

# Economy-wide material flow accounts – assessment of early estimates for reference year 2021

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*Eurostat E2, October 2023*

## 1 Introduction

In June/July 2022 Eurostat produced and published early estimates of the domestic extraction of materials (*2022-vintage of early estimate*) for reference year 2021. 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 2021 by analysing the estimation error. The estimation error is defined as the difference between the *2022-vintage of early estimate* and the actual *2023-outturn*<sup>1</sup> for reference year 2021. 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 2021 with the 2023-vintage of model specifications (whilst keeping the 2022-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 2022 and July 2023. This effect 2 is quantified by simulating the estimation for reference year 2021 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. one year 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 2021 according to Regulation (EU) 691/2011 Annex III. This data was published in July 2023.

2022. This effect 3 is quantified by simulating the estimation for reference year 2021 with the 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 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 2021 and the aggregated EU is 5558 million tonnes, which is about 104 million tonnes bigger than the 2022-vintage of early estimate (see Table 1). Table 1 also shows the estimation error by material category. The estimation error for biomass is biggest with ca. 62 million tonnes. The estimation error for non-metallic minerals amounts to ca. 46 million tonnes.

Table 1: Domestic extraction for the reference year 2021 (thousand tonnes) – outturn versus early estimate, by main material categories

EU-27	2022-vintage of early estimate	2023-outturn	Estimation error (overall)
Total materials	5 454 908	5 558 538	103 631
Biomass	1 491 342	1 553 480	62 138
Metal ores	234 228	226 098	-8 130
Non-metallic minerals	3 322 701	3 369 059	46 358
Fossil energy material/carriers	406 637	409 902	3 265

Table 2 shows the EU estimation error in a breakdown by the effects (see above) and by four main material categories. **Effect 1** quantifies the effect of the changed model specifications that took place between June 2022 and July 2023. With 16 million tonnes the effect of improved/changed model specifications was rather moderate.

**Effect 2** (66 million tonnes) is by far the most important effect ‘explaining’ the overall estimation error (104 million tonnes). Effect 2 quantifies the impact of EW-MFA data revisions between June 2022 and July 2023. Within **Effect 2** the material category of non-metallic minerals is most important.

With ca. 3 million tonnes, **Effect 3** also contributes to the overall estimation error. It quantifies the impact of data revisions of the predictor variables between June 2022 and July 2023.

The **residual error**, i.e., the overall estimation error adjusted for the explainable effects is moderate with 19 million tonnes and it is dominated by biomass.

Table 2: Domestic extraction for the reference year 2021 (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	103 631	15 868	65 884	2 636	19 243
Biomass	62 138	43 467	9 443	-2 535	11 763
Metal ores	-8 130	-4 417	2 855	-1 326	-5 241
Non-metallic minerals	46 358	-24 899	53 218	6 716	11 323
Fossil energy material/carriers	3 265	1 718	369	-219	1 398

Figure 1: Decomposed estimation errors for reference years 2017-2021 - domestic material extraction EU

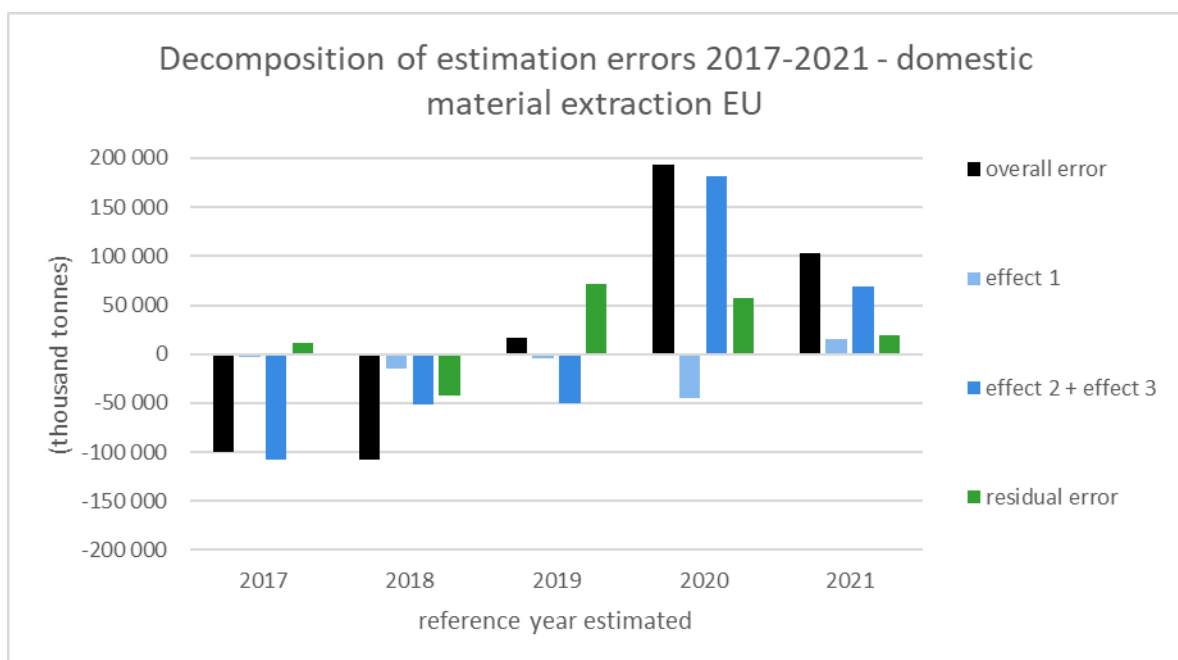


Figure 1 presents for the EU a decomposition of the estimation errors for the reference years 2017 to 2021. The black bar represents the overall estimation error, which is the difference between the initial estimate six months after the respective reference year and the actual outturn as reported by 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 was extraordinarily huge for reference year 2020 with almost 200 million tonnes. For reference year 2021, the overall estimation error is 100 million tonnes, similar to the reference years 2017 and 2018, however with reversed sign.

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 104 million tonnes – can also be broken down by country (see Table 3: Domestic extraction (all materials) for the reference year 2021 (thousand tonnes) – decomposing the EU overall estimation error by country ). The estimation errors for Finland, France, Sweden and Italy are the most outstanding.

Table 3: Domestic extraction (all materials) for the reference year 2021 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	2022-vintage of early	2023-outturn	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	5 454 908	5 558 538	103 631	100.0%	15 868	65 884	2 636	19 243
Austria	136 800	130 834	-5 966	-5.8%	2 105	-12 732	-1 606	6 267
Belgium	90 896	90 907	11	0.0%	-30	1 361	-322	-997
Bulgaria	155 878	157 740	1 862	1.8%	-2 132	289	64	3 641
Croatia	44 548	42 508	-2 040	-2.0%	114	75	2	-2 231
Cyprus	13 915	14 310	395	0.4%	-452	-152	-13	1 012
Czechia	161 927	163 887	1 960	1.9%	229	1 110	1 359	-739
Denmark	114 841	115 764	923	0.9%	-375	-113	441	969
Estonia	42 069	40 230	-1 838	-1.8%	-1 095	-1 280	117	420
Finland	183 720	236 917	53 197	51.3%	-4 043	71 009	-649	-13 122
France	602 231	649 624	47 393	45.7%	42 849	16 293	9 789	-21 539
Germany	957 639	973 451	15 812	15.3%	-6 815	8 906	-348	14 069
Greece	87 062	93 238	6 176	6.0%	3 216	3 714	1 692	-2 447
Hungary	141 924	130 600	-11 325	-10.9%	2 084	-781	-881	-11 746
Ireland	88 017	87 712	-305	-0.3%	8 076	-3 405	604	-5 580
Italy	368 711	346 906	-21 805	-21.0%	24	-6 316	-262	-15 250
Latvia	35 164	38 344	3 180	3.1%	205	-39	0	3 015
Lithuania	56 207	55 059	-1 147	-1.1%	-1 586	-1 765	0	2 204
Luxembourg	2 128	2 473	345	0.3%	428	-10	0	-72
Malta	2 195	2 154	-41	0.0%	0	-1	0	-40
Netherlands	91 214	89 926	-1 287	-1.2%	5 529	-6 858	-905	946
Poland	648 830	641 307	-7 523	-7.3%	-21 155	11 422	-325	2 536
Portugal	153 879	143 280	-10 598	-10.2%	511	-16 227	304	4 813
Romania	556 715	554 960	-1 756	-1.7%	-510	-2 371	-1 982	3 108
Slovak Republic	56 466	57 073	607	0.6%	-404	-155	-33	1 200
Slovenia	23 165	26 290	3 125	3.0%	95	114	-12	2 928
Spain	370 074	382 696	12 622	12.2%	-11 292	5 578	151	18 186
Sweden	268 695	290 349	21 655	20.9%	291	-1 780	-4 549	27 693
Norway	0	328 032	328 032		236 821	-4 405	97 986	-2 370
Switzerland	0	57 857	57 857		0	0	0	57 857

## Annex 1: Estimation methodology

Eurostat has developed a tool to provide early estimates of domestic extraction of four main material 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 for the respective model equations). Four 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 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: 2022-vintage of model specifications

	MF1 - Biomass			MF2 - Metal ores			MF3 - Non metallic minerals			MF4 - Fossil energy material/carriers		
	Estimation Range	2001	2020	Estimation Range	2001	2020	Estimation Range	2001	2020	Estimation Range	2001	2020
	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 + P1	M7
BG	FALSE	P5	M7	FALSE	P11	M3	FALSE	P15	M3	FALSE	P20 + P21 + P1	M1
CZ	FALSE	P5	M4	FALSE	n.a.	n.a.	FALSE	P15	M2	FALSE	P20 + P21 + P1	M1
DK	FALSE	P5	M4	FALSE	n.a.	n.a.	FALSE	P15	M3	TRUE	P20 + P21 + P1	M1
DE	FALSE	P3	M1	FALSE	P11	M6	FALSE	P13	M3	FALSE	P20 + P21 + P1	M3
EE	FALSE	P3	M4	FALSE	n.a.	n.a.	FALSE	P15	M1	FALSE	P17	M3
IE	FALSE	P8	M3	FALSE	P11	M6	FALSE	P15	M7	TRUE	P20 + P21 + P1	M7
EL	FALSE	P4	M4	FALSE	P11	M6	FALSE	P15	M4	TRUE	P20 + P21 + P1	M5
ES	FALSE	P5	M7	FALSE	P11	M6	FALSE	P13	M1	FALSE	P20 + P21 + P1	M5
FR	FALSE	P4	M3	FALSE	P11	M6	FALSE	P15	M3	FALSE	P20 + P21 + P1	M7
HR	FALSE	P5	M3	FALSE	n.a.	n.a.	FALSE	P15	M3	TRUE	P20 + P21 + P1	M3
IT	FALSE	P5	M3	FALSE	P11	M6	FALSE	P15	M4	FALSE	P20 + P21 + P1	M2
CY	FALSE	P4	M4	FALSE	n.a.	M6	FALSE	P15	M4	FALSE	n.a.	n.a.
LV	FALSE	P3	M3	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	P20 + P21 + P1	M6
LT	FALSE	P1	M4	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	P20 + P21 + P1	M7
LU	FALSE	P8	M4	FALSE	n.a.	n.a.	FALSE	P15	M4	FALSE	n.a.	n.a.
HU	FALSE	P5	M7	FALSE	n.a.	n.a.	FALSE	P15	M4	TRUE	P20 + P21 + P1	M1
MT	FALSE	P4	M6	FALSE	n.a.	n.a.	FALSE	P15	M6	FALSE	n.a.	n.a.
NL	FALSE	P4	M1	FALSE	n.a.	n.a.	FALSE	P15	M1	FALSE	P20 + P21 + P1	M1
AT	FALSE	P4 + P6 + P7 + P8 + P9	M6	FALSE	P11	M6	FALSE	P14	M3	FALSE	P20 + P21 + P1	M1
PL	FALSE	P5	M1	FALSE	P11	M6	FALSE	P13	M4	FALSE	P20 + P21 + P1	M1
PT	FALSE	P3 + P9	M2	FALSE	P11	M6	FALSE	P15	M4	FALSE	n.a.	n.a.
RO	FALSE	P3 + P9	M2	FALSE	P11	M4	FALSE	P15	M4	TRUE	P20 + P21 + P1	M3
SI	FALSE	P4 + P6 + P7 + P8 + P9	M3	FALSE	n.a.	n.a.	FALSE	P15	M3	TRUE	P20 + P21 + P1	M5
SK	FALSE	P4	M3	FALSE	P11	M6	FALSE	P15	M3	TRUE	P20 + P21 + P1	M5
FI	FALSE	P9	M3	FALSE	P11	M7	FALSE	P14	M3	TRUE	P20 + P21 + P1	M5
SE	FALSE	P9	M4	FALSE	P11	M6	FALSE	P14	M7	FALSE	P20 + P21 + P1	M1
UK	FALSE	P7	n.a.	FALSE	P11	n.a.	FALSE	P15	n.a.	TRUE	P20 + P21 + P1	n.a.
NO	FALSE	P1	n.a.	FALSE	P11	n.a.	FALSE	P15	n.a.	TRUE	P20 + P21 + P1	n.a.
CH	FALSE	P7	n.a.	FALSE	P11	n.a.	FALSE	P15	n.a.	FALSE	n.a.	n.a.

## 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	FALSE	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 2021 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	62 138	100.0%	43 467	9 443	-2 535	11 763
Austria	1 805	2.9%	-362	-592	113	2 646
Belgium	2 333	3.8%	0	117	-323	2 538
Bulgaria	428	0.7%	0	230	0	198
Croatia	-617	-1.0%	8	75	2	-702
Cyprus	-140	-0.2%	66	-152	-13	-40
Czechia	-1 334	-2.1%	-915	1 639	1 360	-3 418
Denmark	1 078	1.7%	1 928	-172	-31	-647
Estonia	-906	-1.5%	-835	-1 460	119	1 270
Finland	-1 025	-1.6%	0	397	-415	-1 006
France	26 245	42.2%	44 036	-5 827	-909	-11 055
Germany	31 727	51.1%	10 974	7 475	0	13 278
Greece	1 871	3.0%	1 401	-53	1 146	-623
Hungary	1 604	2.6%	0	1 293	287	24
Ireland	-2 228	-3.6%	8 086	-3 121	617	-7 811
Italy	17	0.0%	0	4 393	-2 348	-2 028
Latvia	-688	-1.1%	-1 014	112	0	213
Lithuania	-1 744	-2.8%	-1 528	-1 763	0	1 546
Luxembourg	330	0.5%	428	-10	0	-87
Malta	-5	0.0%	0	-1	0	-4
Netherlands	-264	-0.4%	-630	863	0	-496
Poland	5 986	9.6%	-6 892	9 813	-325	3 390
Portugal	-515	-0.8%	511	-598	304	-732
Romania	-1 114	-1.8%	-3 261	-2 313	-2 223	6 682
Slovak Republic	294	0.5%	-404	56	-35	677
Slovenia	-35	-0.1%	95	4	-12	-122
Spain	1 178	1.9%	-6 391	315	151	7 103
Sweden	-2 143	-3.4%	-1 835	-1 276	0	968
Norway	16 359		14 892	-272	270	1 469
Switzerland	13 109		0	0	0	13 109



Table 5: Domestic extraction of metal ores for the reference year 2021 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	-8 130	100.0%	-4 417	2 855	-1 326	-5 241
Austria	1 385	-17.0%	0	1 128	0	257
Belgium	0	0.0%	0	0	0	0
Bulgaria	-2 150	26.4%	-1 813	48	0	-384
Croatia	0	0.0%	0	0	0	0
Cyprus	-89	1.1%	-89	0	0	0
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	-8 205	101%	-4 349	0	0	-3 857
France	29	-0.4%	0	0	0	29
Germany	-50	0.6%	0	0	0	-50
Greece	-485	6.0%	-178	41	0	-348
Hungary	0	0.0%	0	0	0	0
Ireland	-167	2.1%	0	0	0	-167
Italy	50	-0.6%	0	-1	0	51
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	-1 095	13.5%	0	0	0	-1 095
Portugal	1 290	-15.9%	0	15	0	1 275
Romania	56	-0.7%	0	-59	0	115
Slovak Republic	6	-0.1%	0	0	0	6
Slovenia	0	0.0%	0	0	0	0
Spain	628	-7.7%	0	1 654	0	-1 026
Sweden	667	-8%	2 011	29	-1 326	-47
Norway	2 255		2 343	25	0	-112
Switzerland	0		0	0	0	0

Table 6: Domestic extraction of non-metallic minerals for the reference year 2021 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	46 358	100%	-24 899	53 218	6 716	11 323
Austria	-9 171	-19.8%	2 467	-13 268	-1 721	3 351
Belgium	-2 369	-5.1%	0	1 249	0	-3 618
Bulgaria	3 563	7.7%	-345	9	0	3 899
Croatia	-1 446	-3.1%	-2	0	0	-1 444
Cyprus	623	1.3%	-429	0	0	1 052
Czechia	3 136	6.8%	1 144	0	0	1 992
Denmark	-610	-1.3%	-2 262	0	291	1 361
Estonia	-1 214	-2.6%	-320	180	-2	-1 072
Finland	61 937	133.6%	306	70 613	-238	-8 743
France	21 240	45.8%	-1 100	22 252	10 711	-10 624
Germany	-16 239	-35.0%	-17 789	1 266	-512	797
Greece	4 487	9.7%	0	3 726	546	214
Hungary	-12 995	-28.0%	2 052	-2 178	-1 179	-11 690
Ireland	2 093	4.5%	0	-388	0	2 481
Italy	-21 468	-46.3%	60	-10 224	2 043	-13 348
Latvia	3 791	8.2%	1 219	-152	0	2 724
Lithuania	601	1.3%	0	0	0	601
Luxembourg	15	0.0%	0	0	0	15
Malta	-36	-0.1%	0	0	0	-36
Netherlands	-771	-1.7%	6 433	-6 927	0	-277
Poland	-14 206	-30.6%	-14 263	-286	0	343
Portugal	-11 373	-24.5%	0	-15 644	0	4 271
Romania	-622	-1.3%	2 750	0	0	-3 372
Slovak Republic	281	0.6%	0	-211	0	493
Slovenia	3 160	6.8%	0	110	0	3 050
Spain	10 806	23.3%	-4 902	3 609	0	12 099
Sweden	23 145	49.9%	81	-518	-3 223	26 805
Norway	100 929		111 870	-6 089	0	-4 852
Switzerland	44 748		0	0	0	44 748

Table 7: Domestic extraction of fossil energy material/carriers for the reference year 2021 (thousand tonnes) – decomposing the EU overall estimation error by country

Geo	Estimation error (overall)		Effect 1	Effect 2	Effect 3	residual error
EU27	3 265	100%	1 718	369	-219	1 398
Austria	15	0.4%	0	0	3	12
Belgium	47	1.5%	-30	-6	0	83
Bulgaria	20	0.6%	26	2	64	-72
Croatia	23	0.7%	109	0	0	-86
Cyprus	0	0.0%	0	0	0	0
Czechia	157	4.8%	0	-529	0	687
Denmark	455	13.9%	-41	59	181	255
Estonia	281	8.6%	60	0	0	221
Finland	489	15.0%	0	0	4	484
France	-120	-3.7%	-87	-131	-14	112
Germany	374	11.5%	0	165	164	45
Greece	303	9.3%	1 993	0	0	-1 690
Hungary	67	2.0%	32	103	12	-80
Ireland	-2	-0.1%	-10	105	-14	-83
Italy	-404	-12.4%	-37	-484	43	75
Latvia	77	2.4%	0	0	0	77
Lithuania	-4	-0.1%	-59	-2	0	56
Luxembourg	0	0.0%	0	0	0	0
Malta	0	0.0%	0	0	0	0
Netherlands	-253	-7.7%	-274	-794	-905	1 720
Poland	1 793	54.9%	0	1 895	0	-103
Portugal	0	0.0%	0	0	0	0
Romania	-76	-2.3%	0	1	241	-318
Slovak Republic	26	0.8%	0	0	2	24
Slovenia	0	0.0%	0	0	0	0
Spain	11	0.3%	1	0	0	10
Sweden	-14	-0.4%	35	-15	0	-33
Norway	208 489		107 717	1 930	97 716	1 126
Switzerland	0		0	0	0	0