

# Economy-wide material flow accounts – assessment of early estimates for reference year 2020

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*Eurostat E2, October 2023*

## 1 Introduction

In June/July 2021 Eurostat produced and published early estimates of the domestic extraction of materials (*2021-vintage of early estimate*) for reference year 2020. Eurostat estimates domestic extraction by four main material categories (biomass, metals, minerals, fossils) for each EU Member State and the aggregated EU economy. The estimation method is regression modelling employing a range of predictor variables such as volume indices of production, gross value added, annual energy statistics, crop statistics etc. Annex 1 provides a short description of the estimation methodology.

This report assesses the quality of the early estimates for reference year 2020 by analysing the estimation error. The estimation error is defined as the difference between the *2021-vintage of early estimate* and the actual *2023-outturn*<sup>1</sup> for reference year 2020. Eurostat E2 undertakes this assessment each year enabling a routine monitoring and assessment.

The estimation error is decomposed into three explainable effects and a residual estimation error:

- Effect 1 – due to revision of model specifications introduced in July 2023:  
Eurostat revises, if appropriate, the specifications of the (regression) models applied for each country and material category of domestic extraction (see Annexes 2 and 3). In general, Eurostat makes the model specifications based on fitness-of-estimation statistics that are derived from time series of model input data; the latter include predictors and EW-MFA data. Revisions of model specifications may become appropriate due to the extended time series that include data for one more reference year in comparison to the previous year's situation. Effect 1 is quantified by simulating the estimation for reference year 2020 with the 2023-vintage of model specifications (whilst keeping the 2021-vintage of input data).
- Effect 2 – due to revision of EW-MFA data in July 2023:  
EW-MFA data may have been revised between June 2021 and July 2023. This effect 2 is quantified by simulating the estimation for reference year 2020 using revised model specifications (i.e. the 2023-vintage of model specification as explained under effect 1) and using revised EW-MFA data that became available in July 2023, i.e. two years later than the initial estimate.
- Effect 3 – due to revision of predictor data that are available in July 2023:  
By July 2023 the predictor data may have been revised in comparison to the situation in June

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<sup>1</sup> By 30 April 2023, all European countries mandatorily reported EW-MFA data for reference year 2020 according to Regulation (EU) 691/2011 Annex III. This data was published in July 2023.

2021. This effect 3 is quantified by simulating the estimation for reference year 2020 with the July 2023-vintage of model specifications, the EW-MFA data as of July 2023, and the predictor data as of July 2023.

- **Residual estimation error:**

This is the ‘actual’ remaining estimation error after the elimination of the above effects due to data revisions and changed model specifications. Eurostat quantifies this residual error by simply ‘deducting’ the above three effect from the overall estimation error.

## 2 Assessing the estimation for the aggregated EU: non-metallic minerals cause the majority of estimation error

The 2023-outturn for domestic extraction of materials for reference year 2020 and the aggregated EU is 5348 million tonnes, which is about 194 million tonnes bigger than the 2021-vintage of early estimate (see Table 1). Table 1 also shows the estimation error by material category. The estimation error for non-metallic minerals is biggest with ca. 150 million tonnes. The estimation error for biomass amounts to ca. 37 million tonnes.

Table 1: Domestic extraction for the reference year 2020 (thousand tonnes) – outturn versus early estimate, by main material categories

EU-27	2021-vintage of early estimate	2023-outturn	Estimation error (overall)
Total materials	5 154 513	5 348 465	193 952 3.6%
Biomass	1 470 905	1 507 581	36 676 2.4%
Metal ores	220 235	229 354	9 119 4.0%
Non-metallic minerals	3 079 075	3 228 799	149 724 4.6%
Fossil energy material/carriers	384 299	382 731	-1 568 0.4%

Table 2 shows the EU estimation error in a breakdown by the three effects (see above) and by four main material categories. **Effect 1** quantifies the effect of the changed model specifications that took place between June 2021 and July 2023. With -45 million tonnes the effect of improved/changed model specifications was rather moderate.

**Effect 2** (216 million tonnes) is by far the most important effect ‘explaining’ the overall estimation error (194 million tonnes). Effect 2 quantifies the impact of EW-MFA data revisions between June 2021 and July 2023. Within **Effect 2** the material category of non-metallic minerals is most important.

With ca. -35 million tonnes, **Effect 3** also significantly contributes to the overall estimation error. It quantifies the impact of data revisions of the predictor variables between June 2021 and July 2023.

The **residual error**, i.e., the overall estimation error adjusted for the explainable effects is huge with 58 million tonnes and it is dominated by non-metallic minerals.

Table 2: Domestic extraction for the reference year 2020 (thousand tonnes) – decomposing the overall estimation error into three explaining effects and a residual error

EU-27	Estimation error (overall)	Effect 1	Effect 2	Effect 3	residual error
Total materials	193 952	-45 453	216 318	-34 772	57 860
Biomass	36 676	-13 057	46 726	-17 804	20 811
Metal ores	9 119	3 707	1 652	-377	4 137
Non-metallic minerals	149 724	-35 933	125 402	12 139	48 116
Fossil energy material/carriers	-1 568	-171	42 538	-28 730	-15 204

Figure 1: Decomposed of estimation errors for reference years 2017-2020 - domestic material extraction EU

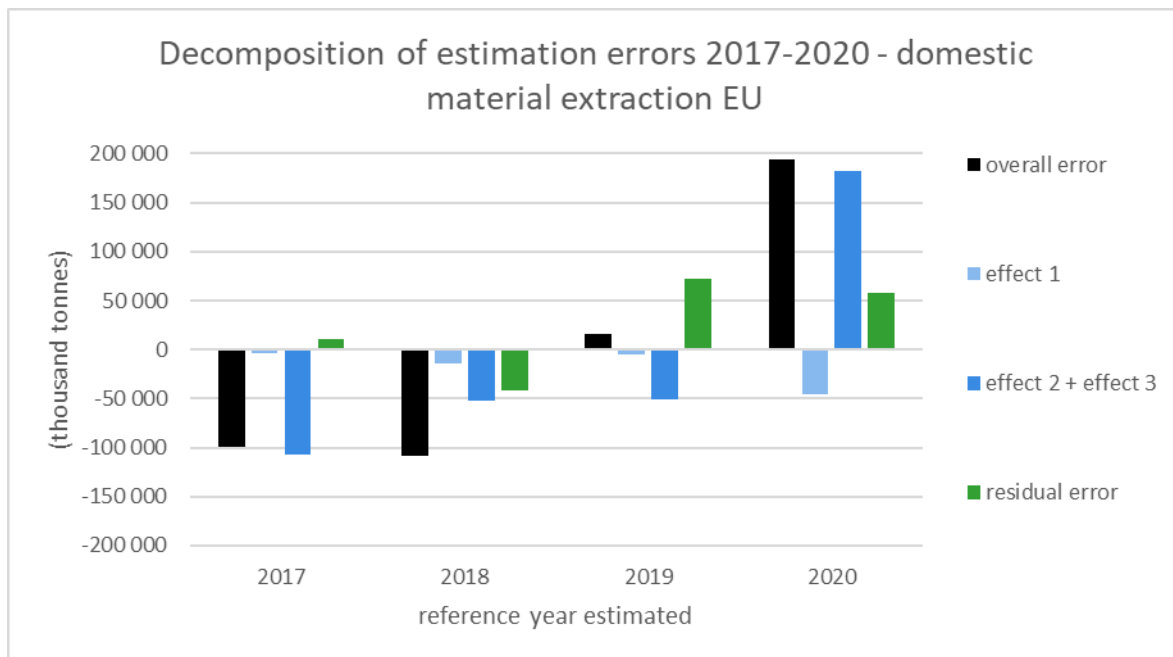


Figure 1 presents for the EU a decomposition of the estimation errors for the reference years 2017 to 2020. The black bar represents the overall estimation error, which is the difference between the initial estimate six months after the respective reference year and the actual outturn as reported by national statistical institutes around 2 years after the respective reference year. This overall estimation error was around 100 million tonnes for the reference years 2017 and 2018. For reference year 2019, the overall estimation error was rather small, while it is extraordinarily huge for reference year 2020 with almost 200 million tonnes.

In Figure 1, the overall estimation error is decomposed into three components:

- effect 1 quantifies the revision of model specifications. This effect is comparably small.
- effects 2+3 quantify data revisions. This component explained a huge part of the overall error. In other words, a good part of the overall estimation errors is due to data revisions.
- residual error is the 'real' estimation error after the explainable effects of data revisions and model revision have been subtracted.

### 3 Assessment by country

The overall estimation error – about 194 million tonnes – can also be broken down by country (see Table 3). The estimation errors for Finland, Germany and Spain contribute most to the EU overall estimation error.

Table 3: Domestic extraction (all materials) for the reference year 2020 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	2021-vintage of early	2023-outturn	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	5 154 513	5 348 465	193 952	100.0%	-45 453	216 318	-34 772	57 860
Austria	133 266	123 474	-9 793	-5.0%	2 925	5 961	-16 305	-2 374
Belgium	92 726	90 971	-1 755	-0.9%	-3 022	-2 897	1 282	2 881
Bulgaria	138 187	142 040	3 853	2.0%	-348	-3 475	548	7 128
Croatia	43 252	42 495	-756	-0.4%	-776	-632	720	-68
Cyprus	12 789	13 348	559	0.3%	488	50	-57	79
Czechia	155 308	162 010	6 702	3.5%	-2 100	1 566	-692	7 928
Denmark	117 362	111 751	-5 611	-2.9%	-61	2 116	-4 837	-2 828
Estonia	39 531	38 963	-568	-0.3%	1 299	-1 256	250	-860
Finland	164 092	239 805	75 713	39.0%	-736	73 541	603	2 305
France	577 945	590 064	12 119	6.2%	-58 781	15 764	5 922	49 213
Germany	891 789	949 984	58 194	30.0%	12 091	51 982	-120	-5 758
Greece	83 482	92 917	9 434	4.9%	-4 114	23 201	1 257	-10 910
Hungary	135 298	134 618	-680	-0.4%	-687	2 518	-199	-2 312
Ireland	88 998	86 995	-2 003	-1.0%	-3 189	320	-4 115	4 981
Italy	305 612	319 725	14 113	7.3%	-4 773	12 804	-253	6 335
Latvia	33 080	35 978	2 897	1.5%	900	3 071	0	-1 073
Lithuania	50 962	55 140	4 178	2.2%	3 179	129	-31	901
Luxembourg	2 113	2 130	16	0.0%	-40	-124	-2	183
Malta	2 020	2 194	174	0.1%	0	176	0	-1
Netherlands	89 825	91 817	1 992	1.0%	659	6 402	-991	-4 079
Poland	632 057	624 179	-7 878	-4.1%	-11 897	-2 351	4 999	1 371
Portugal	151 030	133 605	-17 425	-9.0%	-5 539	-2 152	643	-10 378
Romania	533 037	545 040	12 003	6.2%	-31 404	21 847	-24 210	45 770
Slovak Republic	54 436	56 931	2 495	1.3%	57	-4	-96	2 537
Slovenia	24 667	24 266	-401	-0.2%	394	13	2	-810
Spain	333 784	373 626	39 842	20.5%	60 044	8 330	-60	-28 473
Sweden	267 863	264 400	-3 463	-1.8%	-22	-583	973	-3 831
Norway	359 075	323 339	-35 737		39	534 101	-562 257	-7 619
Switzerland	58 688	58 683	-5		-58 688	0	0	58 683

## Annex 1: Estimation methodology

Eurostat has developed a tool to provide early estimates of domestic extraction of four main material flow categories for EU Member States. The tool calculates the early estimate for each country/material combination according to a selected model equation. For each of the more than 120 country/material combinations, the user (Eurostat) is to specify the model type and chose the predictor. This is referred to as the 'model specification' (see Annexes 2 and 3).

The tool offers seven model variants (see Figure 2 for the respective model equations). Four of the models are regression-type models (M1, M2, M3, M7). Six of the models employ predictors, and one model simply uses the domestic extraction value of the previous year (M6).

Figure 2: List of model equations

Model type	Names	Description
M1	Regression of absolute values	$de\_Predicted(t) = a + b * Predictor(t)$ Where a + b are derived from OLS regression
M2	Regression of absolute changes	$de\_Predicted(t) = de(t-1) + Absolute\_change\_predicted(t)$ $Absolute\_Change(t) = a + b * (Predictor(t) - predictor(t-1))$ Where a + b are derived from OLS regression
M3	Regression of relative changes	$de\_Predicted(t) = de(t-1) * (1 + relative\ change\ predicted(t))$ $Relative\_Change(t) = a + b * ((Predictor(t) - Predictor(t-1)) / Predictor(t-1))$ Where a + b are derived from OLS regression
M4	Annual relative change in predictor	$de\_predicted(t) = de(t-1) * (Predictor(t) / Predictor(t-1))$
M5	Sum of Individual fuels (MF4 only)	$de\_predicted(t) = \sum_i (de\_i(t) * fuel\_i(t) / fuel\_i(t-1))$
M6	Value of previous year	$de\_predicted(t) = de(t-1)$
M7	Regression of logged values	$ln\_Predicted(t) = a + b * ln\_Predictor(t) + e(t-1)$ Where a + b are derived from OLS regression

Where:  $de\_Predicted$  denotes the predicted value of domestic extraction,  $ln\_Predicted$  and  $ln\_Predictor$  denote the natural logs of the actual values of domestic extraction and the predictor respectively, a is the constant term, b is the regression coefficient for the predictor and e is the residual from the regression

Both model input data (predictors and EW-MFA) are available for reference years starting with 2000.

The predictors are European statistics for which data must be available for the reference year for which the domestic extraction is estimated. The tight timeliness is a constraint and limits the choice of potential predictors. Figure 3 presents the list of predictors. There are ranges of different predictors for each of the four material categories.

Figure 3: List of predictors

Predictor code	Description	Indicator	Unit	Material category for which predictor is applied
P1	Agriculture, forestry and fishing	Gross value added (at basic prices)	Chain linked volumes (2015), million euro	Biomass (MF.1)
P2	Manufacture of food products; beverages and tobacco products	Volume index of production	Index, 2015=100	Biomass (MF.1)
P3	Agriculture goods output	Production value at basic price	Million euro	Biomass (MF.1)
P4	Crop output	Production value at basic price	Million euro	Biomass (MF.1)
P5	Cereals for the production of grain (including seed)	Harvested production (1000 t)	Harvested production in EU standard humidity (1000 t)	Biomass (MF.1)
P6	Processing and preserving of fish, crustaceans and molluscs	Volume index of production	Index, 2015=100	Biomass (MF.1)
P7	Forage plants	Production value at basic price	Million euro	Biomass (MF.1)
P8	Live bovine animals	Thousand head (animals)	Thousand head (animals)	Biomass (MF.1)
P9	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Volume index of production	Index, 2015=100	Biomass (MF.1)
P10	Mining of iron ores	Volume index of production	Index, 2015=100	Metal ores (MF.2)
P11	Mining of metal ores	Volume index of production	Index, 2015=100	Metal ores (MF.2)
P13	Other mining and quarrying	Volume index of production	Index, 2015=100	Non-metallic minerals (MF.3)
P14	Construction	Gross value added (at basic prices)	Chain linked volumes (2015), million euro	Non-metallic minerals (MF.3)
P15	Construction	Volume index of production	Index, 2015=100	Non-metallic minerals (MF.3)
P16	Mining of coal and lignite	Volume index of production	Index, 2015=100	Fossil energy materials/carriers (MF.4)
P17	Extraction of crude petroleum and natural gas	Volume index of production	Index, 2015=100	Fossil energy materials/carriers (MF.4)
P19	Natural gas	Indigenous production	Terajoule (gross calorific value - GCV)	Fossil energy materials/carriers (MF.4)
P20.1	Hard coal	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P20.2	Lignite/Brown Coal	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P20.3	Peat	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P20.4	Oil shale and oil sands	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P21.1	Crude oil (without NGL)	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P21.2	Natural gas liquids (NGL)	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P21.3	Other hydrocarbons	Indigenous production	Thousand tonnes	Fossil energy materials/carriers (MF.4)
P23	Extraction of crude petroleum	Volume index of production	Index, 2015=100	Fossil energy materials/carriers (MF.4)

## Annex 2: 2021-vintage of model specifications

	MF1 - Biomass				MF2 - Metal ores				MF3 - Non metallic minerals				MF4 - Fossil energy material/carriers			
	Estimation Range		2001	2019	Estimation Range		2001	2019	Estimation Range		2001	2019	Estimation Range		2009	2019
	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type	
BE	FALSE	P5	M4	FALSE	n.a.	n.a.	FALSE	P13	M3	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
BG	FALSE	P5	M7	FALSE	P11	M3	FALSE	P15	M3	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
CZ	FALSE	P5	M4	FALSE	n.a.	n.a.	FALSE	P15	M7	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
DK	FALSE	P5	M4	FALSE	n.a.	n.a.	FALSE	P15	M3	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
DE	FALSE	P5	M1	FALSE	P11	M6	FALSE	P15	M3	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
EE	FALSE	P9	M4	FALSE	n.a.	n.a.	FALSE	P15	M3	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
IE	FALSE	P8	M3	FALSE	P11	M6	FALSE	P14	M4	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
EL	FALSE	P4	M4	FALSE	P11	M6	FALSE	P15	M7	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
ES	FALSE	P5	M7	FALSE	P11	M6	FALSE	P14	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
FR	FALSE	P4	M3	FALSE	P11	M6	FALSE	P13	M3	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
HR	FALSE	P5	M3	FALSE	n.a.	n.a.	FALSE	P15	M7	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
IT	FALSE	P5	M3	FALSE	P11	M6	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
CY	FALSE	P4	M4	FALSE	n.a.	M6	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
LV	FALSE	P9	M3	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
LT	FALSE	P1	M4	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
LU	FALSE	P8	M4	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
HU	FALSE	P5	M7	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
MT	FALSE	P4	M6	FALSE	n.a.	n.a.	FALSE	P15	M6	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
NL	FALSE	P4	M1	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
AT	FALSE	P4 + P6 + P7 + P8 + P9	M6	FALSE	P11	M6	FALSE	P14	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
PL	FALSE	P4 + P6 + P7 + P8 + P9	M2	FALSE	P11	M6	FALSE	P13	M3	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
PT	FALSE	P3 + P9	M2	FALSE	P11	M6	FALSE	P13	M7	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
RO	FALSE	P3 + P9	M2	FALSE	P11	M4	FALSE	P14	M7	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
SI	FALSE	P4 + P6 + P7 + P8 + P9	M3	FALSE	n.a.	n.a.	FALSE	P14	M4	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
SK	FALSE	P4	M3	FALSE	P11	M6	FALSE	P15	M3	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
FI	FALSE	P9	M3	FALSE	P11	M4	FALSE	P14	M3	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
SE	FALSE	P9	M3	FALSE	P11	M6	FALSE	P14	M7	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	
UK	FALSE	P7	M6	FALSE	P11	M6	FALSE	P15	M6	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
NO	FALSE	P1	M4	FALSE	P11	M4	FALSE	P15	M3	FALSE	n.a.	n.a.	TRUE	n.a.	n.a.	
CH	FALSE	P7	M7	FALSE	P11	M6	FALSE	P15	M4	FALSE	n.a.	n.a.	FALSE	n.a.	n.a.	

Note: In June 2021, MF.4 was estimated outside of the tool due to the changes in the energy statistics data, which are used as predictors for MF.4. Instead, MF.4 was estimated manually.

## Annex 3: 2023-vintage of model specifications

	MF1 - Biomass			MF2 - Metal ores			MF3 - Non metallic minerals			MF4 - Fossil energy material/carriers		
	Estimation Range	2001	2021	Estimation Range	2001	2021	Estimation Range	2001	2021	Estimation Range	2001	2021
	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type	Disaggregation	Predictors	Model Type
BE	FALSE	P5	M4	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	P20 + P21 + P19	M2
BG	FALSE	P5	M7	FALSE	P11	M4	FALSE	P15	M4	FALSE	P20 + P21 + P19	M3
CZ	FALSE	P3 + P9	M3	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	P20 + P21 + P19	M1
DK	FALSE	P5	M3	FALSE	n.a.	n.a.	FALSE	P15	M4	TRUE	P20 + P21 + P19	M4
DE	FALSE	P5	M3	FALSE	P11	M6	FALSE	P15	M4	FALSE	P20 + P21 + P19	M3
EE	FALSE	P3 + P9	M3	FALSE	n.a.	n.a.	FALSE	P14	M2	FALSE	P17	M4
IE	FALSE	P5	M4	FALSE	P11	M6	FALSE	P15	M7	TRUE	P20 + P21 + P19	M3
EL	FALSE	P5	M3	FALSE	P11	M2	FALSE	P15	M4	TRUE	P20 + P21 + P19	M6
ES	FALSE	P5	M4	FALSE	P11	M6	FALSE	P13	M6	FALSE	P20 + P21 + P19	M1
FR	FALSE	P5	M4	FALSE	P11	M6	FALSE	P15	M2	FALSE	P20 + P21 + P19	M3
HR	FALSE	P5	M2	FALSE	n.a.	n.a.	FALSE	P15	M4	TRUE	P20 + P21 + P19	M6
IT	FALSE	P5	M3	FALSE	P11	M6	FALSE	P15	M3	FALSE	P20 + P21 + P19	M3
CY	FALSE	P4	M3	FALSE	n.a.	n.a.	FALSE	P15	M6	FALSE	n.a.	n.a.
LV	FALSE	P5	M2	FALSE	n.a.	n.a.	FALSE	P15	M3	FALSE	P20 + P21 + P19	M6
LT	FALSE	P5	M2	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	P20 + P21 + P19	M1
LU	FALSE	P7	M3	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.
HU	FALSE	P5	M7	FALSE	n.a.	n.a.	FALSE	P15	M3	TRUE	P20 + P21 + P19	M4
MT	FALSE	P4	M6	FALSE	n.a.	n.a.	FALSE	P15	M6	FALSE	n.a.	n.a.
NL	FALSE	P5	M2	FALSE	n.a.	n.a.	FALSE	P15	M6	FALSE	P20 + P21 + P19	M2
AT	FALSE	P4 + P6 + P7 + P8 + P9	M3	FALSE	P11	M6	FALSE	P14	M4	FALSE	P20 + P21 + P19	M1
PL	FALSE	P5	M7	FALSE	P11	M6	FALSE	P15	M3	FALSE	P20 + P21 + P19	M1
PT	FALSE	P3 + P9	M3	FALSE	P11	M6	FALSE	P15	M4	FALSE	n.a.	n.a.
RO	FALSE	P3 + P9	M1	FALSE	P11	M4	FALSE	P15	M6	TRUE	P20 + P21 + P19	M3
SI	FALSE	P5	M7	FALSE	n.a.	n.a.	FALSE	P15	M3	TRUE	P20 + P21 + P19	M5
SK	FALSE	P5	M2	FALSE	P11	M6	FALSE	P15	M3	TRUE	P20 + P21 + P19	M5
FI	FALSE	P9	M3	FALSE	P11	M4	FALSE	P15	M3	TRUE	P20 + P21 + P19	M5
SE	FALSE	P9	M7	FALSE	P11	M2	FALSE	P14	M3	FALSE	P20 + P21 + P19	M3
UK	FALSE	P7	n.a.	FALSE	P11	n.a.	FALSE	P15	n.a.	TRUE	P20 + P21 + P19	n.a.
NO	FALSE	P3 + P9	M3	FALSE	P11	M4	FALSE	P13	M2	TRUE	P20 + P21 + P19	M1
CH	FALSE	P7	n.a.	FALSE	P11	n.a.	FALSE	P15	n.a.	FALSE	n.a.	n.a.

## Annex 4: Decomposed estimation errors by material

Table 4: Domestic extraction of biomass for the reference year 2020 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	36 676	100.0%	-13 057	46 726	-17 804	20 811
Austria	1 164	3.2%	2 925	321	79	-2 162
Belgium	3 239	8.8%	0	-86	1 265	2 060
Bulgaria	-1 160	-3.2%	-165	4	-9	-991
Croatia	-447	-1.2%	-901	-861	720	595
Cyprus	-21	-0.1%	72	50	-57	-86
Czechia	3 653	10.0%	-258	1 557	627	1 727
Denmark	-2 445	-6.7%	234	-2 833	0	155
Estonia	-1 599	-4.4%	-147	-1 332	80	-200
Finland	-2 219	-6.1%	-63	460	-69	-2 547
France	-16 426	-44.8%	-29 483	-3 779	-3 867	20 704
Germany	32 570	88.8%	1 267	18 621	187	12 495
Greece	4 386	12.0%	-910	3 481	1 257	559
Hungary	747	2.0%	6	962	521	-743
Ireland	-1 733	-4.7%	-5 818	-2 208	236	6 056
Italy	9 341	25.5%	-209	7 495	-8	2 063
Latvia	2 357	6.4%	183	1 888	0	286
Lithuania	1 524	4.2%	3 350	0	66	-1 892
Luxembourg	112	0.3%	-40	1	0	152
Malta	-6	0.0%	0	0	0	-6
Netherlands	521	1.4%	440	455	0	-375
Poland	2 028	5.5%	-8 799	1 968	4 361	4 498
Portugal	-579	-1.6%	-366	-92	643	-765
Romania	4 871	13.3%	-2 748	21 603	-23 822	9 838
Slovak Republic	-542	-1.5%	322	-41	0	-822
Slovenia	-260	-0.7%	445	13	3	-721
Spain	1 339	3.7%	29 620	-356	-17	-27 907
Sweden	-3 739	-10.2%	-2 013	-566	0	-1 159
Norway	-309		-142	13	929	-1 110
Switzerland	-209		-14 683	0	0	14 474



Table 5: Domestic extraction of metal ores for the reference year 2020 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	9 119	100.0%	3 707	1 652	-377	4 137
Austria	927	10.2%	0	839	0	89
Belgium	0	0.0%	0	0	0	0
Bulgaria	847	9.3%	1 584	-170	0	-567
Croatia	0	0.0%	0	0	0	0
Cyprus	-434	-4.8%	-523	0	0	89
Czechia	0	0.0%	0	0	0	0
Denmark	0	0.0%	0	0	0	0
Estonia	0	0.0%	0	0	0	0
Finland	3 910	43%	0	0	0	3 910
France	15	0.2%	0	0	0	15
Germany	9	0.1%	0	0	0	9
Greece	-600	-6.6%	574	90	0	-1 264
Hungary	0	0.0%	0	0	0	0
Ireland	-145	-1.6%	0	0	0	-145
Italy	-3	0.0%	0	1	0	-5
Latvia	0	0.0%	0	0	0	0
Lithuania	0	0.0%	0	0	0	0
Luxembourg	0	0.0%	0	0	0	0
Malta	0	0.0%	0	0	0	0
Netherlands	0	0.0%	0	0	0	0
Poland	-296	-3.2%	0	0	0	-296
Portugal	-338	-3.7%	0	819	0	-1 157
Romania	260	2.8%	0	0	0	260
Slovak Republic	3	0.0%	0	0	0	3
Slovenia	0	0.0%	0	0	0	0
Spain	3 570	39.1%	0	72	0	3 498
Sweden	1 395	15%	2 072	0	-377	-300
Norway	-731		0	0	0	-731
Switzerland	0		0	0	0	0

Table 6: Domestic extraction of non-metallic minerals for the reference year 2020 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	149 724	100%	-35 933	125 402	12 139	48 116
Austria	-11 884	-7.9%	0	-11 748	176	-313
Belgium	-4 905	-3.3%	-3 022	-2 734	0	850
Bulgaria	4 160	2.8%	-1 767	-2 796	0	8 723
Croatia	-295	-0.2%	124	0	0	-419
Cyprus	1 015	0.7%	939	0	0	76
Czechia	3 052	2.0%	-1 841	0	0	4 893
Denmark	-3 350	-2.2%	-295	-82	122	-3 095
Estonia	895	0.6%	1 445	-40	170	-680
Finland	73 509	49.1%	-673	73 082	483	617
France	28 591	19.1%	-29 298	19 566	9 782	28 540
Germany	24 616	16.4%	10 824	31 697	0	-17 904
Greece	5 446	3.6%	-3 778	6 027	0	3 196
Hungary	-1 478	-1.0%	-694	1 478	-710	-1 553
Ireland	-127	-0.1%	2 629	-1 958	0	-797
Italy	4 915	3.3%	-4 564	4 915	827	3 737
Latvia	-630	-0.4%	716	0	0	-1 346
Lithuania	2 710	1.8%	0	0	0	2 710
Luxembourg	-96	-0.1%	0	-125	-2	31
Malta	180	0.1%	0	176	0	5
Netherlands	2 387	1.6%	219	2 476	0	-307
Poland	-5 491	-3.7%	-3 098	0	0	-2 393
Portugal	-16 507	-11.0%	-5 173	-2 879	0	-8 455
Romania	6 673	4.5%	-28 657	0	0	35 329
Slovak Republic	3 005	2.0%	-264	0	-62	3 331
Slovenia	-140	-0.1%	-51	0	0	-89
Spain	34 902	23.3%	30 425	8 519	0	-4 041
Sweden	-1 429	-1.0%	-80	-171	1 353	-2 532
Norway	-6 881		181	565	0	-7 627
Switzerland	204		-44 005	0	0	44 209

Table 7: Domestic extraction of fossil energy material/carriers for the reference year 2020 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	-1 568	100%	-171	42 538	-28 730	-15 204
Austria	0	0.0%	0	16 549	-16 560	12
Belgium	-89	5.7%	0	-77	17	-29
Bulgaria	7	-0.4%	0	-514	556	-35
Croatia	-14	0.9%	0	229	0	-243
Cyprus	0	0.0%	0	0	0	0
Czechia	-4	0.2%	0	8	-1 319	1 307
Denmark	185	-11.8%	0	5 032	-4 959	112
Estonia	136	-8.7%	0	116	0	20
Finland	513	-32.7%	0	0	189	324
France	-61	3.9%	0	-22	7	-45
Germany	999	-63.7%	0	1 663	-307	-357
Greece	202	-12.9%	0	13 603	0	-13 401
Hungary	52	-3.3%	0	77	-9	-16
Ireland	1	-0.1%	0	4 486	-4 352	-133
Italy	-140	8.9%	0	393	-1 072	539
Latvia	1 170	-74.6%	0	1 183	0	-13
Lithuania	-57	3.6%	-171	129	-98	83
Luxembourg	0	0.0%	0	0	0	0
Malta	0	0.0%	0	0	0	0
Netherlands	-916	58.5%	0	3 471	-991	-3 396
Poland	-4 118	262.7%	0	-4 318	638	-438
Portugal	0	0.0%	0	0	0	0
Romania	199	-12.7%	0	245	-388	342
Slovak Republic	28	-1.8%	0	37	-34	25
Slovenia	-2	0.1%	0	0	-1	0
Spain	30	-1.9%	0	96	-43	-23
Sweden	310	-19.8%	0	154	-4	161
Norway	-27 815		0	533 524	-563 187	1 848
Switzerland	0		0	0	0	0