PRODUCTIVITY ASSOCIATED WITH THE USE OF MATERIALS DECREASED BY 1.6% IN 2021

Domestic Material Consumption increased by 7.1% in 2021, 1.6 percentage points more than the real GDP growth, leading to a 1.6% reduction in productivity associated with the use of materials, resulting in a less efficient use of materials.

Statistics Portugal publishes the provisional results of the Material Flow Accounts (MFA) for the year 2021 and also presents revised data for the period 1995 to 2020. On Statistics Portugal website, in the National Accounts release area, tables can be found with more detailed information.

Domestic Material Consumption (DMC) increased by 7.1% in 2021

DMC measures the total amount of materials consumed directly in an economy, by corporations and households. In 2021 the DMC was 163.9 million tonnes, 7.1% more than in 2020 and 12.9% less than in 2011.

The DMC distribution by material category indicates the relative importance of various materials and their potential for reuse, recovery or recycling. Non-metallic minerals were the most relevant materials, accounting for 63.2% of DMC in 2021. Biomass, fossil energy materials and metallic ores represented 21.1%, 7.3% and 6.8%, respectively. Between 2020 and 2021, with the exception of other products and waste (-11.5%) and fossil energy materials (-3.3%), the remaining categories of materials grew: metallic ores (+14.9%), non-metallic minerals (+8.7%) and biomass (+5.8%).

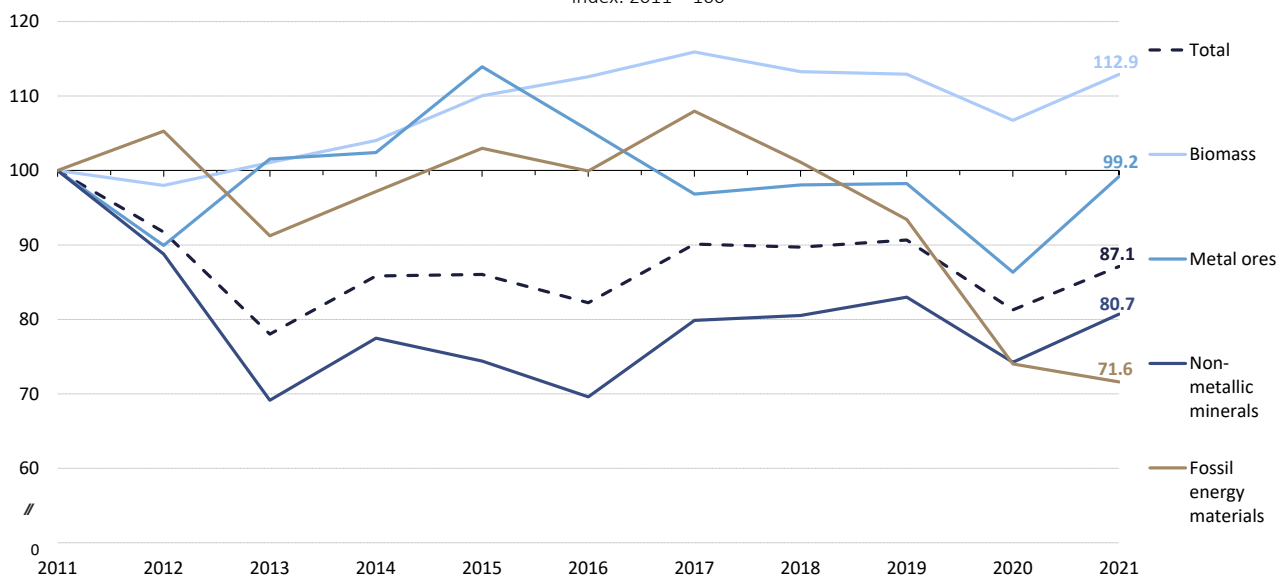Figure 1: **Domestic material consumption (DMC), by type of material, 2021**

Unit: million tonnes
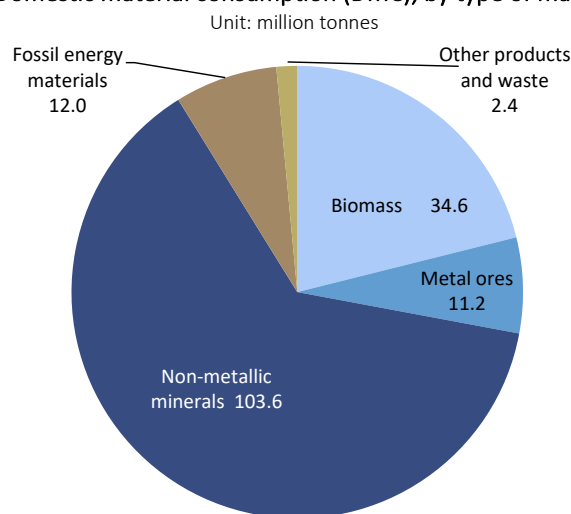
Source: Statistics Portugal (Material Flow Accounts)

Since 2011, with the exception of biomass which grew by 12.9%, the DMC of the remaining material categories decreased, highlighting the decrease in fossil energy materials (-28.4%). The consumption of non-metallic minerals decreased by 19.3% between 2011 and 2021, highlighting, however, a growth of 16.0% since 2016. The consumption of metallic ores shows a downward trend since 2016, having decreased by 0.8% since 2011.

Figure 2: **Evolution of Domestic material consumption (DMC) by type of material, 2011-2021**
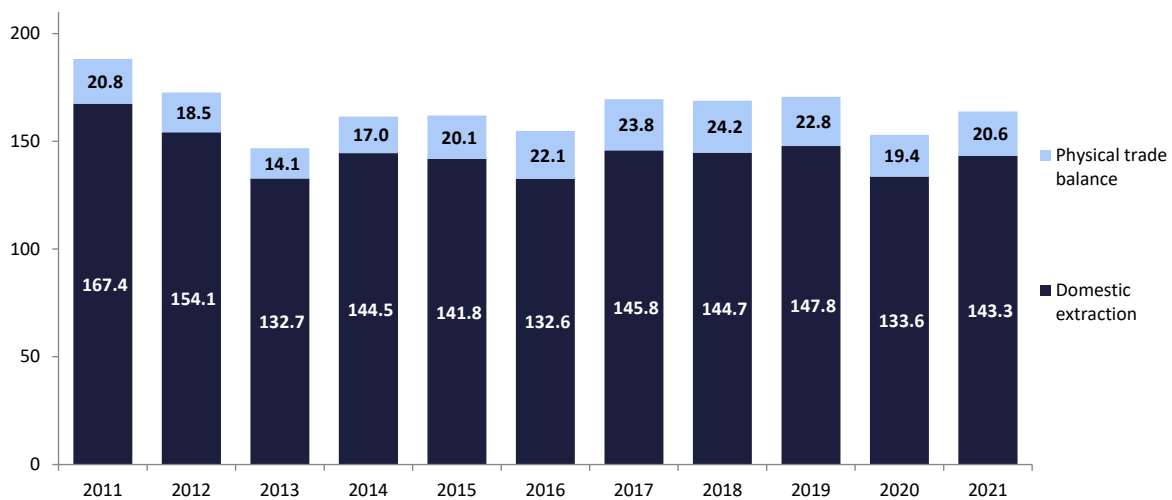
Index: 2011 = 100

Source: Statistics Portugal (Material Flow Accounts)

Domestic extraction of materials increased by 7.2% in 2021

The DMC results from the sum of domestic extraction of materials and the physical trade balance (imports minus exports). In 2021, domestic extraction of materials increased by 7.2%, accounting for 87.4% of the DMC.

Figure 3: **Domestic material consumption, by components, 2011-2021**

Unit: million tonnes

Source: Statistics Portugal (Material Flow Accounts)

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The growth in the internal extraction of materials in 2021 is explained by the increases observed in all types of materials: metallic ores (+15.5%), non-metallic minerals (+7.6%) and biomass (+3.3%). However, it was the increase in volume of non-metallic minerals, about 7.5 million tonnes, which contributed the most to the increase in domestic extraction of materials compared to 2020.

Figure 4: Domestic extraction of materiais, by type of material, 2011-2021
Unit: million tonnes
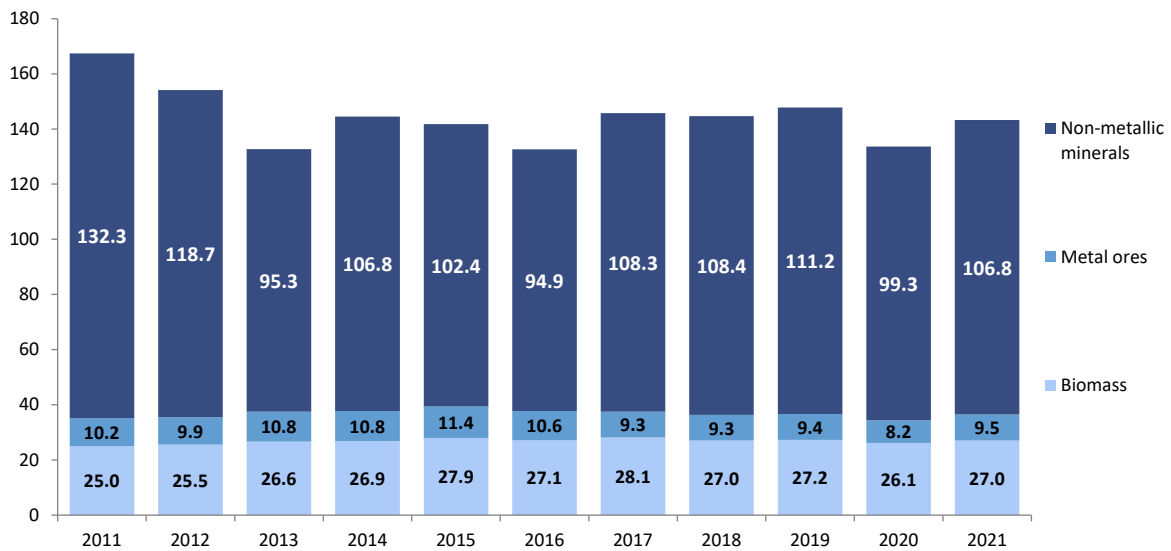
Source: Statistics Portugal (Material Flow Accounts)

The physical trade balance grew by 6.5% in 2021

In 2021, the physical trade balance grew by 6.5% (imports grew by 6.2% and exports increased by 6.0%). Fossil energy materials recorded the greatest weight in imports (38.2%) and biomass the greatest weight in exports (29.5%).

Table 1. Physical trade balance, by type of material, 2021
Unit: million tonnes

	Physical trade balance	Imports	%	Exports	%
Total	20.6	62.1	100	41.5	100
Biomass	7.6	19.3	31.1	11.7	28.2
Non-metallic minerals	-3.2	5.2	8.4	8.4	20.2
Metal ores	1.7	7.9	12.7	6.2	15.0
Fossil energy materials	12.0	23.7	38.2	11.7	28.1
Other products	1.5	3.9	6.3	2.4	5.8
Waste	0.9	2.1	3.4	1.1	2.7

Source: Statistics Portugal (Material Flow Accounts)
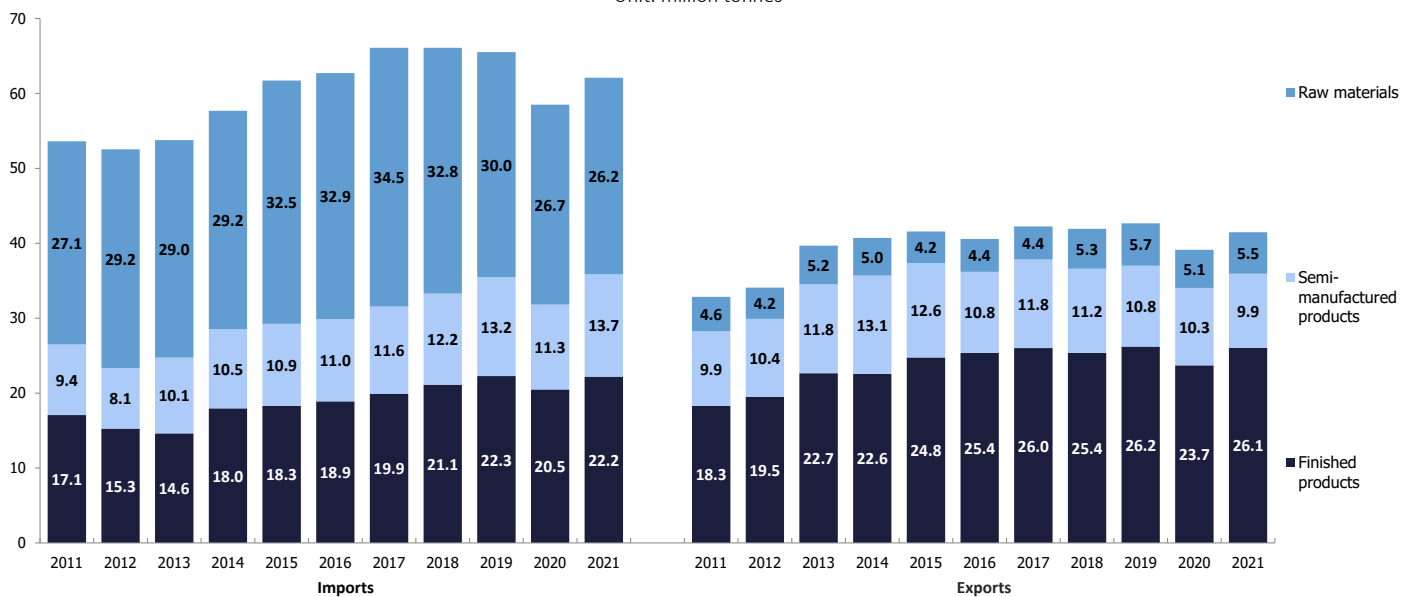
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Between 2011 and 2021, exports increased by 26.2% and imports grew by 15.8%.

Analysing by manufacturing stage, a distinction is made between three stages: finished products, semi-manufactured products and raw materials. In 2021, as in all previous years, physical imports are dominated by raw materials (42.3%), while physical exports are dominated by finished products (62.8%).

Between 2011 and 2021, the most pronounced increases in imports were registered in semi-manufactured products (+45.1%). In exports, the increases in finished products stand out (+42.3%).

Figure 5: Physical imports and exports by manufacturing phase, 2011-2021
Unit: million tonnes

Source: Statistics Portugal (Material Flow Accounts)

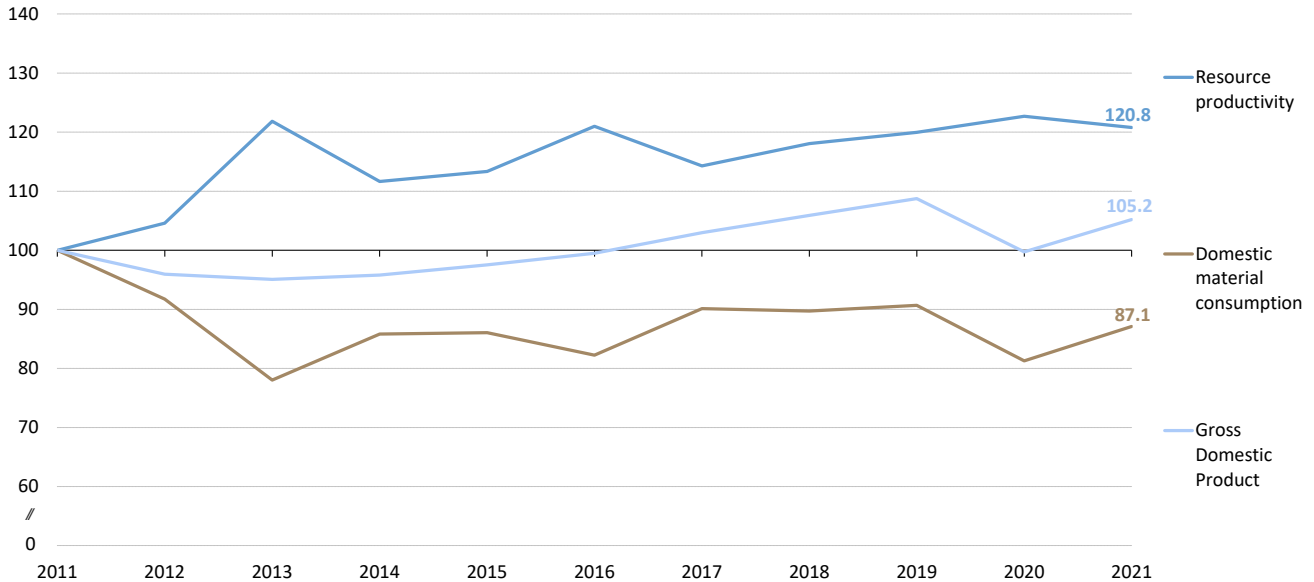## Productivity associated with material use decreased by 1.6% in 2021

Resource productivity is measured by Gross Domestic Product (GDP) over DMC (the latter measures the total amount of materials directly consumed in an economy). In 2021, this indicator declined by 1.6%, following an increase in DMC (+7.1%) that was higher than real GDP growth (+5.5%). Due to the COVID-19 pandemic, there have been sharper falls in the DMC compared to the decreases in GDP, thus resource productivity increased by 2.3% between 2019 and 2020.

Between 2011 and 2021, resource productivity increased by 20.8%, as a result of the 12.9% reduction in DMC and the 5.2% increase in GDP in volume. An analysis of the components of resource productivity, namely GDP and DMC, helps explain this evolution. Prior to 2017, the two components decoupled, i.e. developed in opposite directions, resulting in a clear increase in resource productivity (+14.3%). Between 2017 and 2019, GDP and DMC grew differently and gave rise to a less marked increase in resource productivity (+5.0%). Since 2019, both components seem to evolve in parallel, showing fairly similar patterns of annual change, which still resulted in a slight increase in productivity (+0.7%).

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Figure 6: Resource productivity, GDP and DMC, 2011-2021
Index: 2011 = 100

Resource productivity — 120.8
Gross Domestic Product — 105.2
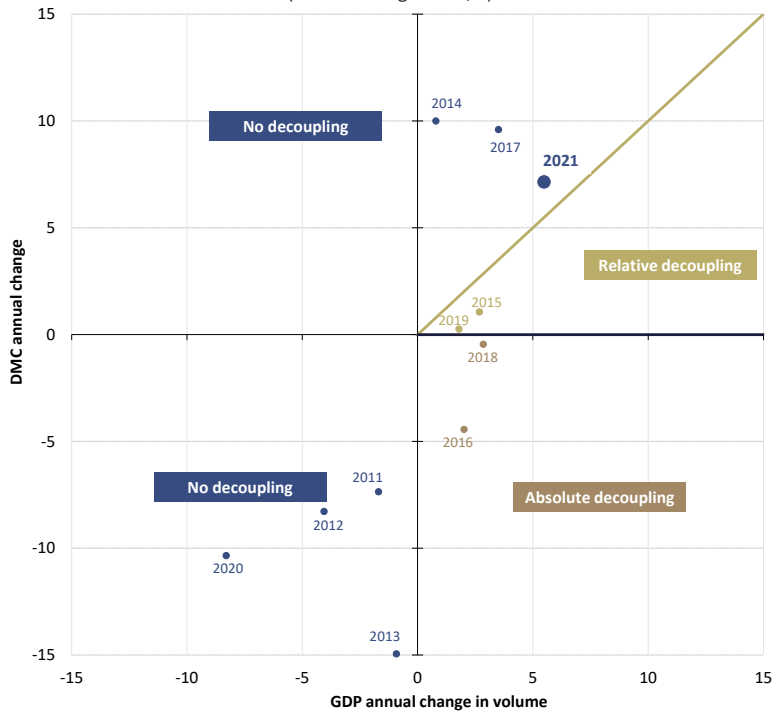Domestic material consumption — 87.1

Source: Statistics Portugal (Material Flow Accounts; National Accounts - Table A.1.1.6 - GDP; National Accounts - Table A.1.4.4.5 - GVA Construction)

Another way of evaluating the degree of decoupling between DMC (pressure on the environment) and GDP (economic growth) is illustrated by Figure 7, where the diagonal line represents identical rates of change in GDP and DMC.

Figure 7: Annual changes in DMC and GDP in volume, 2011-2021
(annual change rates,%)

Source: Statistics Portugal (Material Flow Accounts; National Accounts - Table A.1.1.6 - GDP)

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The years above this diagonal line had a higher growth in DMC than in GDP and no decoupling occurred. This was the case in 2021, as it was in 2011, 2012, 2013, 2014, 2017 and 2020. Below the diagonal line are all the years whose GDP increased faster than the DMC and thus marked at least a relative decoupling, namely 2015 and 2019. Absolute decoupling denotes an absolute decrease in DMC while GDP grows and, in the period under review, was achieved only in the years 2016 and 2018.

Box 1. SUSTAINABLE DEVELOPMENT G✪ALS and the Material Flow Accounts

MFA provides information for the construction of indicators 8.4.2 and 12.2.2 - Domestic material consumption, domestic material consumption *per capita*, and domestic material consumption per GDP and for indicators 8.4.1 and 12.2.1 - Material footprint, material footprint *per capita* and material footprint *per* GDP (see box 2), which monitor Sustainable Development Goals (SDG) targets 8.4 and 12.2.

This information is also available in the **thematic dossier on** Sustainable Development Goals Indicators **on the** Statistics Portugal website.

Table 2: MFA indicators in SDG (8.4.2 and 12.2.2)

	Domestic material consumption	Domestic material consumption *per capita*	Domestic material consumption per GDP
	change rates		
2020-2021	⬆ 7.1	⬆ 6.9	⬆ 1.6
2017-2021	⬇ -3.4	⬇ -3.6	⬇ -5.4
2011-2021	⬇ -12.9	⬇ -10.9	⬇ -17.2

Source: Statistics Portugal (Material Flow Accounts)

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Box 2. Indicators expressed in raw material equivalents and material footprint

The overall material footprint measures the weight of materials actually consumed in an economy, converted into the "primary unit" that is at the origin of the various materials consumed, regardless of the degree of transformation with which raw materials enter or leave the economy. MFA indicators do not provide a fully consistent picture of the material footprint because they record imports and exports in the actual weight of goods traded when they cross the border, rather than the weight of materials extracted to produce them. As such, MFA's main indicators, namely the DMC, underestimate the material footprint. To adjust for this difference, the weight of internationally traded processed goods is converted into the corresponding extractions of raw materials they cause and expressed in the concept "raw material equivalents" (RME).

RME are estimated using a model created by Eurostat (see "Handbook for estimating raw material equivalents"), which is still under development, so the results obtained are not yet considered official statistics. Experimental calculations of some RME based indicators for Portugal are presented in this box.

In Portugal, imports and exports expressed in RME, in 2020 were higher than those recorded in MFA (88.9% and 112.9%, respectively), as finished and semi-manufactured products made up a significant part of these items. Consequently, raw material input (RMI) was 27.1% higher than direct material input (DMI).

The material footprint (MRF) in Portugal was 15.6 tonnes per capita in 2020, 5.1% higher than the DMC (14.9 tonnes per capita). The overall EU material footprint was 13.7 tonnes per capita and 0.5% higher than the DMC (13.6 tonnes per capita).

Figure 8: **Material flow indicators derived from MFA and MFA-RME, 2020**

Unidade: tonnes *per capita*
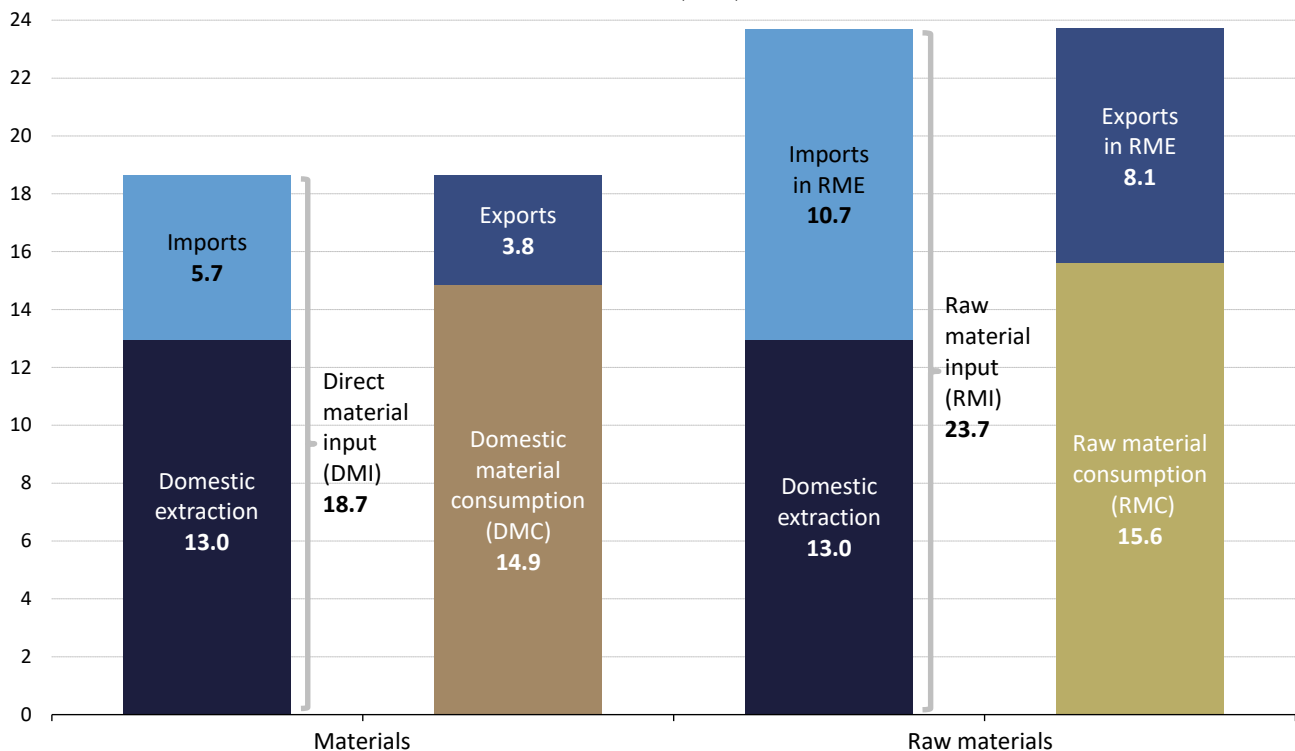
Source: Statistics Portugal

METHODOLOGY

The methodological aspects and explanations essential to the operationalization and understanding of the MFA compilation are available in *Notas Metodológicas da Conta de Fluxos Materiais* at Statistics Portugal's website (Portuguese version only).

EXTERNAL LINKS

- • European Commission - Environment - Material flows and resource productivity
- • European Commission - Environment - Circular economy
- • European Commission - Environment - Material footprints
- • European Environment Agency: The European environment — state and outlook 2020: knowledge for transition to a sustainable Europe - SOER 2020
- • OECD - Resource efficiency
- • UNECE - Sustainable use of natural resources

DATA REVISION AND UPDATES

The MFA series now available incorporates the updating of different data sources, more specifically the extractive industry data from the Directorate-General for Energy and Geology; the air emissions inventory and the cross-border movement of waste from the Portuguese Environment Agency I.P.; the Portuguese National Accounts, including the satellite accounts: Economic Accounts for Agriculture, Economic Accounts for Forestry and the Air Emissions Account (AEA).

To ensure completeness of estimates and to include the unobserved or informal economy, the extractive industry statistics are scaled up, with reference to the National Accounts. In provisional data, the scaling-up coefficients are based on the latest available information, and are revised when definitive versions of national accounts are available.

Given the relatively larger than usual magnitude of the revisions to the National Accounts for 2020, a year deeply marked by the COVID-19 pandemic, there was also a larger revision to the results for domestic extraction and domestic consumption of materials in that year.

The revisions of imports and exports of materials were a consequence of the methodological changes made under the AEA, namely in the adjustment of the residence principle of air transport. These changes forced the revision of data on international trade of materials, namely those related to fuel associated to that means of transport.

Table 3. Revision of the main MFA aggregates, 2011-2020

Unit: million tonnes

	Data sent to Eurostat	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Domestic extraction	**2021**	167.4	154.1	132.7	144.5	141.8	132.6	145.8	144.6	147.8	149.3
	2022	167.4	154.1	132.7	144.5	141.8	132.6	145.8	144.7	147.8	133.6
	revision:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-10.5%
Imports	**2021**	53.5	52.4	53.6	57.5	61.5	62.6	65.9	65.9	65.3	58.8
	2022	53.6	52.5	53.8	57.7	61.7	62.7	66.1	66.1	65.5	58.5
	revision:	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.3%	0.3%	0.4%	-0.5%
Exports	**2021**	32.7	33.9	39.5	40.6	41.4	40.4	42.0	41.7	42.4	40.2
	2022	32.9	34.1	39.7	40.7	41.6	40.6	42.3	41.9	42.7	39.1
	revision:	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.6%	-2.6%
Domestic material consumption	**2021**	188.2	172.6	146.8	161.5	161.9	154.8	169.6	168.8	170.6	167.9
	2022	188.2	172.6	146.8	161.5	161.9	154.7	169.6	168.8	170.6	153.0
	revision:	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-8.9%

MATERIAL FLOW ACCOUNTS – 1995-2021

ACRONYMS AND DESIGNATIONS

DMI - Direct Material Input

DMC - Domestic Material Consumption

MFA - Material Flow Account

GDP - Gross Domestic Product

GVA - Gross value added

RMC - Raw Material Consumption

RME - Raw Material Equivalent

RMI - Raw Material Input

SDG - Sustainable Development Goals

MATERIAL FLOW ACCOUNTS – 1995-2021