are relatively more circular jobs in Flanders than in Belgium according to Circle Economy (2019). According to Eurostat (2020), the circular sectors in Belgium have a smaller share of employment than in the European Union (EU-28).

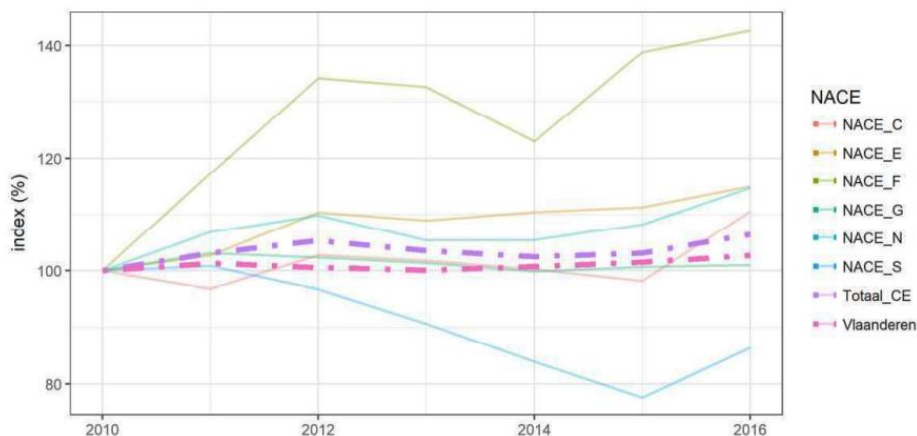


Figure 51. Employment index (%) of the circular sectors in Flanders, 2010-2016. Source: Bachus & Willeghems (2018).

The number of employees and the turnover of the circular sectors in Flanders is increasing (Figure 52). From Figure 51, it appears that employment in the circular sectors in Flanders is increasing more than twice as fast as the Flemish average. According to Bachus & Willeghems (2018), the employment in this sector mainly consists of low and medium-skilled workers. This means that the circular economy is an important growth sector with significant employment opportunities for these groups.

According to Eurostat, Belgium does not show a clear trend in the number of persons employed in the circular sectors (Figure 52). The same applies to private investments by these circular sectors. The added value of the circular sectors in Belgium seems to be increasing, however.

Relative to the total economy (Figure 53), the circular sectors in Belgium have a smaller share of employment than in the European Union (EU-28). The same goes for the added value. The circular sectors in Belgium do however have a larger share of private investment than in the European Union (EU-28). Based on Eurostat (2020) data, there is no clear trend in the share of circular sectors in employment, added value and private investment, both for Belgium and for the European Union (EU-28).

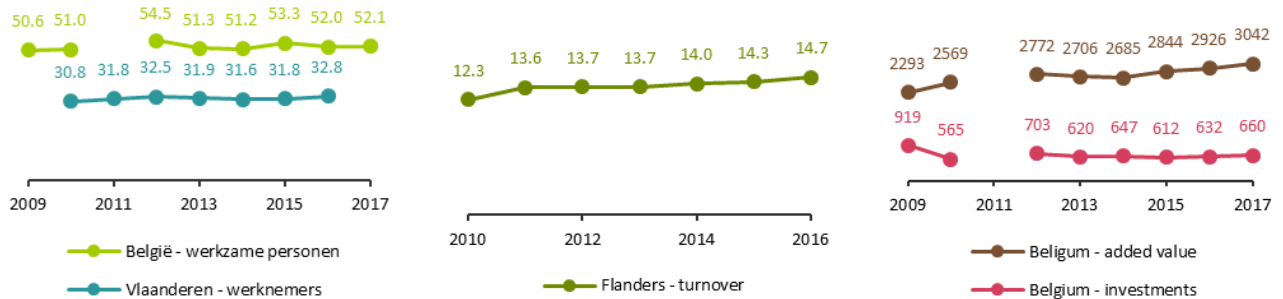


Figure 52. Circular sectors: number of persons employed in Belgium and number of employees in Flanders (1000x), turnover in Flanders (in billion euros), added value in Belgium (in million euros) and private investments in Belgium (in million euros), 2009-2017. Source: Eurostat (2020) & Bachus & Willeghems (2018).

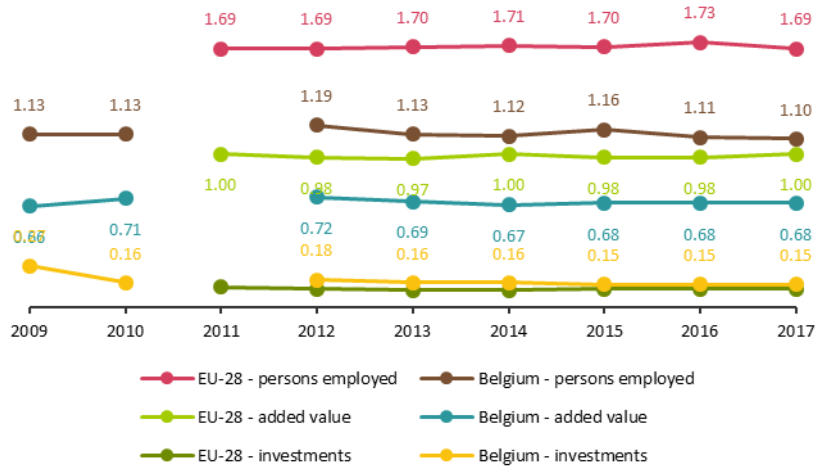


Figure 53 : Share of the circular sectors in number of persons employed, added value and private investment (%) in Belgium and the European Union (EU-28), 2009-2017. Source: Eurostat (2020).

### More information & sources

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### Box 3. The Online Symbiosis Platform

Since the end of 2019, companies can contact other companies anonymously using the online symbiosis platform - [smartsymbiose.com](https://smartsymbiose.com) - of the Flemish government. Together they can look for opportunities to achieve a symbiosis agreement. In industrial symbiosis, a material flow from one company is used as a high-quality raw material in another company. Industrial symbiosis contributes optimally to reducing the climate impact by encouraging companies to close material cycles and thus avoiding the extraction of primary raw materials (and the associated CO<sub>2</sub> emissions).

We want to stimulate the reuse of valuable materials through this platform. This may involve high-quality material valorisation of industrial residual flows, the detection of the technology required to realise the symbiosis or the use of recyclates to replace primary raw materials (recycled content). The partnership between OVAM and the symbiosis team (VITO) guarantees that the online symbiosis platform has been developed as a user-friendly, neutral and confidential platform in which companies can actively participate and thus experience the ecological and economic added value of symbiosis.

The Online Symbiosis Platform was launched at the end of 2019. In 2020, we will be able to report for the first time on the number of symbioses realised at sector level, based on aggregated symbiosis data.

Industrial symbiosis was started as a pilot project in Flanders in the context of the Factory of the Future (2012-2015). At that time, a database was developed with >300 companies and almost 2000 resources (material flows and technology) that were offered or requested. A total of 13 matches were realised, representing annual savings of approximately 1 million euros in waste and raw material costs. These experiences showed that the Flemish industry needed a platform to enable more symbiosis between companies. The economic profits realised by companies through matchmaking were higher than the costs of organising the matchmaking. Moreover, the platform can detect innovation opportunities for new recycling techniques and markets for recyclates.

Symbiosis example in the food industry: A nice example of symbiosis in food is [the collaboration between Ecover and AB Inbev](#) [website only available in Dutch] producing a detergent with a quarter of the residual waste from the AB Inbev brewery. At the end of 2019, Ecover held a symbiosis workshop with 60 enthusiastic organisations who are all convinced that waste is an opportunity rather than a problem. The Online Symbiosis Platform was also presented at that time.

Symbiosis example in construction industry: One of the realised symbioses in the construction industry is the production of Carbstone, a high-quality building material through the valorisation of steel waste. The production of stainless-steel leaves behind so-called 'slag', residual material that still contains a quantity of stainless-steel scrap. This residual fraction used to end up in landfill. These granulates still contain 2 to 3 percent valuable metal. In order to recover this, the granulate had to be ground very finely. After thorough research and in collaboration with VITO, Orbix succeeded in turning the residual product into a binding agent, which in combination with CO<sub>2</sub> can be converted into clinkers, bricks and tiles.



### 3.3.7 Size of the re-use centres

#### **What do we measure?**

The indicator measures the annual turnover and employment in the accredited re-use centres in Flanders. The accredited re-use centres report their results to OVAM every year. This indicator is used as a **proxy** for the extent of re-use in Flanders. In addition, there are many other initiatives for re-use (e.g. informal circuit, second-hand fairs, online sales) for which we do not have data.

Almost all re-use centres are sheltered workshops recognised by the Flemish Department of Work and Social Economy. Their objective is to provide training and employment to the long-term unemployed and the low-skilled (target group employees) and to ensure that these people move on to the regular labour market. The target group employees have built up knowledge and expertise in materials, raw materials and re-use. They perform tasks throughout the entire process from collection to sale.

#### **Why do we measure?**

Re-use is high on the Flemish priority ladder for the sustainable management of materials and waste. In addition to strict re-use (re-use of a discarded product in good condition by another user in the same function), re-use also includes a number of other strategies that extend the life of products and parts. It concerns repair (repair and maintenance of a broken product for reuse in its old function), refurbishment (refurbishing or modernising an outdated product) and remanufacturing (using parts of a discarded product in a new product with the same function).

The sector of the re-use centres has built up experience and knowledge in many product groups including the inspection and repair of waste electrical and electronic equipment (WEEE). In addition, there is a varied range of repair services in the private commercial sector through distribution or non-profit initiatives, local and open source.

#### **What do we see?**

We notice a strong increase in the turnover of the re-use centres in the period 1995-2018. In terms of turnover in kg, the categories “furniture”, “household goods” and “textiles” were in the top 3 in 2018. For the 2018 results, furniture is a combination of several product categories including leisure, DIY, multimedia, books and furniture. The top 3 of turnover in euros are “household goods”, “textiles” and “furniture”.

Employment in accredited re-use centres in Flanders is also increasing over time. In 2018, 4,614 FTEs were employed for the activities of the re-use centres. These are both volunteers and paid workers. Sufficient personnel with appropriate and suitable skills are required to achieve the re-use objective. This has been more difficult in recent years and is one of the reasons for the slowdown in growth. Regionally or locally, there are many differences in the offer and the number of target group employees.

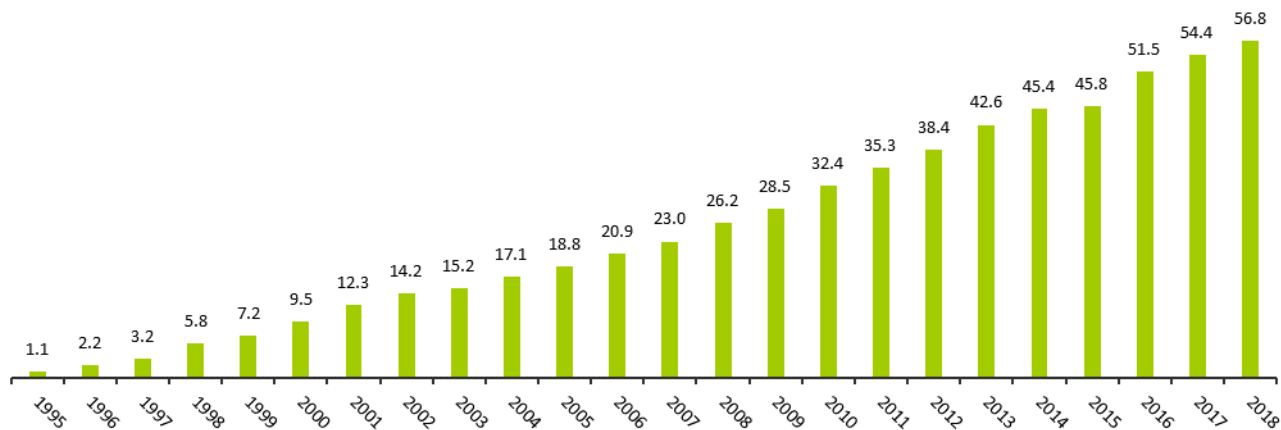


Figure 54. Evolution of the turnover (in million euros) of the accredited re-use centres in Flanders for the period 1995-2018. Source: OVAM and Herw!n.

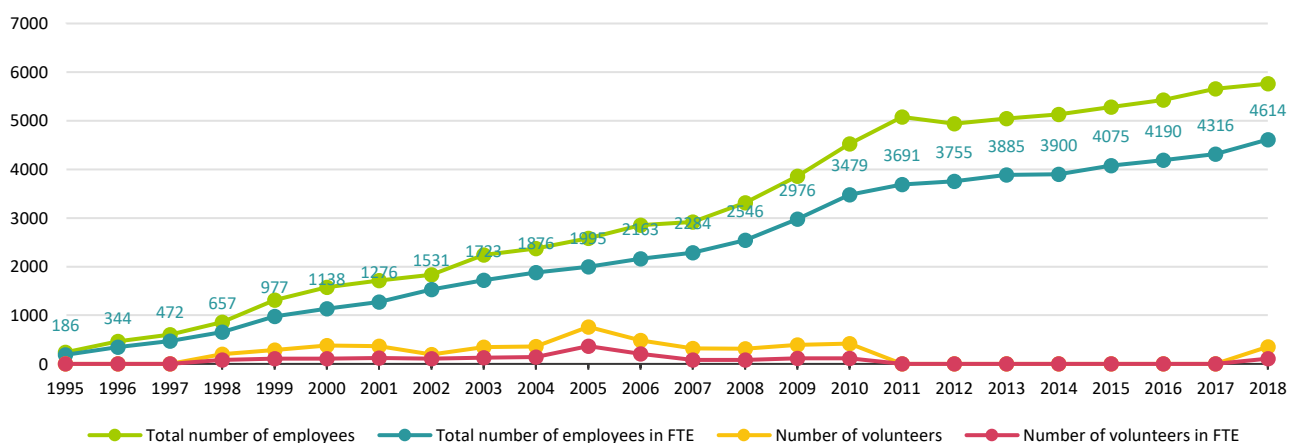


Figure 55. Evolution of employment (total and voluntary) in the accredited re-use centres (in persons and in FTEs) in Flanders, 1995-2018. Source: OVAM and Herw!n.

### Outside Flanders?

No benchmarking is possible with European figures.

### More information & sources

- Herw!n (2019). Figures and publications. Ghent. [only available in Dutch] [herwin.be/cijfers-publicaties](http://herwin.be/cijfers-publicaties)
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### 3.3.8 Implementation of circular economy strategies by companies

#### **What do we measure?**

This indicator provides insight into the extent to which companies in Flanders are engaged in circular strategies. We want to measure to what extent the circular economy is still a niche strategy in the business sector or is already widely distributed among companies in Flanders.

In the future, this indicator will be completed by using OVAM's CE Self-Assessment Tool, which will be used by a representative group of Flemish companies. OVAM also recently launched the Online Symbiosis Platform to encourage companies to use a by-product from another company as a raw material. From 2020 onwards, OVAM will be able to measure the number of initiated and/or created symbioses in Flanders (and eventually in Belgium) via this online platform.

In this report, the indicator is filled in by a proxy, namely based on the results of the 2018 Enterprise Survey of the SERV foundation "*Stichting Innovatie & Arbeid*". This survey provides an estimate of the implementation of circular economy practices in Flanders and was taken from a representative sample of 1,651 companies and organisations. The following dimensions of the circular economy are discussed: recovery of waste, residual or by-products (industrial symbiosis), repair and recycling options for own and purchased products, cooperation to share resources and product-service systems.

#### **Why do we measure?**

This indicator should rise as a result of the transition to a circular economy in which more and more companies are integrating circular practices into their business operations.

#### **What do we see?**

One in five (18.2%) companies and organisations re-use waste, residual or by-products for the same process, 16.2% use waste, residual or by-products for another process and 13.2% sell waste, residual or by-products. 14.1% use raw materials or materials from other companies or organisations for which it is waste, residual or by-products.

Nearly three in ten (27.2%) companies and organisations consider when designing or manufacturing their own product that these products can be easily disassembled, dismantled or repaired. Six out of ten (59.7%) companies and organisations also consider the extent to which products can be repaired or recycled when purchasing.

One in three companies and organisations (30.8%) cooperate in the field of logistics, 20.2% for sharing machines and tools and 27.3% for sharing building and space. One-tenth (11.3%) of companies offer a product-service system.

Table 1. Selection of answers about circular economy from the 2018 Business Survey. Source: Stichting Innovatie & Arbeid (SERV) (2019)

Circular strategy	% Flemish companies that adopt the strategy
Re-use of waste, residual or by-products for the same process	18.2
Using waste, residual or by-products for another process	16.2
Selling waste, residual or by-products	13.2
Using raw materials or materials from other companies for which it is waste, residual or by-products	14.1
Ensure that own products are easily disassembled and can be dismantled or repaired	27.2
Ensure that purchased products are easy to disassemble and can be dismantled or repaired	59.7
Working together to share resources on a logistics level	30.8
Cooperate to share resources in terms of space and buildings	27.3
Work together to share resources in terms of machines and tools	20.2
Offer product service combinations	11.3

### Outside Flanders?

The above figures are only for Flanders so no comparison with other countries is possible. However, we do find a possible benchmark in the Flash Eurobarometer 456 “SMEs, resource efficiency and green markets”. This survey measures the current level of actions on resource efficiency and green markets among European SMEs through a representative survey. This concerns other questions so that no comparison is possible with the Flemish figures of the SERV. The geographical level here is Belgium.

Table 2. Selection of responses to resource efficiency from Flash Eurobarometer 456. Source: European Commission (2018)

Campaign on resource efficiency	% of Belgian SMEs implementing the action	% of EU-28 SMEs implementing the action
Reducing waste	75	65
Saving materials	61	57
Saving energy	70	63
Saving water	46	47
Recycling, by re-using material or waste within the company	41	42
Designing products that are easier to maintain, repair or reuse	25	25
Selling scrap to another company	25	21

### More information & sources

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#### Box 4. The design phase is crucial for the environmental impact of a product

It is during this phase that action can be taken in an efficient and effective manner to reduce the environmental impact of a product during the various phases of its life cycle. Measures taken and improvements made in the design phase are much cheaper, work in the longer term and have a much greater environmental benefit than when intervention is made in the life cycle of a product at a later stage.

When designing products, it is important to look at the big picture: we have to take into account the environmental impact over their **entire lifespan** (production, transport, use, end of life). This approach also avoids the so-called “shifting” of environmental burdens to other phases or impact types.



Ontwerp	Productie	Verpakking	Transport	Processing	Recycling	Totaal
Inbouwspot met LED	6894.85	40.05	1500.77	11900	20.56	20356.23
Inbouwspot met halogeenlamp	448.85	40.05	373.25	59575	11.85	60449

Figure 56. Environmental impact of a recessed spotlight with LED versus halogen lamp - Ecoscore in mPt. Source: Ecolizer.

The recessed spot with **LED lights** is compared in the Ecolizer with the same recessed spot but with **halogen lamps** over the same time span of 25 years. The LED version scores much better than the halogen version despite the high score for the production of the electronic power component required with the LED lighting. The usage phase (“processing” in the table above) is dominant in both cases due to the energy consumption of the recessed spot.

**More information?** The **Ecolizer** ([ecolizer.be](http://ecolizer.be)) is an instrument that makes environmentally responsible design of products more accessible. The various processes, materials, packaging, transport modes required for the manufacture and use of the product are summarised as one comparable figure. Through the Ecolizer, the user tries to keep this Ecoscore, which represents the environmental impact as low as possible. **OVAM Ecodesign.link** ([ecodesignlink.be](http://ecodesignlink.be)) [website only available in Dutch] is the meeting point for everyone who is active in sustainable product innovation. It brings OVAM instruments together in a visible and accessible manner and aims to position OVAM as a cooperation partner for all actors in the product lifecycle.

## 4 INDICATORS FOR THE DIFFERENT SOCIETAL NEEDS

### 4.1 NUTRITION

#### 4.1.1 Recycling of separately collected bio-waste

##### What do we measure?

This indicator measures the number of tons of bio-waste from companies and households, which is processed in biological treatment plants in Flanders. For this, we base ourselves on the figures of the processors, which are collected by Vlaco. A distinction is made between vfg composting<sup>6</sup>, green composting and co-processing of organic-biological industrial waste (anaerobic digestion or fermentation).

Composting is a biological process in which, in the presence of oxygen, the organic-biological material is converted into stable (mature) compost. The installations can be classified according to the input material: green composting or vfg composting. The compost is used as a soil improver. These plants are also allowed to accept a limited amount of other organic-biological flows. Fermentation is an anaerobic process in which micro-organisms break down the biomass into a stable digestate. Biogas is formed during this process. The digestate is used as a fertiliser.

##### Why do we measure?

By 2030, Flanders aims to additionally recycle at least 50% of the recyclable fraction of household and industrial waste. More efficient separate collection and recycling processes for priority waste flows including organic biological waste should make this possible.

In order to monitor this, it is important to map out the entire cycle of biowaste. Closing the biological cycle starts with the collection of large quantities of green waste, vfg waste or organic-biological industrial waste where quality takes precedence. In Flanders, quality control and monitoring from input to end product takes place in all companies. The end products of these processes (composting and fermentation) are useful for the soil. The biological cycle is thus closed.

Recycling of bio-waste (fermentation or composting) is an important element in the biological cycle. Compost and digestate can improve the structure and carbon content of the soil. They contribute to a good soil management, closing biological cycles and achieving climate objectives for example, by capturing organic carbon in the soil. Biogas plants and, to a lesser extent, composting plants also play a role in renewable energy generation. Biogas or biomethane from the fermentation process is usually converted into green power and green heat in a cogeneration setup.

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<sup>6</sup> Vfg = vegetables, garden and fruit waste

## What do we see?

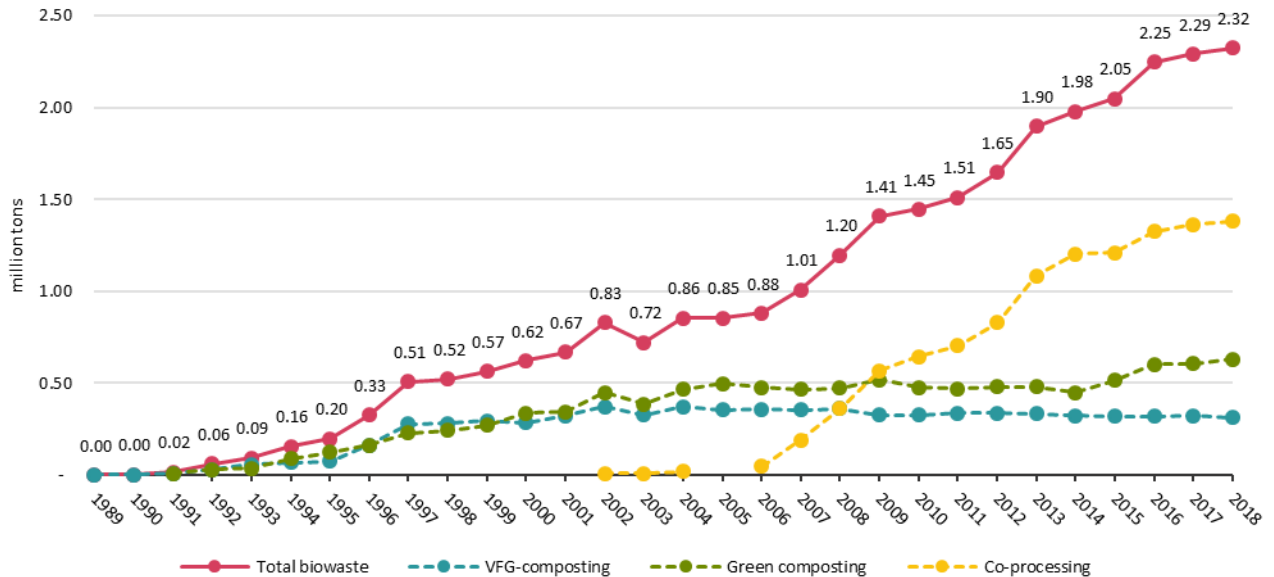


Figure 57. Evolution of the processing of bio-waste broken down into vfg composting, green composting and co-processing (in million tons) in Flanders for the period 1989-2018. Source: Vlaco (2019).

Green composting has increased in recent years. The sharp increase in fermentation of organic-biological industrial waste (mainly from the food industry and retail) in the past 10 years is the result of the development of fermentation capacity in Flanders. The amount of vfg waste processed decreases slightly. We also notice this slightly downward trend in the figures of the collection of vfg by municipalities in recent years (OVAM, 2019). This is mainly due to changes in rates for vfg waste in certain municipalities and changes in the acceptance policy at recycling parks, which sometimes results in more garden waste from households being transported directly to green composting via garden contractors.

### Outside Flanders?

We can benchmark with other European countries based on the amount of bio-waste processed per capita per year as shown in the ECN Status report 2019. Belgium ranks third here with 201 kg of bio-waste processed per capita per year after Slovenia and the Netherlands.



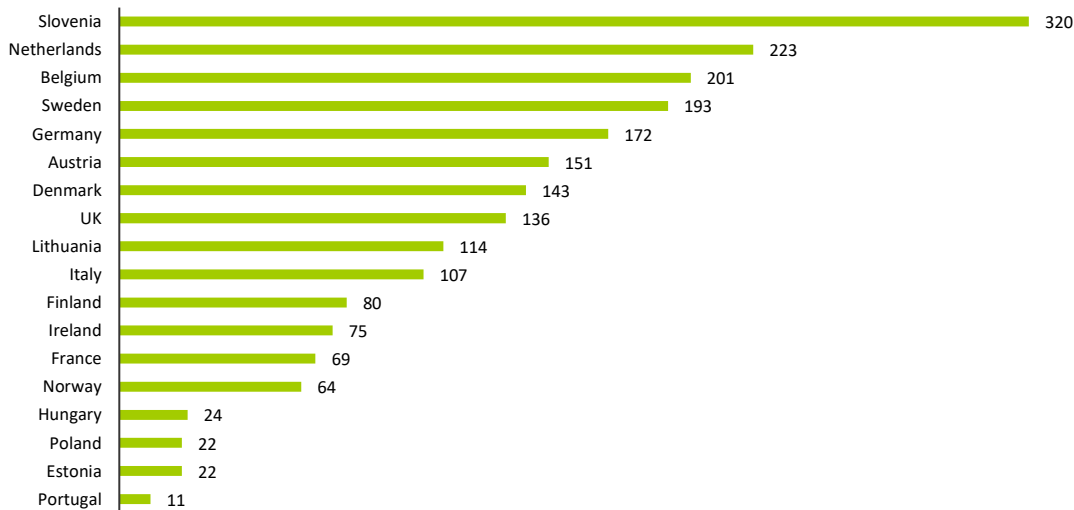


Figure 58. Annual amount of bio-waste processed per EU Member State (in kg per capita per year). Source: ECN (2019).

#### More information & sources

- Vlaco (2019). Trends in selective collection and processing in Flanders. [only available in Dutch] [vlaco.be/nieuws/trends-in-selectieve-inzameling-en-verwerking-in-vlaanderen](https://vlaco.be/nieuws/trends-in-selectieve-inzameling-en-verwerking-in-vlaanderen)
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#### 4.1.2 Biowaste in the residual waste

##### What do we measure?

This indicator represents the weight percentage of biowaste that is still present in the residual waste from households (HW) and industries (IW). This is based on the various sorting analyses that have been carried out for the different waste flows (HW and IW).

##### Why do we measure?

The biowaste that ends up in the residual waste could largely be processed in alternative ways if it were to be collected selectively. This way, maximum value could be obtained from this biomass. That is why selective collection of food waste will become mandatory for certain entities (retail, schools, hospitals, catering...) in Flanders in 2021. As a result, these companies are expected to have less residual waste and more selectively collected food waste. Because of the pursuit of the European and Flemish objectives, it is important to monitor the trends for bio-waste in HW and IW.

##### What do we see?

**In households:** In 2013-2014, biowaste still takes up approximately 25 kg of the residual waste bag per capita, which makes it the largest fraction in household residual waste. About 18 kg of it is compostable. However, we do see that the average absolute amount of biowaste in Flanders has fallen sharply over time from an average of 123 kg/capita in 1995-1996 to about 25 kg in 2013-2014. In relative terms, biowaste contributes increasingly less to the weight of the residual waste bag: from 48 to 23% by weight in the period 1995-1996 to 2013-2014. With the European selective collection obligation in mind, we can expect that these trends will continue in future sorting analyses.

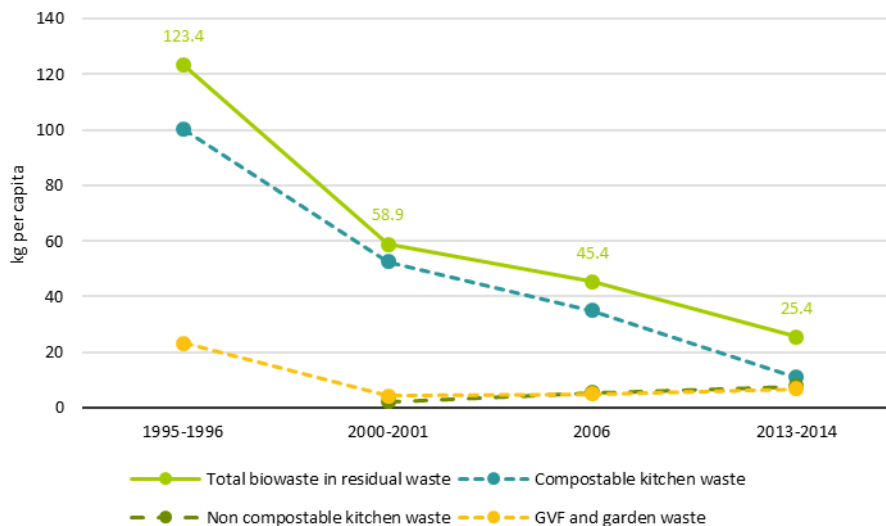


Figure 59. Evolution of biowaste in household residual waste in Flanders and its fractions (in kg per capita), 1995-2014. Source: OVAM (2015).

**Regarding industrial entities:** For the IW, sorting analysis data are limited to 2017. During this study, five waste collectors kept a fixed amount of industrial residual waste separate from both incoming wheelie bins (via compactor trucks) and dumpsters. From this, random and representative mixing samples could be collected in which waste from a minimum number of customers and compactor trucks/dumpsters was present. It should be noted here that the composition of the IW strongly depends on the sector in which a company is active. Therefore, the results of this analysis are only used to monitor major trends.

From the results for residual waste in wheelie bins, we can conclude that the share for green/garden waste is approximately 1.5% by weight. Loose/packed OBA (organic-biological waste) makes up 8.1% by weight of the residual waste. For residual waste in dumpsters, the values are similar for green/garden waste (approx. 1%) but considerably lower for loose/packed OBA (approx. 0.9%). Especially in wheelie bins, it therefore seems that progress can be made by selectively collecting biowaste. Biowaste that was categorised as sieve residue in the study may increase this share.

### Outside Flanders?

Although no comparison can be made with European figures, we can compare it with the composition of HW residual waste in the Netherlands. As in Flanders, we see a declining trend for the fraction of organic waste + indefinable residues (similar to our bio-waste fraction). In relative terms, however, biowaste in Flanders makes up a smaller part of the residual waste (23% in Flanders, compared to 32% in the Netherlands if the most recent measurements are compared).

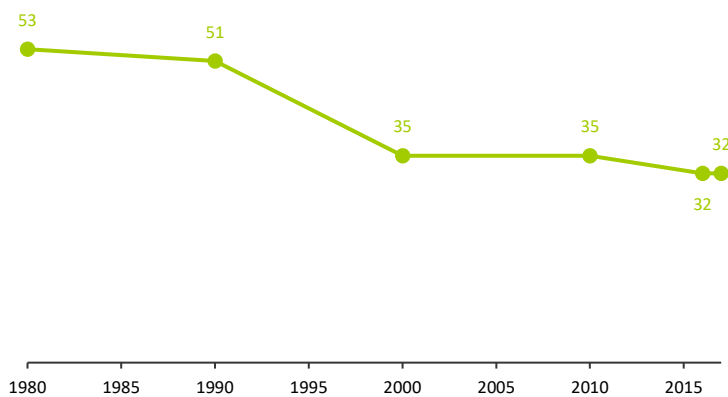


Figure 60. Evolution of organic waste and indefinable residues in household residual waste (in percentage by weight) in the Netherlands, 1980-2017. Source: Rijkswaterstaat (2019).

### More information & sources

- OVAM (2015) Sorting analysis research household waste 2013-2014. OVAM, Mechelen. [only available in Dutch] [ovam.be/sites/default/files/atoms/files/Sorteeranalyse-onderzoek-huisvuil-2013-2014-def.pdf](https://ovam.be/sites/default/files/atoms/files/Sorteeranalyse-onderzoek-huisvuil-2013-2014-def.pdf)
- OVAM (2018) Sorting analysis of residual waste collected by private collectors. OVAM, Mechelen. [only available in Dutch] [ovam.be/sites/default/files/atoms/files/Eindrapport\\_Sorteeranalyse\\_Bedrijfsrestafval\\_20180320.pdf](https://ovam.be/sites/default/files/atoms/files/Eindrapport_Sorteeranalyse_Bedrijfsrestafval_20180320.pdf)
- OVAM (2012). Sorting analysis of bulky waste and analysis of bulky waste collection. OVAM, Mechelen. [only available in Dutch] [vlaanderen.be/publicaties/sorteeranalyse-grofvuil-en-analyse-grofvuilinzameling](https://vlaanderen.be/publicaties/sorteeranalyse-grofvuil-en-analyse-grofvuilinzameling)
- OVAM (2015). Strategic plan 2015-2020. OVAM, Mechelen. [only available in Dutch] [vlaanderen.be/publicaties/strategisch-plan-ovam-2015-2020-de-ovam-zet-de-bakens-uit-voor-een-duurzaam-afval-materialen-en-bodembeheer-in-vlaanderen](https://vlaanderen.be/publicaties/strategisch-plan-ovam-2015-2020-de-ovam-zet-de-bakens-uit-voor-een-duurzaam-afval-materialen-en-bodembeheer-in-vlaanderen)
- Rijkswaterstaat (2019). Composition of household residual waste, sorting analyses 2018; average triennial composition 2017. Rijkswaterstaat, Utrecht. [only available in Dutch] [afvalcirculair.nl/onderwerpen/helpdesk-afvalbeheer/publicaties/downloads/downloads-0/samenstelling-7/](https://afvalcirculair.nl/onderwerpen/helpdesk-afvalbeheer/publicaties/downloads/downloads-0/samenstelling-7/)

### 4.1.3 Food loss

#### **What do we measure?**

This indicator measures the food losses per stage of the food chain (fisheries, agriculture, auctions, the food industry, retail, hospitality, catering and households) expressed in tons.

When food is not consumed by humans, we speak of food loss. This loss of food for human consumption does not mean that this material flow will not receive a useful destination or valorisation (e.g. as animal feed, for material and/or energy applications). A residue is the portion of food that is inedible (to humans) and is released during its processing or consumption (e.g. inedible peels). Food waste is the totality of food losses and residues that are removed from the agri-food chain intended for human nutrition.

#### **Why do we measure?**

In a circular economy, food waste is valued as high as possible in the food waste cascade of value retention. Food makes up a large part of the carbon and material footprint of the Flemish consumption. Food losses put high pressure on finite natural resources, on the environment and contributes to climate change.

In the Food Supply Chain Roadmap on Food Loss, the Government of Flanders and partners committed themselves to reducing food loss in the entire chain, from agriculture to consumer, by 15% by 2020 compared to the baseline measurement of 2015. A final measurement will be carried out in 2020 and will be published in 2021.

#### **What do we see?**

The table below shows the food losses and residues in tons per stage of the chain in 2017. For the 'agriculture', 'hospitality' and 'catering', only the figures from the baseline measurement in 2015 are available.

The food industry generates 196,235 tons of food losses (and 2.62 million tons of residues). These high figures for the food industry are due to the high production volume (including exports) and the nature of the activity (most residues are generated during processing). Households have 241,000 tons of food losses or 36.8 kg per capita. An estimated 25% of food loss in households ends up in residual waste (60,000 tons). In agriculture about 330,319 tons of food losses are generated (and 119,033 tons of residues). All losses from the moment crops are ready for harvest and cattle are ready for slaughter are included in this amount. As in the food industry, an important part of food waste in agriculture is linked to production for foreign markets.

The total food loss in Flanders (all stages together) amounts to 144 kg/capita. Note: this includes food losses linked to the food production for export. For the food industry, exports represent about half of the turnover.

Table 3. Food loss and residues per stage of the food supply chain, absolute (in tons) and relative to food production (%) in Flanders, 2015-2017. Source: Flemish Food Supply Chain Platform for Food Loss (2017, 2019).

	Food losses (= edible food waste)		Residues (= inedible food waste)
	Absolute amount in tons in 2017	Food loss (tons) compared to total production in the stage (%)	Absolute amount in tons in 2017
Fishery	1,417	6%	1,417
Agriculture *	330,319 *	4.0%	119,033 *
Auctions	9,807	0.9%	237
Food industry	196,235	1.3%	2,619,970
Retail	47,992	2.6%	22,856
Hospitality *	19,108 *	/	48,342 *
Catering *	57,090 *	/	3,005 *
Households	240,925	8%	256,447 *

\* Figures from 2015, no figures available for 2017.

### Outside Flanders?

From 2020, the European Member States must report annually on the amount of food waste per stage of the food chain (agricultural sector, food industry, distribution and retail, services (catering, restaurants ...) and households). Voluntary reports can also be submitted on the tonnage of edible versus inedible food waste, food waste that is disposed of with wastewater, food that is donated and food waste that is valorised as animal feed. The first figures will be available by the end of 2022.

The European definition of food waste includes edible and inedible food waste and is without the part that goes to animal feed, which is used in biochemistry or remains on the farm (e.g. ploughing). The scope is therefore more limited than the Flemish definition of food waste presented above.

At the moment it is difficult to benchmark because of the different definitions. From 2022, we will be able to compare food waste and the edible part of it with European Member States. For your information:

- The Fusions study (2016) estimated the global food waste in Europe in 2012 at 87.6 million tons (production, processing, distribution, hospitality, households) or 173 kg/capita.
- Food waste in the EU is included as an indicator in the EC's CE monitoring framework. In 2016, food waste in the EU was estimated at €80 million based on waste statistics.

### More information & sources

- Flemish Department of Environment (2019). Food loss and consumer behaviour among Flemish households. Research report by GfK Belgium for the Flemish Environment Department of Environment, Brussels. [only available in Dutch]
- European Commission (2020). Food waste measurement.  
[ec.europa.eu/food/safety/food\\_waste/eu\\_actions/food-waste-measurement\\_en](https://ec.europa.eu/food/safety/food_waste/eu_actions/food-waste-measurement_en)
- Eurostat (2020). Monitoring Framework.  
[ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework](https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework)
- Fusions (2016). Estimates of European food waste levels. Fusions on behalf of the European Commission, Brussels, Stockholm.
- Flemish Chain Platform for Food Loss (2017). Food waste and food losses: prevention and valorisation – Monitoring Vlaanderen 2015. Government of Flanders, Brussels. [only available in Dutch]
- Flemish Chain Platform for Food Loss (2019). Food waste and food losses: prevention and valorisation – Monitoring Vlaanderen 2017. Government of Flanders, Brussels. [only available in Dutch]

### Box 5. A healthy and climate-friendly diet without food loss contributes to a circular economy and the climate objectives

The figure below shows the share of various food products in the global carbon footprint as a result of food consumption in Flanders.



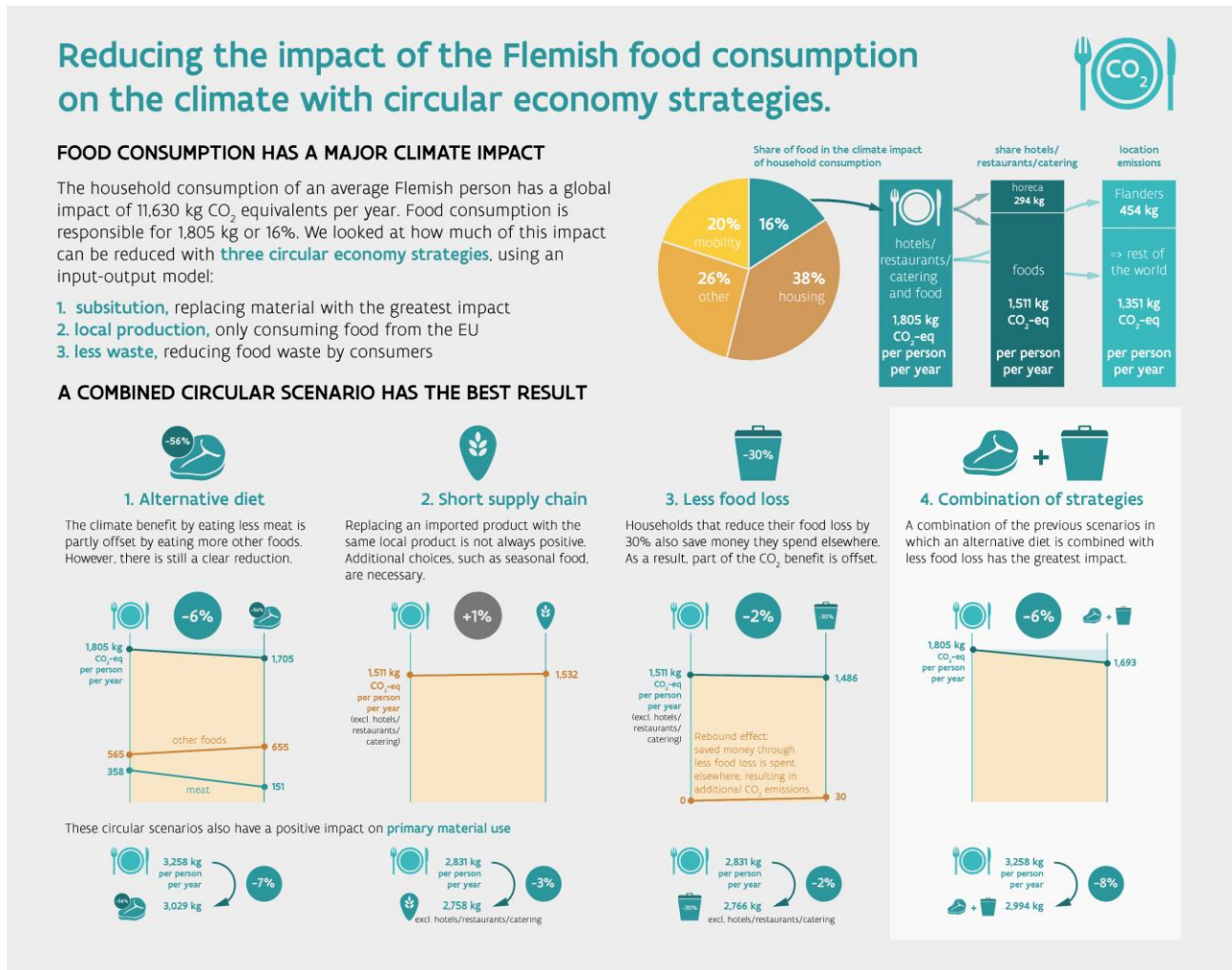
Figure 61. Global carbon footprint as a result of food consumption in Flanders per food product (kg CO<sub>2</sub>-eq.). Source: VITO (2019).

Commissioned by OVAM, VITO analysed the climate and material impact of a healthy diet, less food loss and local food production. The study looks at 3 scenarios:

- The first scenario assumes a healthy diet based on a WHO study.** This diet includes a halving of meat consumption, combined with an increase in the consumption of vegetable products. This scenario leads to a 6% reduction in global greenhouse gas emissions from food consumption. In this scenario, the type of the meat consumed was not adjusted. It goes without saying that a protein transition that takes into account the type of animal and vegetable proteins consumed can lead to higher reductions in the carbon footprint of food consumption. This is investigated in further detail in a study commissioned by the Flemish Government (see “More information”).
- The consumption of more local products** does not in itself have much impact on the carbon footprint of the food. Local production will only have an effect if this is combined with the consumption of seasonal food products. Otherwise, the impact of local production will be overshadowed by the impact needed to grow unseasonal products locally. The **reduction of food loss** also creates climate gains because less food has to be produced. The effects of decreased food waste production and food loss have also been studied by Quentin D. Read *et al.* (2020) and confirms these results.



A combination of the 3 scenarios above (alternative diet, more local production and less food loss) leads to a decrease of the carbon footprint by more than 6% and a decrease of the material footprint by more than 8%.



### More information?

- VITO (2019), Circular economy and the Flemish climate objectives, Food and textile system, commissioned by OVAM. Publication in spring 2020 on OVAM website. [only available in Dutch]
- RDC Environment (XXXX). Transition to a sustainable Flemish diet in 2030: exploration of future scenarios and social cost-benefit analysis with a focus on protein transition, less food loss and more seasonal consumption. Study commissioned by the Government of Flanders, Department of Environment. In conclusion. [only available in Dutch]
- Quentin D. Read et al. (2019). Assessing the environmental impacts of halving food loss and waste along the food supply chain. Science of the total environment, 712, 136255.

## 4.2 HOUSING

### 4.2.1 Use of alternative raw materials for primary minerals

#### What do we measure?

The total use of mineral raw materials in Flanders and to what extent their use is fulfilled by primary minerals (Flemish or import) or alternative raw materials, and the sectors and applications in which these minerals and alternatives are used are monitored in the context of the Monitoring System for Sustainable Surface Mineral Resources Policy (Dep. of Environment, OVAM and VITO, 2017). The data are collected periodically through a survey of the producers, traders and consumers of mineral raw materials. Producers of alternative raw materials achieve a response rate of almost 100%. To correct for the companies for which no results are available, the survey results are extrapolated. After an increment, two sets of preliminary results are available: (1) the producer and trader side and (2) the consumer side. The most reliable side is taken over in the final figures for Flanders.

These indicators only look at the mass balances. They do not take into account loss of quality when using the recycled materials as an alternative raw material.

**Import dependency** for primary minerals is calculated by the following formula:

$$\text{Import dependency} = \frac{\text{Use of primary minerals from outside Flanders}}{\text{Total use of mineral raw materials}}$$

in which

$$\begin{aligned} \text{Total use of mineral raw materials} \\ &= \text{Use of primary minerals from Flanders} + \text{Use of primary minerals from outside Flanders} \\ &+ \text{Use of alternative raw materials} \end{aligned}$$

The use of alternatives from outside Flanders is negligible. This indicator looks at all mineral raw materials as a whole. As a result, dependence on imports for specific minerals and their alternatives cannot be noticed.

The construction industry is the main buyer of primary minerals and alternative raw materials for applications including ready-mixed concrete (15%), pre-cast concrete products (5%) asphalt (3%) and contract works (62%). Primary minerals and alternative raw materials are also used in the ceramic industry (5%), glass industry (<1%), landfills (4%) and other applications (5%).

### Why do we measure?

The use of alternative raw materials to replace primary minerals is the only information available in Flanders on the use of alternative raw materials in the production processes. Material cycles are closed in a circular economy. After use, raw materials are reused in the economy through reuse or recycling.

Flemish policy aims to manage the available stocks of surface minerals in a sustainable manner. This means, for example, that surface minerals must be used economically, efficiently and optimally and that the use of fully-fledged alternative raw materials is encouraged. Ensuring sufficient stock of surface minerals in the long term requires insight into a series of basic data such as the total need for minerals, the import and export flows and the quantities of alternative materials that are used and are available to replace primary minerals.

The use of alternative raw materials (such as “waste materials” that are returned to the cycle) reduces the need for primary minerals. As a result, fewer primary raw materials have to be mined and a larger reserve of primary raw materials remains available.

### What do we see?

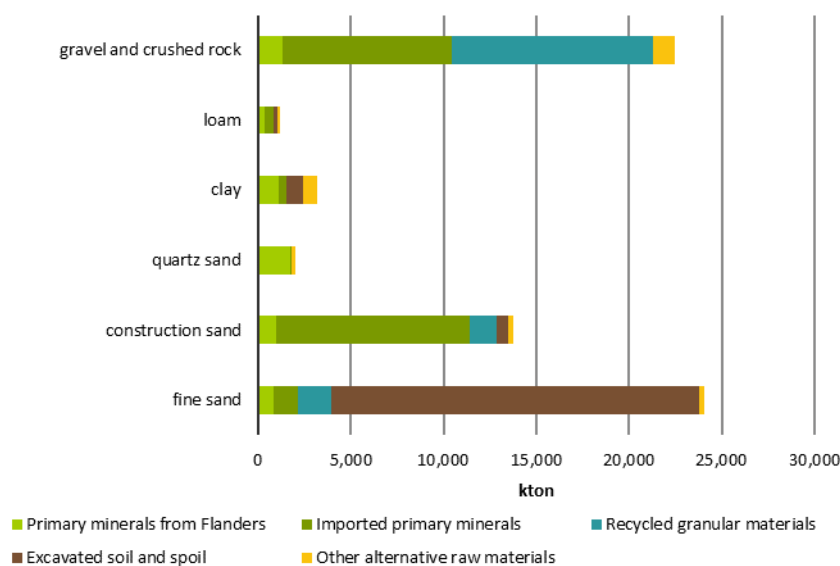


Figure 62. Use of primary minerals (Flemish, imported) and alternative raw materials (granulates, soil, other) (in kiloton) in Flanders in 2015. Source: Dep. of Environment, OVAM and VITO (2017).

Figure 62 shows to what extent primary minerals have been replaced by alternative raw materials and how many of them are imported for consumption in Flanders. In 2015, a total of almost 67 million tons of mineral raw materials were used in Flanders. 38.6 million tons or 58% of these are alternatives that have not been mined. 9% of the total input consisted of Flemish primary minerals, 33% of imported primary minerals. The main alternative raw material used in Flanders is excavated soil (14.7 million tons or 22% of the total use of raw materials), followed by recycled granular materials (13.8 million tons), dredging and clearance spoil (6.7 million

tons) and slag from metallurgy (1.4 million tons). Other material flows that are used to replace Flemish minerals include ashes from waste incineration plants and electricity generating plants and oven-ready shards of glass. For some primary minerals import account for a large part of Flemish consumption: 10.4 million tons of construction sand, 1.1 million tons of gravel and 8 million tons of gravel replacement aggregates were imported. With alternative raw materials, there is very little import but a large share of exports of slag from metallurgy (0.7 million tons) and oven-ready shards of glass (0.3 million tons). 0.5 million tons of Flemish recycled aggregates are used in the Brussels Region.

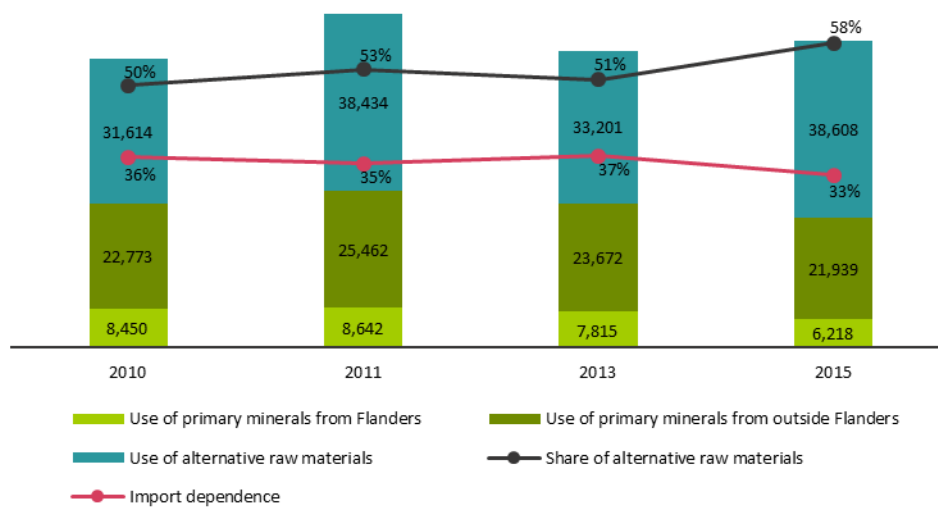


Figure 63. Total use of primary minerals from Flanders and from outside Flanders, use of alternative raw materials (in kiloton), share of alternatives in total use of mineral raw materials (%) and dependency on imports (%) in Flanders/ Source: Dep. of Environment, OVAM and VITO (2017). The use of alternatives from outside Flanders is negligible.

The total amount of alternative raw materials used to replace Flemish primary minerals increased by 5,407 tons (16%) in 2015 compared to 2013 (Figure 63). This increase is largely due to the doubling of the amount of dredging and clearance spoil. The use of recycled aggregates also explains part of the increase. After all, these amounts get greater year after year and follows the economic cycle. The amount of excavated soil declines slightly and remains more or less the same as in 2013. Usage also appears to be gradually increasing for the other alternative raw materials. This increase is mainly due to an increase in the use of mine stone, non-ferrous slag and sludge from natural stone processing.

The share of alternatives in the total use of mineral raw materials has risen in Flanders from 50% in 2010 to 58% in 2015 (Figure 63). The share of primary mineral imports fell from 36% in 2010 to 33% in 2015. This is mainly due to an increase in the use of alternative raw materials. However, this doesn't indicate that the alternative raw materials replace the import of the primary minerals. The use of alternative raw materials has increased mainly due to the increased use of dredging and clearance spoil while imports mainly consist of construction sand and crushed stone. These have other applications.

#### **Outside Flanders?**

No comparable data are available outside Flanders.

#### **More information & sources**

- Flemish Department of Environment (2008). The general surface mineral plan. Flemish Department of Environment, Brussels. [only available in Dutch] [vlaanderen.be/publicaties/het-algemeen-oppervlakedelfstoffenplan](http://vlaanderen.be/publicaties/het-algemeen-oppervlakedelfstoffenplan)
- Flemish Department of Environment, OVAM and VITO (2017). Monitoring system for Sustainable Surface Mineral Resources Policy (MDO) – Deployment of primary minerals and alternative raw materials in Flanders in 2015. Flemish Department of Environment, VPO, Brussels. [only available in Dutch] [vlaanderen.be/publicaties/jaarverslag-monitoringsysteem-duurzaam-oppervlakedelfstoffenbeleid](http://vlaanderen.be/publicaties/jaarverslag-monitoringsysteem-duurzaam-oppervlakedelfstoffenbeleid)

## 4.2.2 Recovery of construction and demolition waste

### What do we measure?

This indicator measures the percentage of construction and demolition waste that is recovered per year. It is the ratio of the amount of construction and demolition waste that is prepared for reuse, recycling including backfilling divided by the amount of collected construction and demolition waste. Energy recovery is not taken into account here. The indicator only describes the recovery of the non-hazardous mineral waste from construction and demolition activities<sup>7</sup>.

If the use as a backfilling material is not included, the recycling rate of construction and demolition waste is obtained. The recovery rate is reported as there is currently no harmonised application of the definition for backfilling at European level.

The indicator does not take into account whether the waste materials are used in a low-quality or high-quality application after recycling. Data on the reuse of mineral raw materials are missing. Data are only available on the processing of mineral raw materials released as waste.

### Why do we measure?

Construction and demolition waste is one of the largest waste flows in Flanders and Europe. Many building materials can be recycled or reused. According to European Directive 2008/98/EC, the recovery rate must be at least 70% by 2020.

Important factors to be able to put these materials back into the economy and to retain their quality as much as possible are the design of building materials and structures, selective demolition of structures, acceptance procedure with the crushers, as well as quality assurance of the recycled materials.

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<sup>7</sup> Waste code EWC-Stat 12.1 according to Regulation 2150/2002 on waste statistics

### What do we see? Outside Flanders?

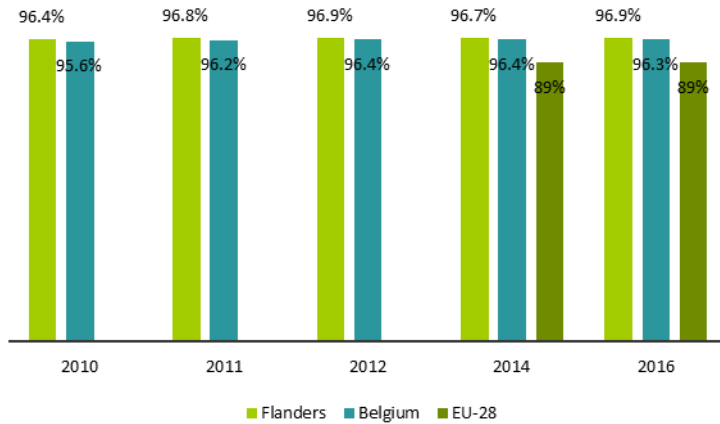


Figure 64. Recovery of construction and demolition waste (%) in Flanders, 2010-2016. Source: OVAM (2019) for Flanders and Belgium & Eurostat (2020) for the European Union (EU-28).

Construction and demolition waste is a very large waste flow that dominates all the waste statistics. More than 15 million tons of construction and demolition waste are crushed into recycled aggregates every year. Moreover, this amount is rising sharply. The largest amount of mineral waste from construction and demolition activities is recycled and returned to construction activities. This in itself does not immediately suggest that there is a problem. However, based on the Monitoring System for Sustainable Surface Mineral Resources Policy (Dep. of Environment, OVAM and VITO, 2017), it appears that most granulates are used in sub-foundations, which is a fairly low-value application. Moreover, we hear from the sector that the granulate market is almost saturated.

#### More information & sources

- Eurostat (2020). Treatment of waste by waste category, hazardousness and waste operations (env\_wastrt) [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_wastrt&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wastrt&lang=en)
- Flemish Department of Environment, OVAM and VITO (2017). Monitoring system for Sustainable Surface Mineral Resources Policy (MDO) – Deployment of primary minerals and alternative raw materials in Flanders in 2015. Flemish Department of Environment, VPO, Brussels. [only available in Dutch] [vlaanderen.be/publicaties/het-algemeen-oppervlaktedelfstoffenplan](https://vlaanderen.be/publicaties/het-algemeen-oppervlaktedelfstoffenplan)
- OVAM (2019). Waste framework directive – recycling and recovery targets.

### 4.2.3 Landfilled construction and demolition waste of Flemish origin

**What do we measure?** This indicator is twofold. On the one hand, we consider the amount of landfilled inert waste materials of Flemish origin. We use this as a proxy for the amount of landfilled construction and demolition waste. On the other hand, we consider the amount of landfilled asbestos cement and asbestos-containing waste of Flemish origin. Both (sub-)indicators only include waste that is landfilled in Flanders. The starting point is the data from OVAM (2019) on tariffs and capacities for landfilling and incineration.

Why can we use the amount of inert waste as a proxy? Since 2006, the “inert waste” fraction mainly comprises construction and demolition waste. In 2006, a European decision with stricter standards for inert waste came into effect. The strict acceptance standards ensure that mainly construction and demolition waste falls under “inert waste”. These are waste materials that can cause little or no pollution of the underlying soil, groundwater or the nearby environment. In practice, it concerns mixtures of concrete, bricks, tiles and ceramics; glass waste; and uncontaminated soil with stones. About 95% by weight of construction and demolition waste consists of inert materials: the stony debris. This includes concrete debris, masonry debris, a mixture of both (“mixing debris”), ceramic debris and/or natural stone. A large part of this is recycled and reused, for example as a sub-foundation. The rest is landfilled (OVAM, 2013).

Note that the inert waste materials of Flemish origin that are landfilled are also included in the macro indicator Incinerated, co-incinerated and landfilled waste of Flemish origin (paragraph 3.2.5). In this indicator we look at the inert waste separately. The same applies to landfilled asbestos waste.

#### **Why do we measure?**

Construction activities have a major impact on the environment. Globally, they are responsible for nearly 40% of energy consumption and 50% of global raw material consumption.

Flanders wants to build structures with materials circulating in closed loops. That is why OVAM, together with the stakeholders drew up a prevention programme for the period 2014-2020 (OVAM, 2013). The programme contains measures for further closing the material cycles. The goal is: as little material loss as possible. For more information, see the indicator *Recovery of construction and demolition waste* (paragraph 4.2.2).

In the circular economy, we close the material cycles. However, hazardous substances such as asbestos must be removed from the economy. OVAM pursues an active asbestos reduction policy. Flanders wants to be asbestos-safe by 2040 (OVAM, 2020).



### What do we see?

In the period 2012-2018, we see a clear decrease in the supply of inert waste materials of Flemish origin to landfill sites. In 2018, only 4,002 tons were landfilled, compared to almost 34,000 tons in 2012. For more information, see the indicator *Recovery of construction and demolition waste* (paragraph 4.2.2).

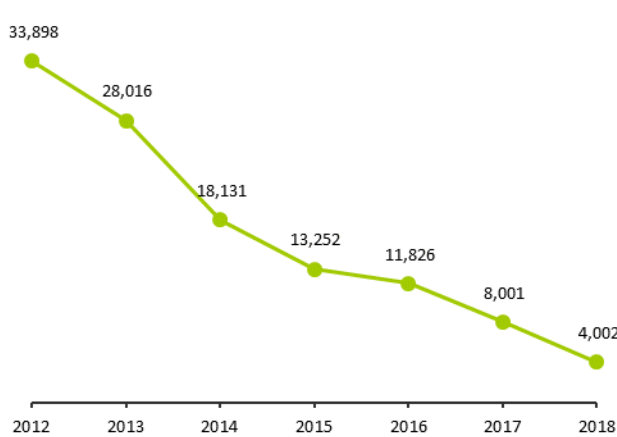


Figure 65. Quantity of inert waste of Flemish origin, which are landfilled in Flanders (in tons), 2012-2018. The quantities deposited in landfills of category 1, 2 and 3 have been taken into consideration. Source: OVAM (2019).

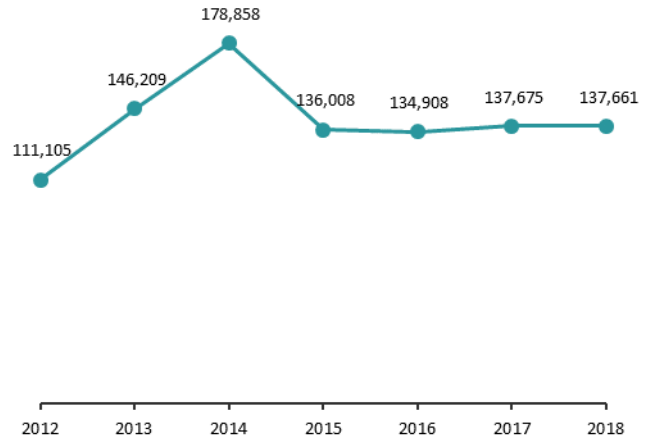


Figure 66 . Quantity of landfilled asbestos waste of Flemish origin (in tons), 2012-2018. Source: OVAM (2019).

The asbestos waste of Flemish origin varies greatly between 2012 and 2015. The peak in 2014 of almost 179,000 tons is striking. On the one hand, this peak was caused by a large share of asbestos-cement production waste from ex-officio clean-ups in the Kapelle-op-den-Bos region (approximately 31,000 tons). On the other hand, OVAM started in 2014 to elaborate an Action Plan for asbestos phase out on behalf of the Flemish Government. As of 2015, the total quantity is stable at approximately 136,000 tons. The share of “other asbestos waste” landfilled is decreasing but the share of landfilled asbestos cement waste is increasing and peaked in 2018. In this year, the asbestos reduction policy had a further start with the approval of the Action Plan for Asbestos Phase Out. The asbestos reduction policy is expected to further increase this indicator in the coming years.

### Outside Flanders?

Comparable, recent data for other countries in Europe are not available.

### More information & sources

- OVAM (2013). Material-conscious building in cycles. Prevention programme for sustainable materials management in the construction sector 2014-2020. OVAM, Mechelen. [only available in Dutch] [ovam.be/materiaalbewust-bouwen-kringlopen](https://ovam.be/materiaalbewust-bouwen-kringlopen)
- OVAM (2019). Tariffs and capacities for landfilling and incineration – Update until 2018. OVAM, Mechelen. [only available in Dutch] [ovam.be/tarieven-en-capaciteiten-voor-storten-en-verbranden](https://ovam.be/tarieven-en-capaciteiten-voor-storten-en-verbranden)
- OVAM (2020). Towards an asbestos-safe Flanders. OVAM, Mechelen. [only available in Dutch] [ovam.be/naar-een-asbestveilig-vlaanderen](https://ovam.be/naar-een-asbestveilig-vlaanderen)

## **Box 6. Material impact of energy renovations**

**Limit - in new constructions but especially in renovations, not only the energy use required for heating (greenhouse gas emissions) but also the environmental impact of the production, use and end-of-life of the materials in the building.**

Too often, the impact of building(s) and living is equated with the greenhouse gas emissions that arise when heating buildings. This is too biased for 2 reasons. Firstly, the impact of the chosen materials on land use, particulate matter, human toxicity, aquatic ecotoxicity... must also be taken into account. Secondly, focussing on the usage phase (mainly heating) is not enough. The production, transport, construction, maintenance and end-of-life of the materials (all steps in the life cycle) must also be included in the figures.

OVAM had various renovation and new construction scenarios evaluated. The scenarios vary in E-level, insulation, material choices, installations (ventilation, hot water, solar panels...) ... The emissions of CO<sub>2</sub>-eq. were compared to the total environmental impact. The total environmental impact is the sum of the impact on all indicators (incl. greenhouse gas emissions), in all steps of the life cycle. Each indicator has its own unit. To sum up, each unit is converted to euros.

The renovation scenarios showed that a lower E-level is usually associated with a lower total environmental impact. Nevertheless, for a specific E-level, there are large differences in the total environmental impact. These differences may be due, for example, to (the materials in) solar panels or to the replacement of materials that do not directly contribute to the energy efficiency of the construction. This means that a renovated dwelling with a low E-level can have a higher total environmental impact than a dwelling with an E-level that is not so good.

The results of various new construction scenarios differ much less from one another. In new constructions, the choice of materials is – relatively speaking – more important.

Finally, it turned out that the impact of materials weighs more if the total environmental impact is calculated than if only CO<sub>2</sub>-eq. emissions are calculated. The choice of indicators therefore has a significant effect on the research conclusions.

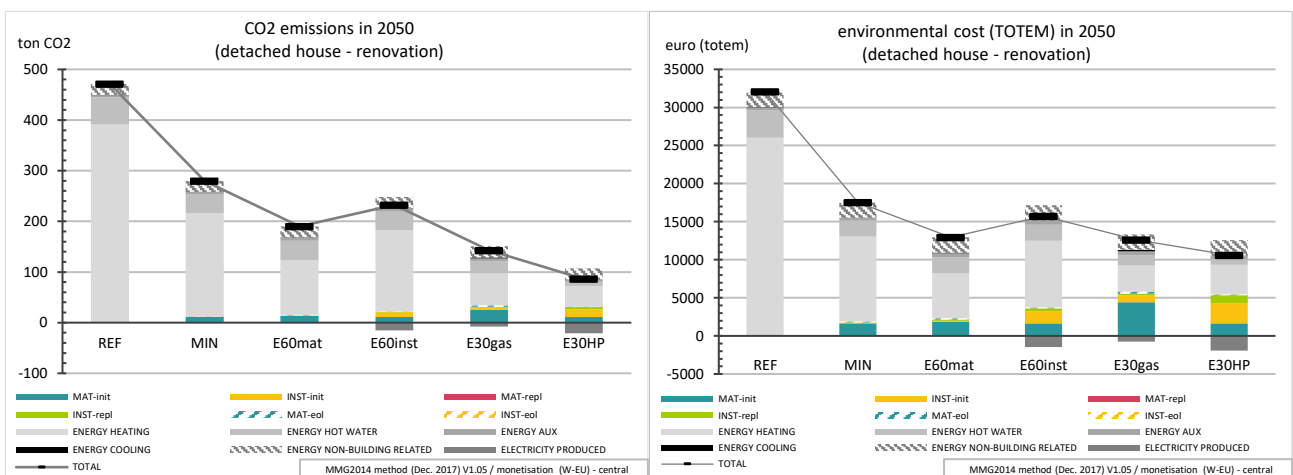


Figure 67. Emissions of CO<sub>2</sub> eq. and total environmental impact of 6 renovation scenarios of the same detached house. Delem L. *et al.* (2019).

The two figures show the CO<sub>2</sub> emissions and the total environmental impact of 6 renovation scenarios of the same detached building, respectively: status quo (no renovation measures), minimal renovation, renovation up to E-level E60 (focus on insulation), renovation up to E60 (focus on efficient installations), renovation to E30 level (incl. condensing gas boiler), renovation to E30 (incl. heat pump). The figure illustrates that a house that meets the E60 level may have a lower overall environmental impact than a house that achieves a better E-level. The optimum may therefore lie between measures that improve the E-level and measures that limit the impact due to materials.

### More information?

Delem L., Janssen A., Vrijders J. & Wastiels L. (2019). The impact of materials needed for renovation and new housing. BBRI on behalf of OVAM. Publication in spring 2020 on the OVAM website.

## 4.3 CONSUMER GOODS

### 4.3.1 Packaging: put on the market, recycling rate and in residual waste

#### A. Amount of single-use packaging put on the market

##### **Why do we measure?**

The indicator measures the quantity (in tons) of single-use packaging that has been put on the market in Belgium. It concerns both single-use household and single-use industrial/commercial packaging. The geographical level of the indicator is Belgium as no division can be made into the 3 regions.

Eurostat has a dataset on packaging and packaging waste to monitor compliance with the quantitative targets for recovery and recycling. The data are collected following the Directive 94/62/EC on packaging and packaging waste as recently amended. The Belgian figures are reported to Eurostat by the Interregional Packaging Commission (IRPC).

##### **Why do we measure?**

In a circular economy, the goal is to use more reusable packaging instead of single-use packaging. The single-use packaging that is still put on the market must be recycled to the maximum (see the following indicator).

One of the basic principles of the Integrated Packaging Policy of Flanders is to make packaging as environmentally friendly as possible. This means that the packaging that is put on the market is designed in such a way that it is reusable, has a long lifespan and can subsequently be recycled to a high standard with maximum value retention of the material. The packaging is made from recycled and easily recyclable raw materials (fossil or bio-based). Biodegradable or compostable raw materials are only used when this has a function or added value. One of the objectives of the Integrated Packaging Policy is that by 2025, all packaging that is put on the market will be reusable, recyclable, compostable or biodegradable.

##### **What do we see?**

Globally speaking, the quantity of single-use packaging that is put on the market in Belgium is increasing. When we relate the growth of the amount of single-use packaging put on the market to GDP, we see that there has been a relative decoupling in recent years. Population growth in Belgium follows roughly the same trend as the amount of single-use packaging put on the market in Belgium.

In the period 2008-2017, the total number of tons of single-use packaging put on the market in Belgium increased by 5.9%. If we also take into account the reusable packaging that is put on the market for the first time in accordance with the Eurostat methodology, the increase in the total quantity of packaging amounts to 5.4% in 2008-2017. Plastic packaging (14.5%), paper and cardboard (8.6%) and wood (5.7%) showed a larger increase while metals (-9.9%) and glass packaging (-0.7%) have seen a decrease in the number of tons put on the market.

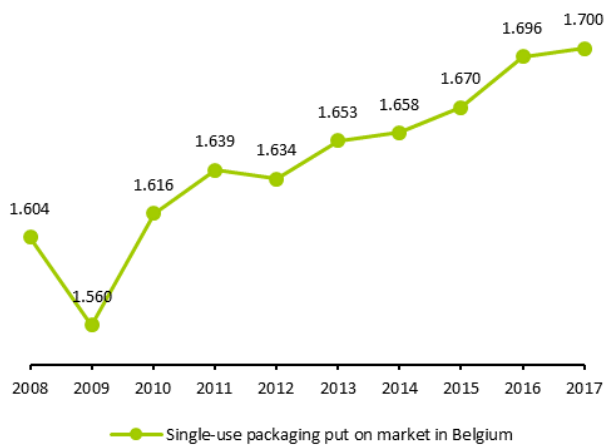


Figure 68. Evolution of the amount of single-use packaging (household + industrial/commercial) put on the market (in million tons) in Belgium, 2008-2017. Source: IVC.

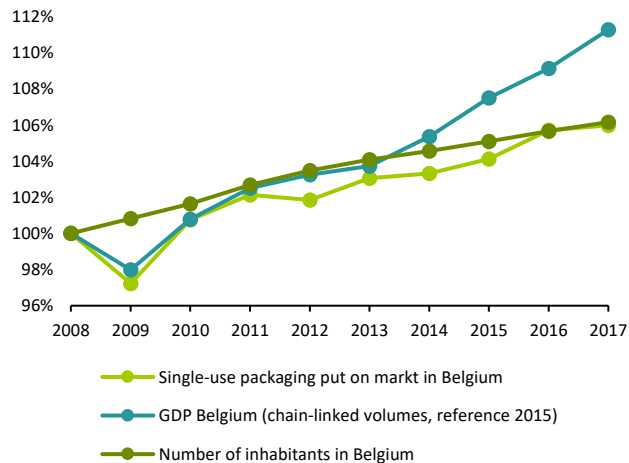


Figure 69. Evolution of the amount of single-use packaging (household + industrial/commercial) put on market, GDP and growth number of inhabitants (index 2008) in Belgium, 2008-2017. Source: IVC, NBB, Statbel.

### Outside Flanders?

Benchmarking with European figures is possible based on Eurostat data on packaging and packaging waste. The generated packaging waste per capita is used as a basis for comparison. In Belgium, this indicator was 157 kg/capita in 2017 while the EU-28 average was 173 kg/capita (Eurostat, 2020).

### More information & sources

- Eurostat (2020). Packaging waste by waste management operations and waste flow (env\_waspac). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_waspac&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_waspac&lang=en)
- IVC (2019). Activity report 2018. IVC, Brussels. [only available in Dutch] [ivcie.be/wp-content/uploads/2018/10/Activiteitenverslag-2018-gecorrigeerd-NL\\_web.pdf](https://ivcie.be/wp-content/uploads/2018/10/Activiteitenverslag-2018-gecorrigeerd-NL_web.pdf)
- OVAM (2018). Packaging policy and litter policy 2.0. Draft note to the Flemish government. OVAM, Mechelen. [only available in Dutch]
- <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=LEGISSUM%3A121207>

## B. Recycling rate of packaging

### **What do we measure?**

This indicator measures the recycling rate of all packaging put on the market in Belgium, both household and industrial/commercial packaging. "Recycling" within the meaning of article 6 (1) of Directive 94/62/EC means the total amount of packaging waste recycled divided by the total amount of packaging waste generated.

The Interregional Packaging Commission (IRPC) calculates the global results of packaging recycling in Belgium based on the results of the accredited compliance organisations (Fost Plus and Valipac) and of the individual responsible companies. In the calculation method determined by the European Commission, the figures still have to be adjusted on a number of points (e.g. packaging of free-riders, reusable packaging put on the market for the first time).

### **Why do we measure?**

In a circular economy, the single-use packaging put on the market is recycled to the maximum.

In accordance with Directive (EU) 2018/852 amending Directive 94/62/EC on packaging and packaging waste, there are EU targets for the recycling of single-use packaging (see table below). At Belgian level, in the context of the take-back obligation for packaging, stricter objectives have been set in the interregional Cooperation Agreement on the prevention and management of packaging waste (ICA).

Table 4. Recycling targets for packaging (EU and Belgium). Source: European Commission and OVAM

	EU	EU	Belgium – ICA	Belgium – ICA	Belgium – ICA
	2025	2030	2020	2023	2030
<b>Plastics</b>	50%	55%	50%	Domestic: 65% Industrial/commercial: 55%	Domestic: 70% Industrial/commercial: 65%
<b>Wood</b>	25%	30%	80%	-	-
<b>Ferrous (ferro) metals</b>	70%	80%	90%	-	-
<b>Aluminium</b>	50%	60%	75%	-	-
<b>Glass</b>	70%	75%	90%	-	-
<b>Paper and cardboard</b>	75%	85%	90% *	-	-
<b>All packaging</b>	65%	70%	-	-	-

\* the 90% target applies to both paper/cardboard and beverage cartons

### What do we see?

In 2017, Belgium already achieved most of the EU targets for packaging waste in 2025 and 2030. For plastic packaging, an increase in the recycling rate is still required to achieve the EU goals of 2025 and 2030. With regard to the objectives in the new ICA, the challenge also lies primarily in increasing the recycling rate of plastic packaging.

Table 5. Recycling rate for packaging in 2017 (Belgium and EU-28). Source: Eurostat (2020a)

Packaging by type of material	Packaging recycling rate in 2017	
	Belgium	European Union (EU-28)
Plastics	44.5%	41.9%
Wood	83.7%	40%
Metals	98.5%	79.7%
Glass	100%	74.4%
Paper/cardboard	92.9%	84.7%
Others	6.2%	-
Total	83.8%	67%

### Outside Flanders?

The recycling rate of packaging waste is included as an indicator in the EU Monitoring Framework for the circular economy. The recycling rate of packaging waste in Belgium is higher than the EU-28 average for all materials (see table above).

### More information & sources

- Eurostat (2020a). Recycling rates for packaging waste.  
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[ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework](https://ec.europa.eu/eurostat/web/circular-economy/indicators/monitoring-framework)
- IVC (2019). Activity report 2018. IVC, Brussels. [only available in Dutch]  
[ivcie.be/wp-content/uploads/2018/10/Activiteitensverslag-2018-gecorrigeerd-NL\\_web.pdf](https://ivcie.be/wp-content/uploads/2018/10/Activiteitensverslag-2018-gecorrigeerd-NL_web.pdf)

## C. Packaging in household waste

### **What do we measure?**

The amount of packaging that is present in residual waste in Flanders can be derived from the sorting analyses of household waste. These analyses are repeated approximately every 5 years.

### **Why do we measure?**

The amount of packaging that (still) ends up in the residual waste can be an indicator of its effective selective collection and the recyclability of the materials. Within a circular economy, it can be expected that avoiding packaging and/or recycling is a priority with the ultimate goal of reducing raw material loss.

In Flemish policy, packaging crops up in several places: “Memorandum on Packing Policy and Litter Policy 2.0”, OVAM’s business plan (2019), the strategic plan 2015-2020 and the Implementation Plan for Household Waste and Comparable Industrial Waste. The amount of packaging in the residual waste does not appear in the objectives. However, given the various policy initiatives, the absolute amount of packaging in residual waste can be expected to decrease. The relative contribution of packaging to residual waste should also decrease.

### **What do we see?**

In 2013-2014, packaging waste took up approximately 26% of household waste. Compared to 1995-1996, the positive effect of selective collection on the absolute amount of packaging in the residual waste is clear (from approx. 41 kg to approx. 29 kg). In the same period, however, the total amount of residual waste per capita also decreased considerably. As a result, the weight percentage of packaging has continued to rise to more than 25 per cent by weight in 2013-2014. Due to this dependence, it seems appropriate to link any targets to the absolute amount.

The vast majority (approx. 88%) of the packaging waste in the residual waste was eligible for selective collection and recycling. Within packaging, plastics account for the largest share although the absolute amount continues to decrease over the years to 11.7 kg in 2013-2014. The total amount of PMD (Plastic bottles and flasks, Metal packaging, Drink cartons) in the residual waste has increased again after previous decreases after the minimum value of 4.1 kg per capita in 2006. In 2013-2014, the amount of PMD rose to 5.62 kg per capita (or approx. 5%). The current sorting message apparently still causes considerable confusion among citizens. Furthermore, paper and cardboard account for approximately 4.2 kg per capita or 5 per cent in 2013-2014. This percentage has also increased since the penultimate measurements. For glass, however, a continuous decrease can be observed.



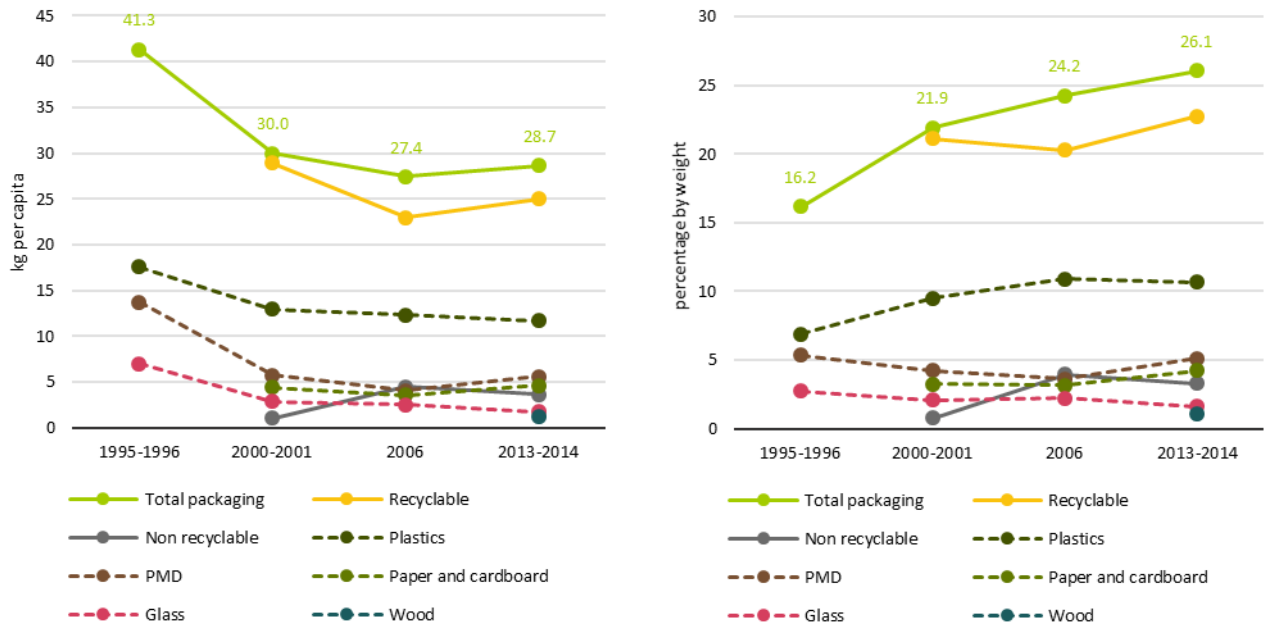


Figure 70. Evolution in (different fractions of) packaging in household residual waste (in kg per capita and as a percentage by weight in relation to total residual waste), 1995-2014. Source: OVAM (2015).

### Outside Flanders?

No comparable data are available outside Flanders.

### More information & sources

- OVAM (2015) Sorting analysis research household waste 2013-2014. OVAM, Mechelen. [only available in Dutch] [ovam.be/sites/default/files/atoms/files/Sorteeranalyse-onderzoek-huisvuil-2013-2014-def.pdf](https://ovam.be/sites/default/files/atoms/files/Sorteeranalyse-onderzoek-huisvuil-2013-2014-def.pdf)
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### 4.3.2 Textiles: collection and in residual waste

#### **What do we measure?**

The Selective Textile Collection Indicator includes the amount of textile waste that is selectively collected in Flanders each year. On the one hand, this concerns quantities that are recorded by municipalities, intermunicipal companies and management organisations and collected via the annual Online Waste Materials Survey. On the other hand, the amount of selectively collected textiles from companies can be derived from the biennial industrial waste statistics. The data for this come from a sample of the reported data from the Integrated Environmental Annual Report (IMJV).

In addition, the amount of (household or comparable) textiles that is still present in the residual waste from households (HW), industry (IW) or bulk waste can provide insight into another aspect of textile waste. The various sorting analyses that have been carried out for these different waste flows (HW, IW or bulk waste) form the basis for this indicator.

#### **Why do we measure?**

Textiles can be a valuable waste material, which is why it is best to collect them selectively. Depending on their composition, textiles can thus be included in high-quality processes (e.g. recycling, re-use). Textiles that end up in the residual waste are not processed in this manner and leave the material cycle. In the context of the circular economy, it is therefore important to aim for a minimal amount of textile in the residual waste.

Flanders is taking various actions to increase the selective collection of household textiles. Furthermore, companies are obliged to selectively collect textiles. In bulk waste, efforts are also being made to improve the selective collection of textiles (see, for example, the URBANREC project: [urbanrec-project.eu/](http://urbanrec-project.eu/)).

#### **What do we see?**

The amount of selectively collected household textiles has risen considerably since the beginning of the measurements. In the period 2012-2015, there was a temporary dip in the amounts of household textiles. In 2018, the selective collection was 8.14 kg per capita.

For each capita, increasingly more textiles are ending up in household residual waste. For example, we see an increase in the amount of textile per capita in household residual waste from 1995-1996 (5.5 kg/capita) to 2013-2014 (7.79 kg/capita) while the total amount of residual waste per capita is down. Relatively, we therefore see a sharp increase in the percentage by weight of textiles for this time interval. From this, we can conclude that there is still room for improvement for textiles in the HW. However, for contaminated textiles (e.g. oil, rags), collection via residual waste is the only option. For a more recent evaluation of the current efforts regarding selective collection, we have to wait for the figures from the HW sorting analysis that is being carried out at the time of writing.

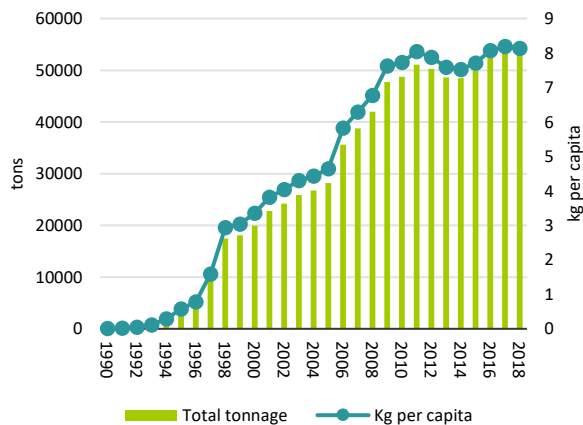


Figure 71. Evolution of the amount of selectively collected textiles (in tons and kg per capita) in Flanders, 1990-2018. Source: OVAM.

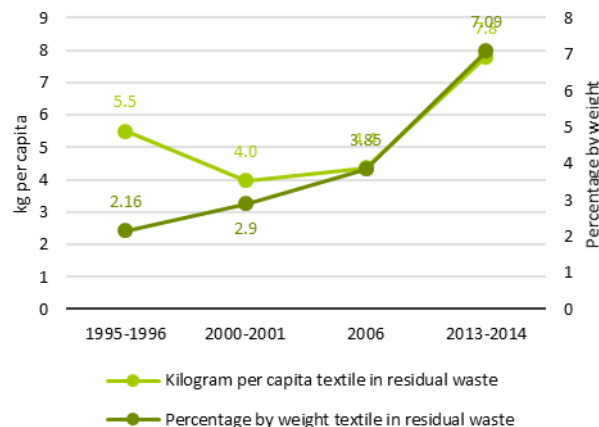


Figure 72. Evolution of the amount of textiles in the household residual waste (in kg/capita and percentage by weight) in Flanders, 1995-2014. Source: OVAM (2015).

In the IW, household (or comparable) textiles account for a small part of the residual waste (2.4% by weight in dumpsters, 1.5% by weight in wheelie bins in 2017). This indicates that the obligation of selective collection is largely complied with. The evolution of textiles in the IW cannot be traced due to the absence of sorting analyses for other years.

Finally, textiles account for about 6% by weight of the bulk waste collected from house to house. If only the reusable materials in bulk waste are considered, textiles represent 5.7% by weight. Considerable gains can also be made for bulk waste by investing in improved selective collection. It should be noted that textiles in bulk waste are often part of mattresses or furniture, for instance. The separate collection therefore also strongly depends on the dismantling possibilities of the products.

### Outside Flanders?

At European level, the available data on selectively collected textile waste is fairly limited. A comparison of the figures for a number of European countries shows that Germany and the UK are doing better than Flanders in terms of collection per capita. At the moment, Flanders is not performing badly at all compared to France, for example. In absolute terms, the total selective collection is much higher in Germany, France and the UK. The figures for the Netherlands and Sweden are not fully comparable due to the exclusion of shoes in the calculations.

Table 6. Comparison of the quantities of selectively collected household textile waste (kg per capita and kiloton) for a number of European countries. Source: Watson *et al.* (2018).

	Flanders (2018)	Germany (2013)	Denmark (2010)	France (2016)	Netherlands (2012)	Sweden (2013)	UK (2010)
<b>Kg per capita</b>	8.14	12.5	7.4	3.2	5.4*	2.4*	11
<b>Total collection (kiloton)</b>	54	1011	39	214	89*	23*	619

\* Excl. shoes

A comparison of the evolution in selective collection is possible with the Netherlands (Figure 73). In terms of size, the amounts collected per capita are comparable to those in the Netherlands. The increasing trend in selective collection is similar in both regions. However, more textiles are collected selectively per capita in Flanders.

At European level, the textile fraction in residual waste is not monitored. A comparison with the figures from the Netherlands shows a similar increase in weight percentage for more recent years. Absolute figures are not available. As in Flanders, no reason is given for the relative increase in the textile fraction.

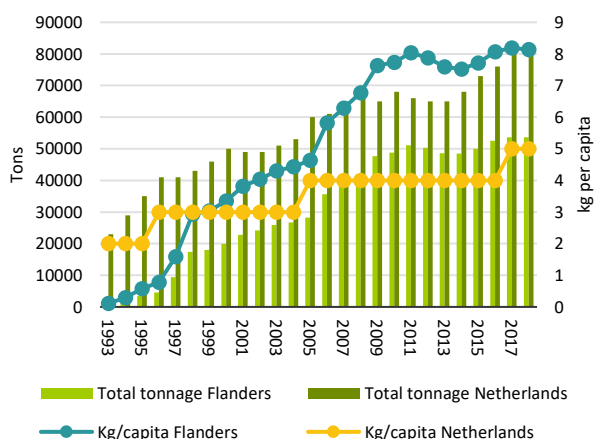


Figure 73. Evolution of the amount of selectively collected textiles (in tons and kg per capita) in Flanders and the Netherlands (1993-2018). Sources: Central Bureau of Statistics (Netherlands), OVAM.

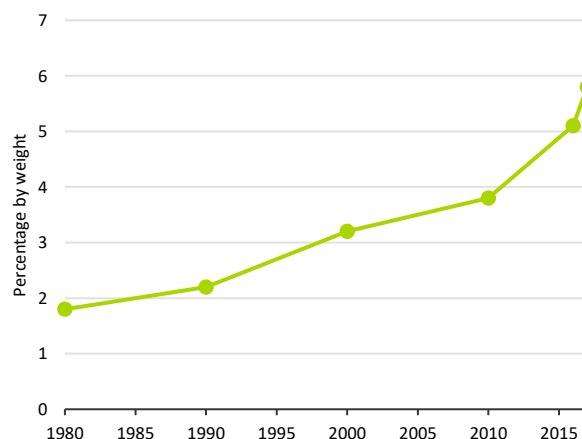


Figure 74. Evolution of the running average percentage by weight textiles in household residual waste in the Netherlands (1980-2017). Source: Rijkswaterstaat (2019).

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- Watson *et al.* (2018). Used Textile Collection in European Cities. Study commissioned by Rijkswaterstaat under the European Clothing Action Plan (ECAP) [ecap.eu.com/wp-content/uploads/2018/07/ECAP-Textile-collection-in-European-cities\\_full-report\\_with-summary.pdf](https://ecap.eu.com/wp-content/uploads/2018/07/ECAP-Textile-collection-in-European-cities_full-report_with-summary.pdf)
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### **Box 7. Local production, reuse and recycling give impetus to a circular textile industry in Flanders that contributes to the climate objectives**

Commissioned by OVAM, VITO investigated the effects of a more local circular textile chain aimed at high-quality textiles with a longer lifespan versus a linear textile chain based on the import of cheap textiles of low quality and short lifespans. A more local circular textile chain provides more local employment and a slight increase in CO<sub>2</sub> emissions in Flanders. However, this increase is more than offset by a drop in global CO<sub>2</sub> emissions along the entire chain.

Three scenarios have been investigated:

- **Extending the life of textiles via leasing systems.** In this scenario, the Fleming consumes part of his textile purchases via a leasing system. We assume 100% leasing for baby and toddler clothing, 50% leasing for children's clothing and 40% leasing for adult clothing.  
The global carbon footprint of this leasing scenario is 16 per cent lower than the current textile system and the material footprint is 22 per cent lower. The decrease in the carbon and material footprint can mainly be attributed to reduced production and processing of raw materials outside Europe. The leasing sector requires additional activity in Flanders itself and therefore leads to a small increase in local CO<sub>2</sub> emissions. Employment shows a similar trend with a decline in employment in the textile pre-chain but an increase in Flanders as a result of the new leasing services.
- **More local production of textiles that last longer.** In this second scenario, 15% of the Flemish demand for textiles is produced by Flemish producers, 10% by producers in the rest of Belgium and 75% by European producers. These local producers deliver high-quality products that can be used up to three times longer but also cost up to four times more. The production and processing of basic raw materials remains localised abroad.  
In total, the largest reductions in global greenhouse gas emissions are achieved in this scenario but the emissions of local greenhouse gases are increasing due to the concentration of production activities in Flanders and Europe. The material footprint also decreases significantly. Due to the combination of less labour-intensive production in Europe and the assumption that high-quality production in Europe leads to a reduced demand for new textile fibres, there is also a marked decrease in the number of jobs in the production and processing of basic raw materials.
- **More recycling of textile fibres.** This third scenario analyses the impact of the recycling of textile fibres. Taking into account the technical feasibility, we assume that for both clothing and home textiles, half of the textile fibres can be replaced by textile fibres that are recycled in Europe. The production of clothing still takes place in the same geographical locations as that of the current textile system.  
Overall, global greenhouse gas emissions are decreasing by about 8%. 87% of this decrease is located outside Europe. Demand for materials is down by 11%, 64% of which is located outside Europe and is due to lower demand for agricultural products. Since agriculture is an important sector in the employment of cheap labour outside Europe, the number of jobs in the total pre-chain is also decreasing.

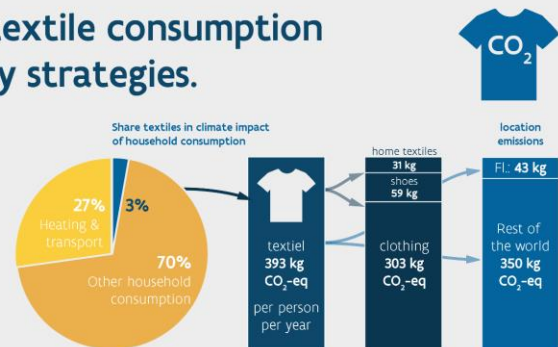
Finally, all previous textile scenarios were also combined. This combined scenario is resulting in a decrease in global greenhouse gas emissions from the textile system by approximately 30% and a decrease in global materials demand by approximately 53%.

## Reducing the impact of the Flemish textile consumption on the climate with circular economy strategies.

### THE CLIMATE IMPACT OF FLEMISH TEXTIEL CONSUMPTION

The household consumption of an average Flemish person has a global impact of 11,630 kg CO<sub>2</sub> equivalents per year. Textile consumption is responsible for 393 kg of 3%. We looked at how much of this impact can be reduced with **three circular economy strategies**, using an input-output model:

1. **Reuse**, part of the clothes are not bought but rented
2. **Recycling**, up to 50% of the textile fibers are recycled
3. **Local production**, high-quality production only in Europe



### A COMBINED CIRCULAR SCENARIO HAS THE BEST RESULT



### More information?

VITO (2019), Circular economy and the Flemish climate objectives, Food and textile system, commissioned by OVAM. Publication in spring 2020 on OVAM website. [only available in Dutch]

### 4.3.3 Electrical and electronic equipment: put on the market, collection and recycling rates

#### **What do we measure?**

Waste legislation considers the following equipment to be electrical and electronic equipment (EEE): equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1 000 volts for alternating current and 1 500 volts for direct current, and which are subject to the acceptance obligation. Waste electrical and electronic equipment (WEEE) is all EEE which is waste including all parts, sub-units and consumables that are part of the product at the time of disposal.

A distinction can be made between household EEE on the one hand and professional EEE on the other. Household EEE are EEE used in households or similar EEE but used in businesses (e.g. computers or refrigerators). On the other hand, there are the professional EEE. These are equipment that are normally never used in a household. They are equipment that are only used within a professional context.

The collection rate is the percentage obtained by dividing the total weight collected WEEE by the average weight of EEE put on the market in the previous three years in that Member State. The recycling/reuse rate and the recovery rate are calculated by dividing the weight of the WEEE recycled/reused and recovered by the weight collected of WEEE.

Anyone who collects, trades, brokers, exports abroad via notification, processes WEEE or prepares WEEE for reuse is obliged to report this to the Member State. This obligation also applies to waste streams that are collected and processed outside the Recupel system. EEE distributors are also required to report how much WEEE they received from customers. In addition, every producer/importer of EEE is obliged to report on the quantities of EEE that were put on the market in Belgium and WEEE that were collected and processed on their behalf. The non-profit association Recupel was founded by importers and producers of electrical and electronic equipment. It is responsible for the practical implementation of the WEEE take-back obligation. The Recupel system is financed with environmental contributions. For household EEE, Recupel makes an estimate of the Flemish quantities put on the market and collected in proportion to the number of inhabitants and/or the location of the companies concerned, which may, however, be active in several regions.



### Why do we measure?

In a circular economy, EEE is reused and maximally collected and recycled at the end of its life for material recovery. Appropriate collection and recycling not only reduce the pressure on our natural resources but also protects people and the environment from pollution such as refrigerant gases.

The existing Flemish policy on WEEE is strongly guided by Directive 2012/19/EU on WEEE. It was published on 24 July 2012 and supersedes Directive 2002/96/EC. Prior to 2016, the collection target of discarded EEE in VLAREMA was 11 kg per capita per year (4% according to the Directive). As of 2016, it has been replaced by a minimum collection rate of 45% compared to the average weight of EEE put on the market in the previous three years, in accordance with the EU Directive. As of 2019, the annual collection rate to be achieved is 65% or alternatively 85% compared to the amount of available WEEE by weight. For recovery, recycling and reuse, objectives have been defined for each category of WEEE (see VLAREMA regulation).

### What do we see? Outside Flanders?

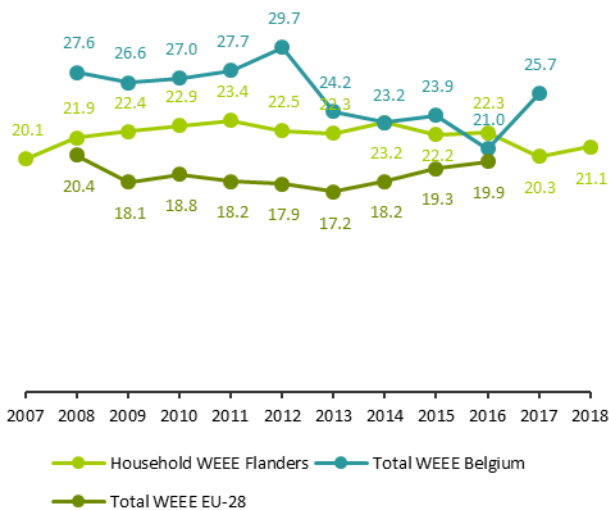


Figure 75. Quantity of total EEE put on the market (in kilograms per capita) in Belgium and the European Union (EU-28) and amount of household EEE put on market in Flanders, 2007-2018. Source: Eurostat (2020) and Recupel (2019).

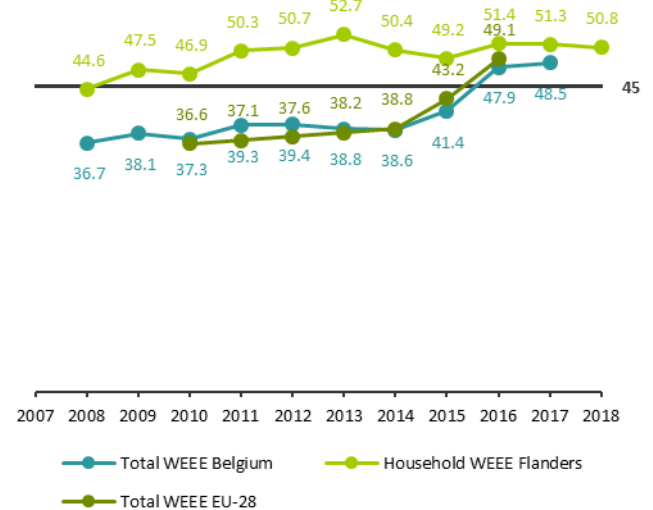


Figure 76. Collection rate (%) for the total WEEE in Belgium and the European Union (EU-28) and for household WEEE in Flanders, 2007-2018. Source: Eurostat (2020) and Recupel (2019). Own calculation of collection rate in Flanders based on quantities put on the market and collected the previous three years.

The amount of EEE put on the market in kilograms per capita does not show a clear trend. The total weight of WEEE put on the Belgian market was 295 kilotons in 2008 and 292 kilotons in 2017. In comparison with the European average, more EEE is marketed per capita in Flanders/Belgium. In 2017, the stock of EEE in Belgian homes was estimated at 378 million items according to a study by FFact on behalf of Recupel.

The collection rate for household WEEE in Flanders shows a slightly increasing trend. The 45% target for the period 2016-2019 has been achieved. The collection rate for household WEEE in Flanders is higher than for Belgium (46.1% in 2018, not shown). The minimum collection rate is also achieved for the total of WEEE (household and industrial together) (no data at Flemish level). Belgium scores as well as the European average. Because Recupel has been focusing on fighting free-riders for years, the amount put on the market in Belgium is well estimated. However, a good estimate of the quantity put on the market puts the Belgian collection rate at a disadvantage compared to the other Member States.

The target of 65% from 2019 is a challenge. Research by Deloitte shows that 30% of the electrical equipment put on the Belgian market is currently untraceable. To achieve this 65%, an important first step is to reliably map all waste flows in each phase. This was why the online registration and reporting tool [BeWEEE tool](#) was developed.

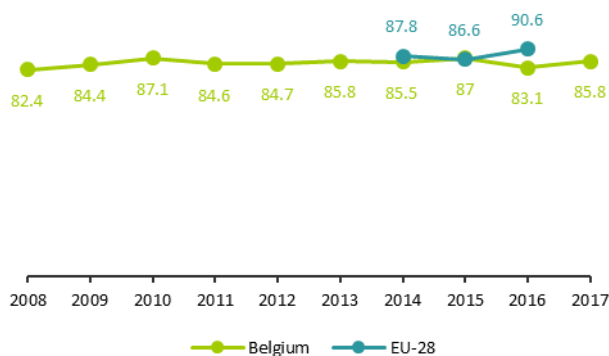


Figure 77. Recovery rate (%) for WEEE in Belgium and the European Union (EU-28), 2008-2017. Source: Eurostat (2020).

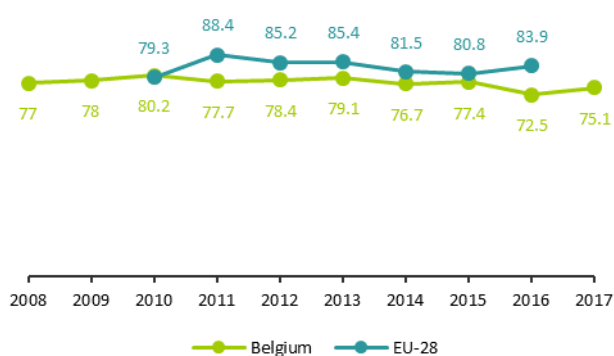


Figure 78. Recycling and reuse rate (%) (right) for WEEE in Belgium and the European Union (EU-28), 2008-2017. Source: Eurostat (2020).

The recycling and reuse rate, and the recovery rate for WEEE in Belgium remains constant over the period 2008-2017. Belgium scores slightly lower than the European average. These percentages are calculated based on the amount collected, not the amount offered for processing. Since some of the reporting agents in BeWEEE indicate how much they collect for processing but do not indicate how many materials have been recycled, the recycling rate is underestimated.

The processors with which Recupel works are contractually obliged to work in accordance with the European CENELEC standard and achieve the recycling and recovery targets.

### More information & sources

- Eurostat (2020). Waste electrical and electronic equipment (WEEE) by waste management operations (env\_waselee). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_waselee&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_waselee&lang=en)
- Recupel (2019). Report 2018 – Environmental policy agreements regarding the take-back obligation of waste electrical and electronic equipment – Reporting of collection and recycling results. Recupel, Brussels. [only available in Dutch]

#### 4.3.4 Batteries: put on market, collection and recycling rate

##### What do we measure?

The legislation defines 3 categories of batteries: portable, industrial and automotive batteries. Bebat has developed a handy [decision tree](#) to determine which category a battery belongs to. The limit for a portable battery is 3 kg.

For discarded batteries and accumulators, extended producer responsibility applies, by means of the take-back obligation. The take-back obligation applies from 1 June 1998. The non-profit association [Bebat](#) has been active since 1996 and aims to collect and recycle all used batteries and accumulators (portable, industrial and automotive) in order to recover them. Bebat reports to the Belgian regions on the portable, industrial and automotive batteries put on the market in Belgium. In addition, Bebat reports the figures of the batteries that are collected and processed in Belgium. The processors of the batteries in Belgium and abroad provide the regions with the input and output of materials for calculating the recycling rates.

The number of batteries put on the market is only known for Belgium, not for Flanders. Since 2010, declarations include information on whether a battery is portable or industrial. Before 2010, this division was estimated using the ratio in 2010. However, the total amount of batteries collected is known for Flanders. Bebat makes an estimate of the amount of portable batteries collected by deducting the collected industrial batteries (e.g. batteries from electric bicycles) and automotive batteries and using different allocation keys per processing category (all details in the Bebat annual reports).

The **collection rate** is the percentage obtained by dividing the weight of the waste batteries and accumulators that have been collected by the average weight of batteries and accumulators that producers sell directly to the end user or supply to third parties to sell to the end user during that calendar year and the previous two calendar years. Bebat determines the collection rate for portable batteries in Belgium. An estimation of the percentage is also communicated for Flanders. Therefore, the batteries put on the market are distributed among the regions based the population.

The **recycling rate** or recycling efficiency is the percentage obtained by dividing the mass of the output fractions produced during recycling by the mass of the input fractions of the discarded batteries and accumulators. The output fraction is the mass of materials produced from the input fraction as a result of the recycling process that can be used without further treatment for their original purpose or for other purposes and are no longer considered waste.

### Why do we measure?

As few materials as possible are lost in a circular economy. Batteries are reused as much as possible and as many as possible are collected after use for material recycling. This means that part of the demand for materials can be met by recycled materials. In addition, through appropriate collection and recycling, the negative impact of batteries on the environment is minimised.

When converting the European Directive (2006/66/EC) to the collection target, the Flemish region set the collection target (only for portable batteries) at 45%, the same as the EU Directive. Minimum recycling targets apply to portable, industrial and automotive batteries: 65% for lead batteries, 75% for nickel cadmium batteries and 50% for other waste batteries.

### What do we see? Outside Flanders?

More and more manufacturers equip their devices with rechargeable lithium batteries as shown figure 79. In 2018, a total of 4,920 tons of portable batteries were put on the Belgian market, of which approximately 34% (weight%) are rechargeable. The rechargeable portable batteries are sold for 79% (weight %) together with the equipment. In 2020, Bebat will investigate a method to monitor the market evolution of disposable versus rechargeable batteries. To make comparisons between rechargeable versus non-rechargeable, not only the numbers or weight of batteries put on the market are relevant. The mAh (Milliampere-hour) must also be considered, since rechargeable batteries, for the same weight, provide much more energy through, among other things, longer and intensive use.

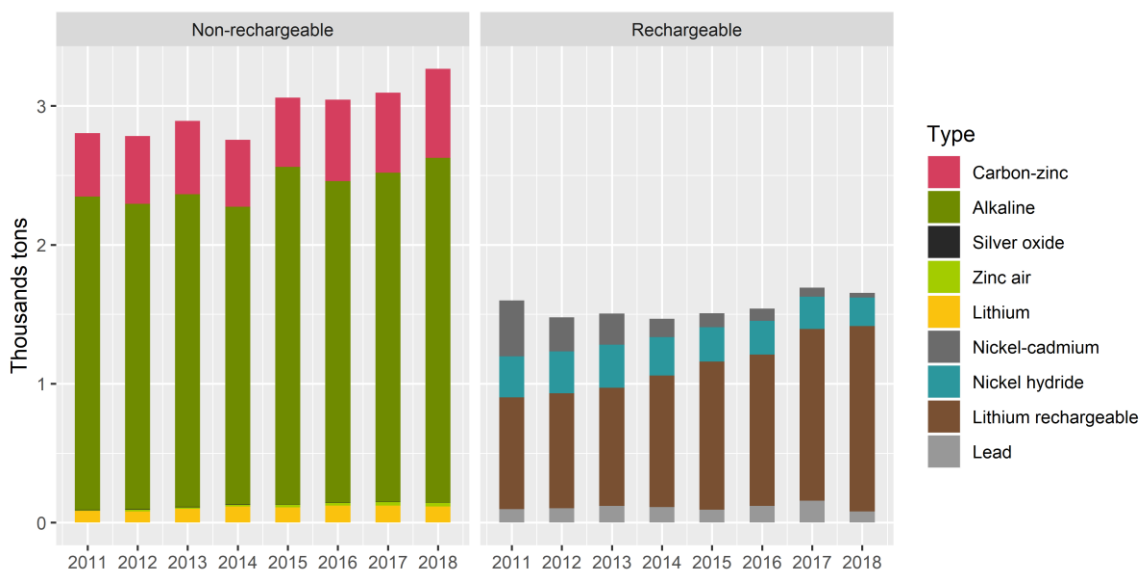


Figure 79. The weight of non-rechargeable and rechargeable portable batteries put on market in Belgium (x1000 tons), 2011-2018. Source: Bebat (2019).

The collection rate of portable batteries is above the 45% target of Europe and Flanders (Figure 80). The collection rate in Belgium declined from 2003. This can be explained by the increase in the weight of rechargeable batteries put on the market, which are only available for collection after a long time period. The increase between 2009 and 2010 is mainly attributable to the transition to the European formula for calculating the collection rate. After 2010, the percentage starts to rise again. The estimate of the collection rate for Flanders also shows on an upward trend. 2016 was an exceptional year due to a particularly successful collection campaign in Flemish schools (K3 campaign). The selective collection has reached cruising speed for several years. Belgium remains a world leader in the collection of waste batteries.

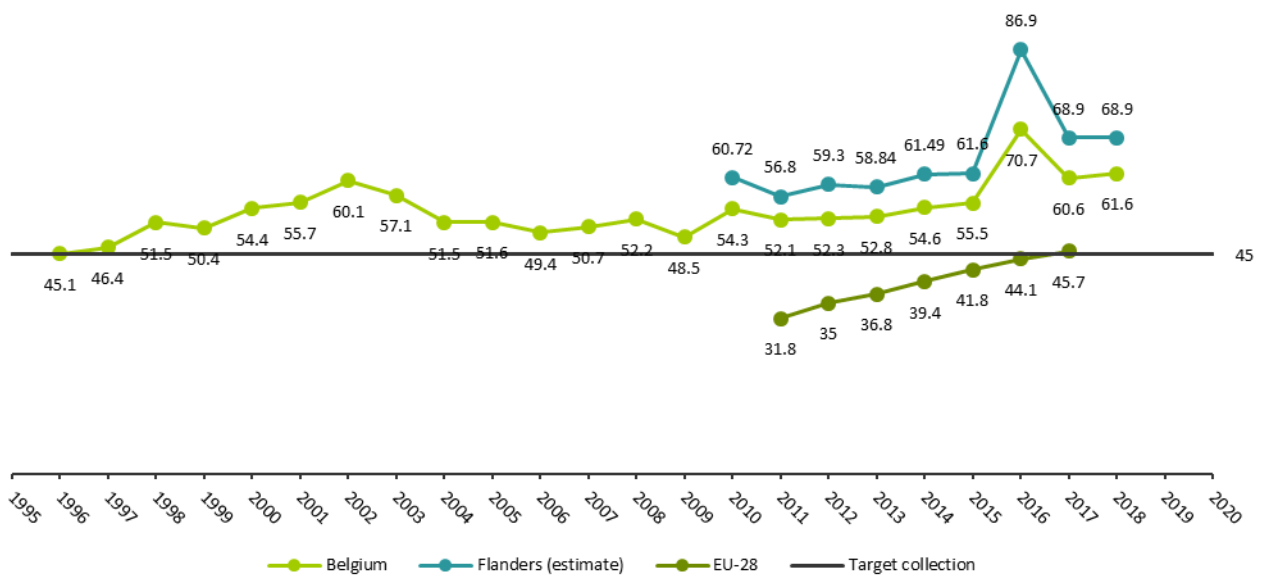


Figure 80. The collection rate (%) for portable batteries for Flanders, Belgium and the European Union (EU-28). Source: Bebat (2019) & Eurostat (2020a).

There are batteries that do not enter the Bebat system. For portable batteries, the main factor for this is the export of second-hand products containing batteries (whether or not used) such as mobile phones, computers and other personal electronic equipment. Household waste analyses show that only 10 to 12% of the batteries still end up in household waste.

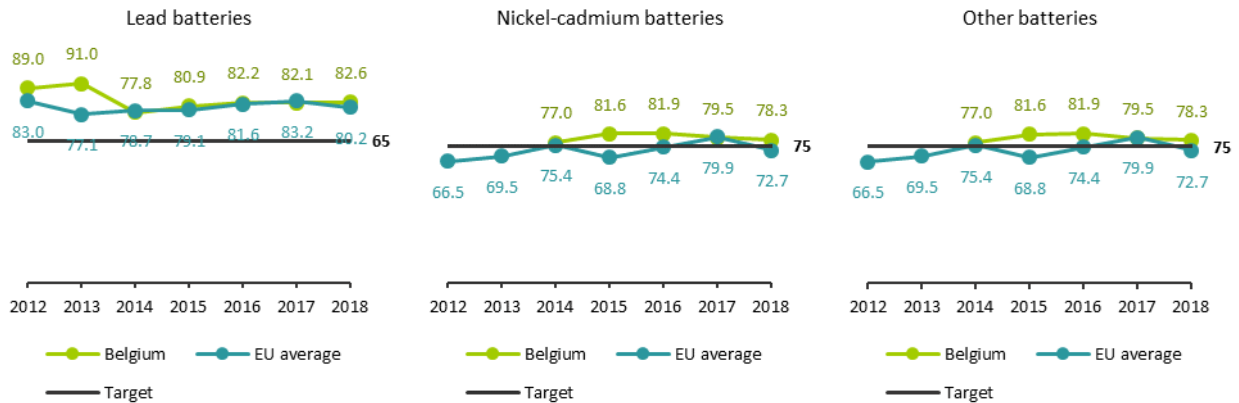


Figure 81. Recycling rate (%) of all lead batteries, nickel cadmium batteries and other batteries for Belgium and target for the recycling rate. Source: Eurostat (2020b). Own calculation of European average based on available data (unofficial).

All recycling targets are met by Belgium. The decrease in the recycling rate of other batteries in 2018 is due to a change in the destination of the slags that arise during the recycling process (applied to a landfill, instead of recycling application). Due to their weight, slags have a major influence on the calculated recycling rate, therefore the recycling rate can change significantly from year to year.

Based on the data available on the Eurostat website, Belgium achieves good recycling rates compared to other European Member States. As the information for many Member States is missing, no official European average is available. Based on data on the Eurostat website, OVAM calculated an average for the European Member States. These are not official figures.

### More information & sources

- Bebat (2019). Annual report Bebat 2018 for waste batteries and accumulators. Bebat, Tienen, 130 p. [only available in Dutch]
- Eurostat (2020a). Sales, collection and recycling of portable batteries and accumulators (env\_waspb). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_waspb&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_waspb&lang=en)
- Eurostat (2020b). Recycling of batteries and accumulators (env\_wasbat). [appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env\\_wasbat&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasbat&lang=en)

### Box 8. Portable batteries in a circular economy

The environmental impact of portable batteries that are consumed in Flanders strongly depends on: (1) the type of battery we buy, (2) how many of these batteries we collect for recycling and (3) how these batteries are ultimately recycled. The use of rechargeable batteries should be encouraged. The selective collection of batteries should be as high as possible. Functional recycling should be pursued.

The figure below compares the total environmental impact of the production and recycling process for 3 different types of portable batteries. The environmental gains (negative values) from functional recycling and non-functional recycling have also been calculated. Both the impact within and outside Flanders has been taken into account during the life cycle analyses. The total environmental impact consists of 16 impact categories including climate change, human toxicity, land, water and consumption of raw materials ...

The following batteries have been compared: zinc carbon (average AA and AAA battery 1.5V), alkaline (average AA and AAA battery 1.5V), rechargeable lithium (4.2V but 1.5V also exists).

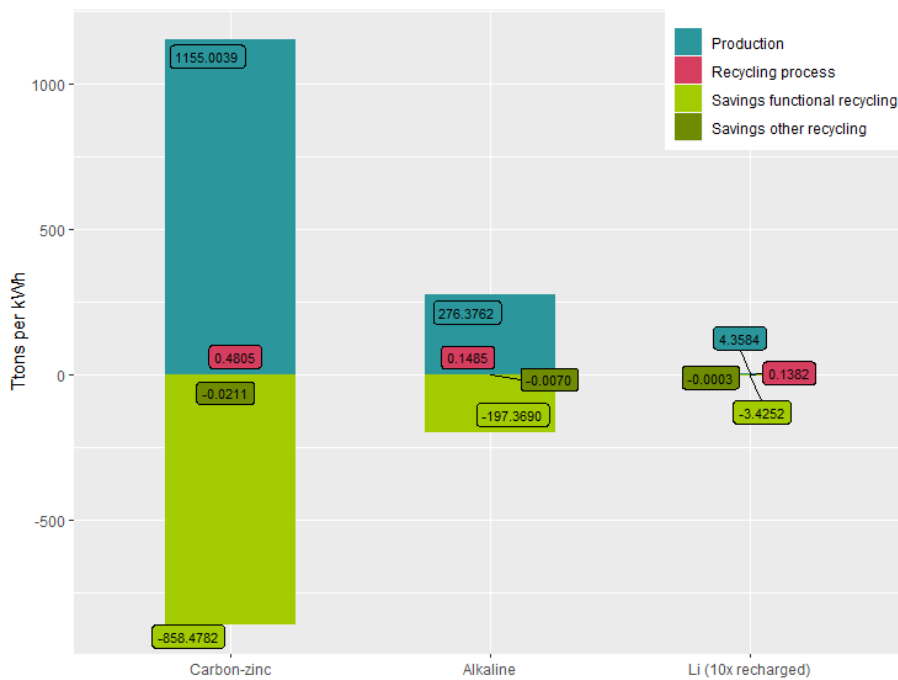


Figure 82. Total environmental impact (in Tton per kWh) of 3 types of portable batteries according to the average composition and recycling efficiency of each type of battery. Source: VITO (2017).

For the same amount of energy supplied, the total environmental impact of a rechargeable battery is nearly 70 times less than that of an alkaline battery. An important side note is that single-use batteries such as zinc carbon and alkaline batteries are not always exchangeable for rechargeable batteries. This depends on the application. The batteries can therefore not be compared one-to-one.

We note that lithium rechargeable batteries are usually built into equipment e.g. in a mobile phone or laptop. Lithium batteries therefore have dimensions that are adapted to the equipment, instead of a standard AA or AAA size. Rechargeable NiMH batteries are available in AA or AAA format. The results do show that, where possible, a rechargeable battery should be preferred to a disposable battery. Rechargeable batteries are definitely recommended for equipment that are often used and require a lot of energy, for example: game consoles, toy racing cars ...

**More information?** Soon on the OVAM website:

[ovam.be/circulaire-materialenverhalen](https://ovam.be/circulaire-materialenverhalen) [PDFs available in English]



#### 4.3.5 Reuse by re-use centres

##### What do we measure?

The indicator shows the amount of goods that were collected by the accredited re-use centres in Flanders as well as the quantity of goods that were resold by the re-use centres. We use this indicator as a proxy for the degree of reuse in Flanders.

In addition, there are also other initiatives that make reuse possible in various ways (commercial, non-profit or citizens' initiatives). Besides the second-hand selling at flea markets, fairs and garage sales, sharing, exchanging and donating are also forms of re-use or extending the lifetime of products. A successful reuse channel that should not be underestimated are the various channels on social media and Internet platforms.

By recognising and subsidising the re-use centres, OVAM can follow up the annual results of all the centres. Other initiatives and organisations with activities in reuse are not accredited by or registered with OVAM so we do not have the figures and results of these activities. The Circular Economy Policy Research Centre is currently working on a broader measurement of the amount of reuse in Flanders.

##### Why do we measure?

After prevention, reuse is the second step in the waste hierarchy. Reuse means any operation in which objects or components of objects other than waste are reused for the same purpose as they were intended. Before reuse is possible, a product sometimes needs to be repaired, checked or refreshed.

Furthermore, the Implementation Plan for Household Waste and Comparable Industrial Waste sets a target of 7 kg of effective reuse per capita by 2022 with a reuse rate (ratio between reused and collected) of at least 50%.

##### What do we see?

Citizens and firms can bring goods to the re-use centre or have them picked up for free by appointment. This is not a collection of waste but a **selective collection** of potentially reusable goods. To achieve the goals of reuse, the collection method in a number of municipalities has been expanded to include integral collection. In **integral collection**, goods are collected without prior selection for reuse (textiles via containers and door-to-door and WEEE via containers). The latter are waste collections.

The collection of goods (selective and integral) by the accredited re-use centres in Flanders was increasing in the period 1995-2018. In 2018, there was another 6.11% increase in collection compared to 2017: approximately 83,338 tons of goods were collected of which approximately 65,984 tons were selective. The average collection per capita is approximately 12.72 kg.

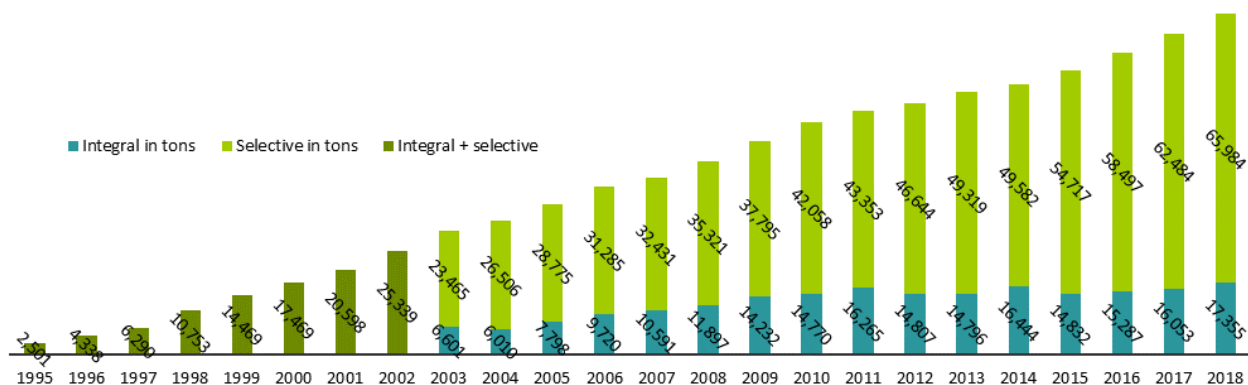


Figure 83. Evolution of the amount of selectively and integrally collected amount of reusable goods in tons by the re-use centres in Flanders for the period 1995-2018. Source: OVAM (2019a).

Table 7 shows the reuse rate within the product groups versus the collection and turnover. The low reuse rate of WEEE is partly due to insufficient supply, poor quality, lack of parts and a shortage of qualified personnel. The general re-use percentage (ratio of quantity of re-used and collected) for 2018 is 44%. As a result, the reuse achieved by the recycling sector rose to 5.4 kg per capita in 2018.

Table 7. Turnover (K€), inflow (tons), reuse (tons) and reuse rate within all product groups (ratio reused/collected) of the top 5 product groups by the accredited re-use centres in Flanders in 2018. Source: OVAM (2019a).

Fractions	Turnover (K€)	Share of turnover (%)	Inflow (tons)	Inflow share (%)	Reuse (tons)	Share of reuse (%)	Reuse rate
Furniture	10,327	19%	23,098	28%	14,562	41%	63%
Household goods	20,324	37%	24,192	30%	14,345	41%	59%
Textile	19,805	36%	14,844	18%	3,763	11%	25%
WEEE	4,076	7%	17,721	22%	2,316	7%	13%
Others	1,112	2%	1,307	2%	454	1%	35%
<b>Total</b>	<b>55,644</b>	<b>-</b>	<b>81,162</b>	<b>-</b>	<b>35,440</b>	<b>-</b>	<b>44%;</b>
<b>Total excl. textiles</b>	<b>35,839</b>	<b>-</b>	<b>66,318</b>	<b>-</b>	<b>31,677</b>	<b>-</b>	<b>48%</b>
<b>Total excl. WEEE</b>	<b>51,568</b>	<b>-</b>	<b>63,441</b>	<b>-</b>	<b>33,124</b>	<b>-</b>	<b>52%</b>
<b>Total excl. textiles &amp; WEEE</b>	<b>31,763</b>	<b>-</b>	<b>48,597</b>	<b>-</b>	<b>29,361</b>	<b>-</b>	<b>60%</b>

### Outside Flanders?

No benchmarking is possible with European figures.

### More information & sources

- Herw!n (2019). Figures and publications. Ghent. [only available in Dutch] [herwin.be/cijfers-publicaties](https://herwin.be/cijfers-publicaties)
- OVAM (2019a). Household waste and similar industrial waste 2018 – monitoring the indicators in the Implementation Plan. [only available in Dutch] [ovam.be/inventarisatie-huishoudelijke-afvalstoffen](https://ovam.be/inventarisatie-huishoudelijke-afvalstoffen)
- OVAM (2019b). Recycling centres ensure re-use. OVAM, Mechelen. [only available in Dutch] [ovam.be/afval-materialen/huishoudelijk-afval-en-lokale-besturen/kringloopcentra](https://ovam.be/afval-materialen/huishoudelijk-afval-en-lokale-besturen/kringloopcentra)

## 4.4 MATERIAL ASPECTS OF MOBILITY

This chapter provides a preview of the elaboration of the mobility system in the CE monitor. An initial approach to elaboration has already been published previously (Alaerts *et al.*, 2019b). The preview below is presented as a more detailed overview of what we would ideally like to know and which data and indicators. Full details will follow in the spring of 2020.

The material use of mobility is enormous: the quantities of materials that are transported are so great that the mobility system actually transports mainly tons of metal and plastics instead of people and goods. From the perspective of monitoring the CE, the intention is to give centre stage to this material demand. In the first instance, this can be done by disaggregating the materials and carbon footprint of Flanders for the consumption domain of mobility. Such figures further illustrate the impact of mobility on materials and climate and ultimately this impact should decrease, and CE will also play a role in this. As shown in chapter 3, such a decline will only become noticeable in macro figures after some time. Therefore, further refinement is needed in the indicators.

The material demand of mobility can alternatively be represented by listing all types and quantities of vehicles that we use to move around to meet the demand for mobility. That boils down to the display of numbers and types of vehicles, compared to the total distances covered by those vehicles. This ratio should decrease in the progress towards the circular economy as vehicles are used more intensively and efficiently. Intensity comes down to maximising the time vehicles are effectively on the road. Efficiency is about the number of passengers per vehicle, to be expressed as the occupancy rate. Ideally, all these data will be displayed for each type of vehicle; in practice, it appears that adequate data are available especially for passenger cars and much less for other means of transport. In any case, the largest amounts of materials are consumed by passenger cars and collective means of transport are generally much more efficient in this respect. It is important, however, to include systemic effects with regard to other modes of transport; this can be done by displaying the modal split. In order to increase the intensity, car sharing is becoming increasingly popular as a circular business model. Depending on the available data, the monitor should best reflect the contribution of car sharing in reducing the amount of materials used and the impact of mobility.

At product level, indicators are required that show circularity in the production, use and end-of-life phase of vehicles. For production, such indicators are ideally based on production data, but these are usually not accessible. However, a number of features of newly marketed vehicles are available such as mass, which can be used as proxy indicators. For the use phase of vehicles, the focus will be on fuels: in addition to their climate impact, the current, mainly fossil, fuels entail a very large amount of material consumption. Other materials at this stage are tyres and lubricants. For the end-of-life phase, the circular economy comes down to keeping vehicles in use for as long as possible (provided that this does not come at the expense of excess emissions) and then ensuring that dismantling of vehicles and the added value of the parts extracted and materials will remain in Flanders as much as possible. For the development of indicators, data on mileage or lifespan are important as are the numbers of vehicles collected and figures on the performance of recycling and reuse. In the future, the monitor will also have to include indicators for batteries and electric motors; after all, the electrification of the vehicle fleet leads to a shift in the use of materials from fossil fuels to critical raw materials.

### **Box 9. The Flemish car fleet: combination of measures required to achieve climate objectives and to take account of the world stock of materials**

Using modelling based on existing data on the Flemish car fleet and emissions for different types of vehicles, we can estimate the effect on the climate for different mobility scenarios (greenhouse gas emissions expressed in CO<sub>2</sub> equivalents):

- BAU (business as usual) – current trends continue: more cars, more kilometres, slightly more electric cars
- EV – fast switch to electric vehicles: from 2030, all new cars will be electric, more cars, more kilometres
- DEV – combination of car sharing and electric vehicles: by 2030, 55% of new cars will be electric, 40% autonomous vehicles (without driver) of which 25% will be shared vehicles, more cars, more kilometres
- H2 – rapid switch to hydrogen cars: more electric cars as in EV scenario by 2024, more new hydrogen cars from 2025, all new cars on hydrogen from 2030, more cars, more kilometres
- MVP – much less trips: 40% less kilometres compared to 2015, less cars, more alternative transport, no increase in shared cars, slightly more electric cars
- DV – many more shared vehicles and shared use of vehicles: a very large share of shared cars and a doubling of the average occupancy rate (an average of 1.33 people in a car in 2015), huge boost in the number of shared cars, much less cars, slightly more electric cars, same kilometres by car
- Combination of DEV and DV: faster introduction of electric cars, from 2030 55% of all new cars will be electric, more shared cars, doubling the average occupancy rate, more cars, more kilometres
- Combination of DEV and MVP: faster introduction of electric cars, from 2030 55% of all new cars will be electric, 40% less trips by car, less cars

The scenarios where no combination of policy measures are taken (EV, H2, MVP and DV) are extreme scenarios in which one policy measure is used to a very large extent. This cannot be converted into practice, but its effect is clear. Of these scenarios, only MVP and DV (much less trips with cars and with many shared cars) meet the target of reducing territorial CO<sub>2</sub> emissions in Flanders by cars by 50% by 2030 compared to 2015. The effect on emissions is best with a combination of measures. The scenarios with only a switch to electric (EV) or hydrogen cars (H2) are going in the right direction but will have insufficient effect by 2030. Because not all cars with a combustion engine will be replaced by 2030. In addition, electric and hydrogen cars consume energy. The model also takes into account the emissions from energy production according to the current energy mix.

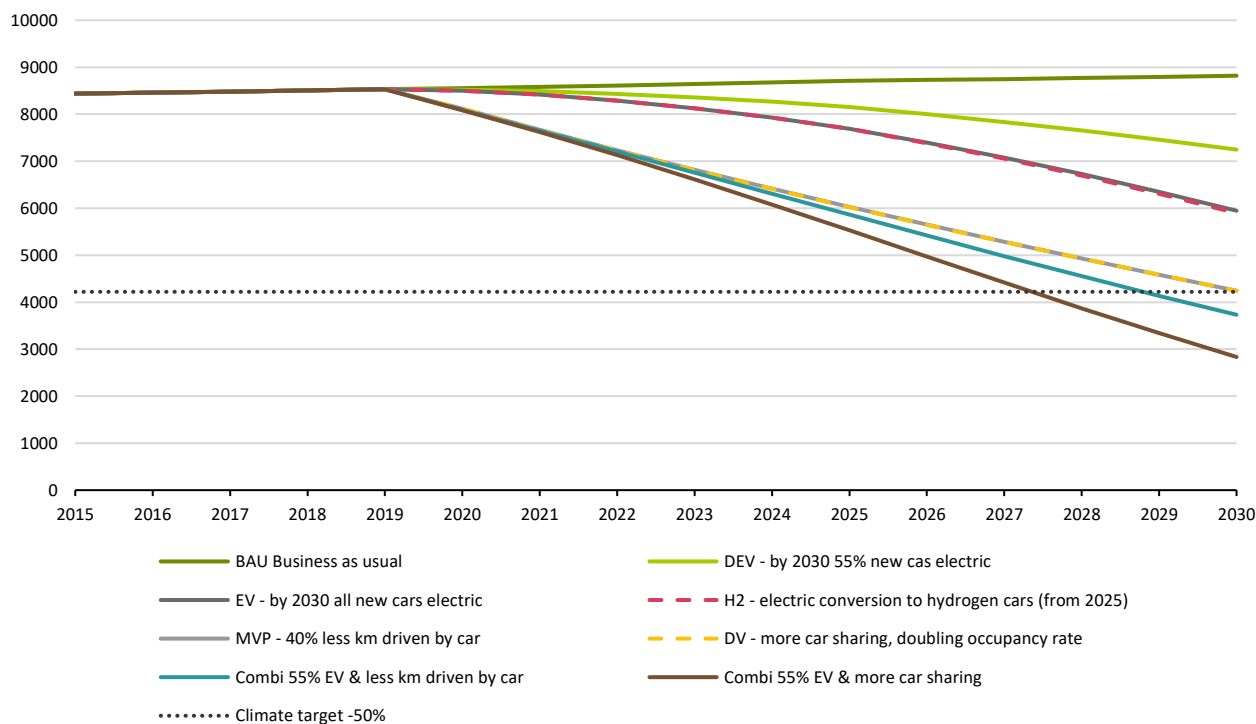


Figure 84. Greenhouse gas emissions within Flanders relating to the use of passenger cars according to 6 mobility scenarios (in kiloton CO<sub>2</sub>-eq.). VITO (2020).

In order to achieve the climate target by 2030, we must therefore **focus on a combination of each of our extensive measures: and much car sharing and much less kilometres and a fleet consisting of many green cars** (electric or hydrogen).

In addition to climate objectives, it is also important to include the **material consumption** of the car fleet. The composition of a classic car with a combustion engine, a hybrid car, an electric car and a hydrogen car differs from one to the other. For hybrid, electric and hydrogen cars, the composition also differs over time, given the technological developments to come. The current study only takes into account the current average composition. Differences currently exist mainly in the battery, the drive, the electric inverter and the hydrogen storage tank. The classic car consists of approximately 200 kg less materials. An electric vehicle contains more copper in the inverter and the battery contains more aluminium, cobalt, lithium and nickel. The battery of an electric vehicle, on the other hand, often has a second life for other applications such as energy storage, which extends its life.

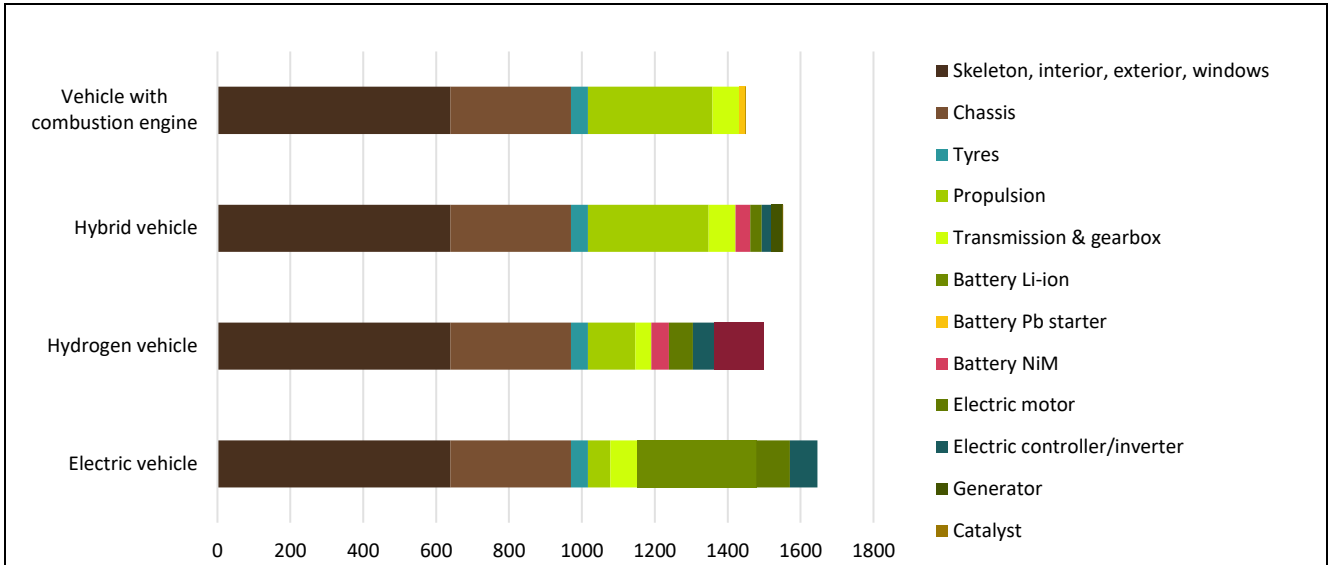


Figure 85. Composition of different types of vehicles per car part (in kg). VITO (2020).

Electric vehicles currently use mainly lithium-ion batteries. They consist of lithium but also of aluminium, copper, polypropylene, iron, cobalt, manganese, nickel, etc. **If we want to accelerate the replacement of the current fleet with electric cars with batteries in their existing composition, many Li-ion batteries will be needed and there will be a shortage of some of these materials such as cobalt (Co).**

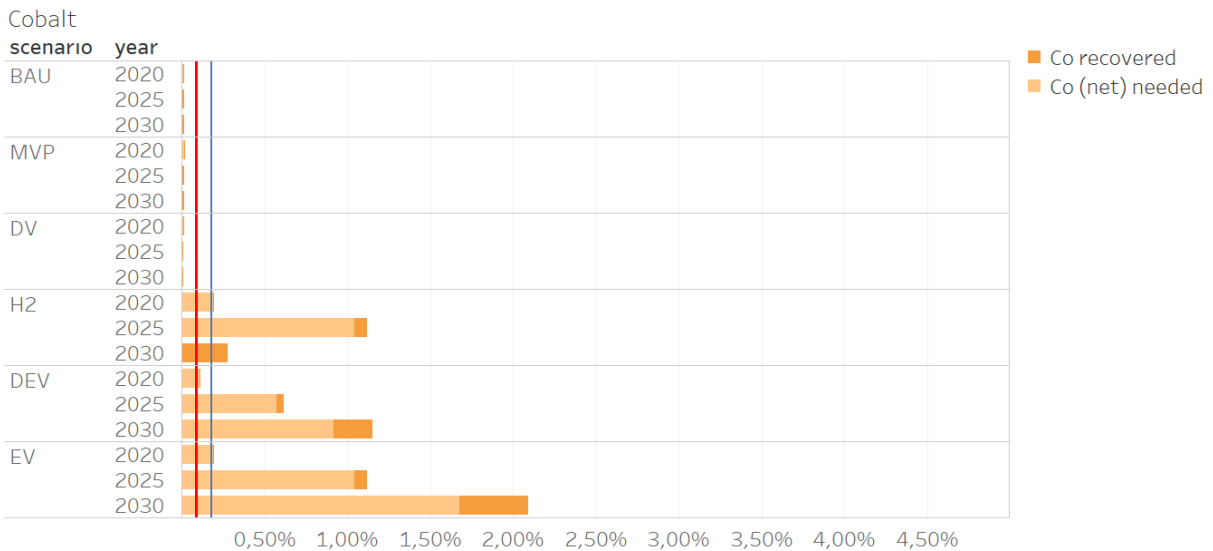


Figure 86. Need for (primary and recycled) cobalt for the Flemish fleet compared to the amount that is mined annually in the world. VITO (2020).

The orange bars in this figure indicate how much cobalt we need in Flanders for passenger cars in per cent compared to the amount of cobalt that is mined annually in the world. If we divide the annual extraction equally among all world citizens, there is 0.085% for Flanders in 2015, not only for batteries in cars but for all applications (red line). We currently use more than our “fair share”, namely 0.22% for all applications of cobalt (blue line). In the EV scenario (switch to electric cars), Flanders would use more than 2% of the cobalt mined annually for car batteries in 2030 if they have the same composition as today. Part of this can be recovered and reused via recycling (dark orange): the recycling indicated in dark orange is the recycling if all batteries that are end-of-life in Flanders are collected and recycled.

At the current rate of cobalt mining, there is still enough to mine for 50 years. In the EV scenario, the Flemish consumption of cobalt for cars would increase by a factor of 24 by 2030 (from less than 0.085% to 2%). If other countries in Europe/the world also focus on electrification of the car fleet, the **mineable cobalt supply will very soon be exhausted**. Moreover, cobalt is mainly mined in Congo in very bad conditions for the people and the environment.

The model also indicates that for **copper, lithium and nickel scarcity may arise in the short term**. For the EV scenario (fast switch to electric vehicles), we would need 0.21% copper, 8% lithium and 0.90% nickel of the annually mined quantity by 2030 if the batteries have the same composition as today.

The sector is responding to this by developing increasingly efficient batteries with less or even without cobalt. This example shows that it is important how much and which materials are used, of which quality and lifespan.

**More information?** You will soon be able to read the VITO report of this study on OVAM website. [only available in Dutch]

## 5 SUMMARY TABLE

The summary table contains the main indicators presented in this report. For each indicator the table shows the trend and the most recent figure for Flanders.

No target values are included in this table. The target values for the Flemish CE policy can be further elaborated in 2020 in the thematic work agendas, within the functioning and partnership of Circular Flanders.

The societal need “mobility” is part of the work agenda for consumer goods. Regarding the indicators the societal need mobility is discussed separately because of the importance of the material impact of the transport system. The CE monitor therefore also focuses on the material aspects that are linked to the production and use of the means of transport.

	Indicator	Trend	Figure for Flanders (year)
<b>MACRO INDICATORS</b>			
<b>Use of natural resources</b>	Direct Material Input	+20% between 2002 and 2018	342 million tons (2018)
	Raw Material Input (Moving Average)	+13% between 2010 and 2018	657 million tons (2018)
	Domestic Material Consumption	+2% between 2002 and 2018	132 million tons (2018)
	Raw Material Consumption (Moving Average)	+8% between 2010 and 2018	191 million tons (2018)
	Water consumption (excluding cooling water)	-1% between 2010 and 2017	744 million m <sup>3</sup> (2017)
	Built-up areas	24.2% (1999) to 28.3% (2018)	28.3% (2018)
<b>Losses and emissions from the cycle</b>	Household waste production	-7% between 2013 and 2018	468.5 kg/capita (2018)
	Production of household residual waste	-8% between 2013 and 2018	145.6 kg/capita (2018)
	Production of primary industrial waste, (excluding soil, sludge and construction and demolition waste)	-8% between 2004 and 2018	8,435 kilotons (2018)
	Production of primary industrial residual waste	+18% between 2007 and 2018	1,140 (2018)
	Incinerated, co-incinerated and landfilled waste of Flemish origin	+4% between 2012 and 2018	4.4 million tons (2018)
	Litter	- 2% between 2015 and 2017	19,916 tons (2017)
	Illegal dumping	-21% between 2015 and 2017	17,895 tons (2017)
	Carbon footprint	+26% between 2003 and 2010	127,684 kiloton CO <sub>2</sub> -eq. (2010)
<b>Ability to keep resources in the cycle</b>	Household waste recycling (excl. construction and demolition waste)	26.2% (1995) to 62.5% (2018)	62.5% (2018)
	Second life indicator primary industrial waste (excluding construction and demolition waste)	58% (2007) to 68% (2018)	68% (2018)
	Production of secondary materials	+165% between 2004 and 2018	28,756 kilotons (2018)
	Barometer for separate collection: share of collection points where residual waste, paper and cardboard and soft plastics are separately collected	Very slight increase in separate collection between 2017 and 2018	4.9% (2018)



	Indicator	Trend	Figure for Flanders (year)
	Barometer for separate collection: share of industrial waste compared to the amount of comparable industrial waste for an average company	Constant in 2018 compared to 2017	31.28% (2018)
	Soil pollution and remediation	+253% between 2008 and 2018	3,913 soils SRW completed (2018)
	Size of CE (proxy): number of employees	+6% between 2010 and 2016	32,800 employees (2016)
	Size of re-use centres: number of employees	+81% between 2008 and 2018	4,614 FTE (in 2018)
	Size of re-use centres: turnover	+117% between 2008 and 2018	56.8 million euros (in 2018)
	Implementation of CE strategies by companies	n.a.	n.a.

#### OVAM INDICATORS FOR SOCIETAL NEEDS

<b>Nutrition</b>	Recycling of selective collected bio-waste	+93% between 2008 and 2018	2.32 million tons processed (2018)
	Bio-waste in household residual waste	-80% between 1995-1996 and 2013-2014	25 kg/capita (2013-2014)
	Food loss	n.a.	940,875 tons (2015 & 2017; all chains)
<b>Housing</b>	Use of alternative raw materials for primary minerals	+22% between 2010 and 2015	38,608 kilotons (2015)
	Recovery of construction and demolition waste	96.4% (2010) to 96.9% (2016)	96.9% (2016)
	Landfilled inert waste materials of Flemish origin	-88% between 2012 and 2018	4,002 tons (2018)
<b>Consumer goods</b>	Packaging: single-use packaging put on the market	Belgium: +6% between 2008 and 2017	Belgium: 1.7 million tons (2017)
	Packaging: recycling rate	Belgium: 78.9% (2008) to 83.8% (2017)	Belgium: 83.8% (2017)
	Packaging in household residual waste	-31% between 1995-1996 and 2013-2014	28.7 kg/capita (2013-2014)
	Textiles: selective collection	+28% between 2008 and 2018	53,643.47 tons (2018)
	Textile in household residual waste	+42% between 1995-1996 and 2013-2014	7.8 kg/capita (2013-2014)
	Electrical and electronic equipment: put on the market	Belgium: -1% between 2008 and 2017	Belgium: 292,234 tons (2017)
	Electrical and electronic equipment: collection rate	Belgium: +36.7% (2008) to 48.5% (2017)	Belgium: 48.5% (2017)
	Portable batteries: put on the market	Belgium: +122% between 1996 and 2018	Belgium: 4,920 tons (2018)
	Electrical and electronic equipment: collection rate	Belgium: +45.1% (1996) to 61.6% (2018)	Belgium: 61.6% (2018)
	Reuse by accredited re-use centres	+13% between 2014 and 2018	5.4 kg per capita (2018)

## 6 CONCLUSION

This report is the first step by OVAM to create set of indicators to monitor the circular economy (CE) at a society-wide (macro) level. It also contains some suggestions of indicators for the societal needs that the Policy Research Centre will further develop.

Because this report is the input from OVAM for the CE monitor, most indicators are related to materials, waste and recycling. In this way, the core approach to the circular economy, in particular the focus on the use of materials is already well represented. At the same time, we note that this approach looks at the circular economy from a somewhat narrow perspective as a story of waste and recycling. This report should therefore be read as an invitation to the other transition partners in the region of Flanders to cooperate with the CE Policy Research Centre and OVAM to create a set of indicators that better visualise the higher circularity strategies and offer a broader view of the circular economy.

### Macro indicators

We selected the macro indicators from already available indicators at the level of Flanders based on their relevance for measuring the CE. The set of macro indicators for material use covers both the production and consumption perspectives. The “Domestic Material Consumption” (DMC) is based on the Flemish “consumption”. The “Domestic Material Input” (DMI) contains the “input” of materials in the Flemish economy. The production for export is therefore also included here. In the macro indicators for material use, you can also choose whether to include the entire upstream chain of the materials or not. This is the distinction between “Raw Material Consumption” (RMC) and DMC. The RMC is comparable to the material footprint of Flanders. This footprint is among the highest in the world. The input of natural resources and materials has steadily increased with the growth of the Flemish economy. The waste figures also show both the production and consumption perspectives: the amount of industrial waste moves along with the economy while the amount of household waste decreases.

This selection of macro indicators confirms what the Netherlands Environmental Assessment Agency (PBL) has concluded about the current availability of CE indicators. The PBL states that it is currently possible to measure a number of results and effects of the transition economy-wide in the macro area. This mainly concerns parameters and indicators that monitor the inputs and leakage flows from the Flemish economy. These provide an indirect picture of the extent to which our economy is becoming circular. However, due to the complex Belgian State structure, the challenge of obtaining data for Flanders is even greater than for the Netherlands. Most basic economic data are collected and managed at federal level. As a result, not all economic indicators are made available at regional level. We see this clearly, for example, when measuring employment in the CE using NACE codes. We also recognise the challenges that PBL sees in the further development of CE indicators in Flanders. Developing macro indicators for the higher circularity strategies (Refuse, Rethink, Reduce, Re-use, Repair, Refurbish, Remanufacture ...) requires a lot of energy and is a challenging project. In this report, these aspects of the CE are only included to a limited extent through indicators on employment and space.

**Indicators for the societal needs**

An important gap in the current state of CE monitoring is the possibility to provide more direct feedback to the policy pursued. The Policy Research Centre for the Circular Economy has developed an approach based on societal needs. For the indicators, we look at how certain product groups are used to meet social needs and how this is done in a circular manner. In this report, OVAM proposes several indicators for each of societal needs based on data available at OVAM. They mainly deal with waste production and closing material cycles in food, construction, textiles, packaging and WEEE. This is a first suggestion from OVAM with an invitation to the partners in the CE transition to supplement and develop the indicators for the societal needs as well. The CE Policy Research Centre will work out the indicators for the societal needs in more detail this year and next year and will therefore enter into discussions with the respective partners.

## 7 BIBLIOGRAPHY

The sources used for the various indicators are listed at the end of each chapter when discussing the indicator. Other resources used in this document are listed below:

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## ANNEXE 1. SELECTION OF NACE CODES TO DETERMINE THE SIZE OF THE CIRCULAR ECONOMY

	Bachus & Willeghems	Circle Economy	Eurostat
<b>C Manufacturing</b>			
<b>33 Repair and installation of machinery and equipment</b>			
33.11 Repair of fabricated metal products	x	x	x
33.12 Repair of machinery	x	x	x
33.13 Repair of electronic and optical equipment	x	x	x
33.14 Repair of electrical equipment	x	x	x
33.15 Repair and maintenance of ships and boats	x	x	x
33.16 Repair and maintenance of aircraft and spacecraft	x	x	x
33.17 Repair and maintenance of other transport equipment	x	x	x
33.19 Repair of other equipment	x	x	x
33.2 Installation of industrial machinery and equipment			
<b>SECTION D – Electricity, Gas, Steam and Air Conditioning Supply</b>			
35.11 Production of electricity		x*	
<b>E Water Supply; Sewerage, Waste Management and Remediation Activities</b>			
36 Water collection, treatment and supply		x	
37 Sewerage			
37.00 Sewerage	x	x	
38.11 Collection of non-hazardous waste	x	x	x
38.12 Collection of hazardous waste	x	x	x
38.21 Treatment and disposal of non-hazardous waste		x	
38.22 Treatment and disposal of hazardous waste		x	
38.31 Dismantling of wrecks	x	x	x
38.32 Recovery of sorted material	x	x	x
39.002 Remediation activities and other waste management services		x	
<b>F - Construction</b>			
43.11 Demolition		x	
43.996 Screed		x	
<b>G Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles</b>			
45 Wholesale and retail trade and repair of motor vehicles and motorcycles			
45.112 Sale on a fee or contract basis of cars and light vans		x	

	Bachus & Willeghems	Circle Economy	Eurostat
45.192 Trade mediation in other motor vehicles		x	
45.201 General maintenance and repair of cars and light vans	x	x	x
45.202 General maintenance and repair of other motor vehicles	x	x	x
45.203 Repair and assembly of specific auto parts	x		x
45.204 Body repairs	x	x	x
45.205 Tyre service companies	x	x	x
45.206 Washing and cleaning of motor vehicles	x	x	x
45.209 Maintenance and repair of motor vehicles n.e.g.	x		x
45.3 Sale of motor vehicle parts and accessories	x		
45.401 Commercial intermediation and wholesale trade of motorcycles and parts and accessories of motorcycles	x		x
45.402 Sale, maintenance and repair of motorcycles and parts and fittings of motorcycles	x	x	x
46.77 Wholesale of waste and scrap	x	x	x
47.79 Retail sale of antiques and second-hand goods in shops	x	x	x
<b>J - Information and Communication</b>			
61 Telecommunications		x	
62 Computer programming, consultancy and related activities		x	
63 Information service activities		x	
<b>N Administrative and Support Service Activities</b>			
77 Rental and leasing activities			
77.1 Rental and leasing of motor vehicles		x	
77.2 Rental and leasing of personal and household goods	x	x	
77.3 Rental and leasing of other machinery, equipment and tangible goods	x	x	
77.4 Leasing of intellectual property and similar products, except copyrighted works		x	
<b>S Other Service Activities</b>			
94.1 Activities of business, employers and professional membership organisations		x	
94.2 Activities of trade unions		x	
95.11 Repair of computers and peripheral equipment	x	x	x
95.12 Repair of communication equipment	x	x	x
95.21 Repair of consumer electronics	x	x	x
95.22 Repair of household appliances and home and garden equipment	x	x	x
95.23 Repair of footwear and leather goods	x	x	x
95.24 Repair of furniture and home furnishings	x	x	x
95.25 Repair of watches, clocks and jewellery	x	x	x
95.29 Repair of other personal and household goods	x	x	x

	Bachus & Willeghems	Circle Economy	Eurostat
<b>96.01 Washing and (dry-)cleaning of textile and fur products</b>		x	

\* The codes for the renewable energy production sector at NACE level 5 are not standardised, therefore bottom-up data are used to prepare proxy codes of 35111 - Non-renewable electricity production and 35112 – Renewable electricity production.