

EO-MINERS: Earth Observation for Monitoring and Observing Environmental and Societal Impacts of Mineral Resources Exploration and Exploitation

Minerals and Society Workshop

**Accounting for mineral extraction
and environmental pressures
from a national perspective**

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- **What do the European statistical offices do?**
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The demand for statistical information on material use

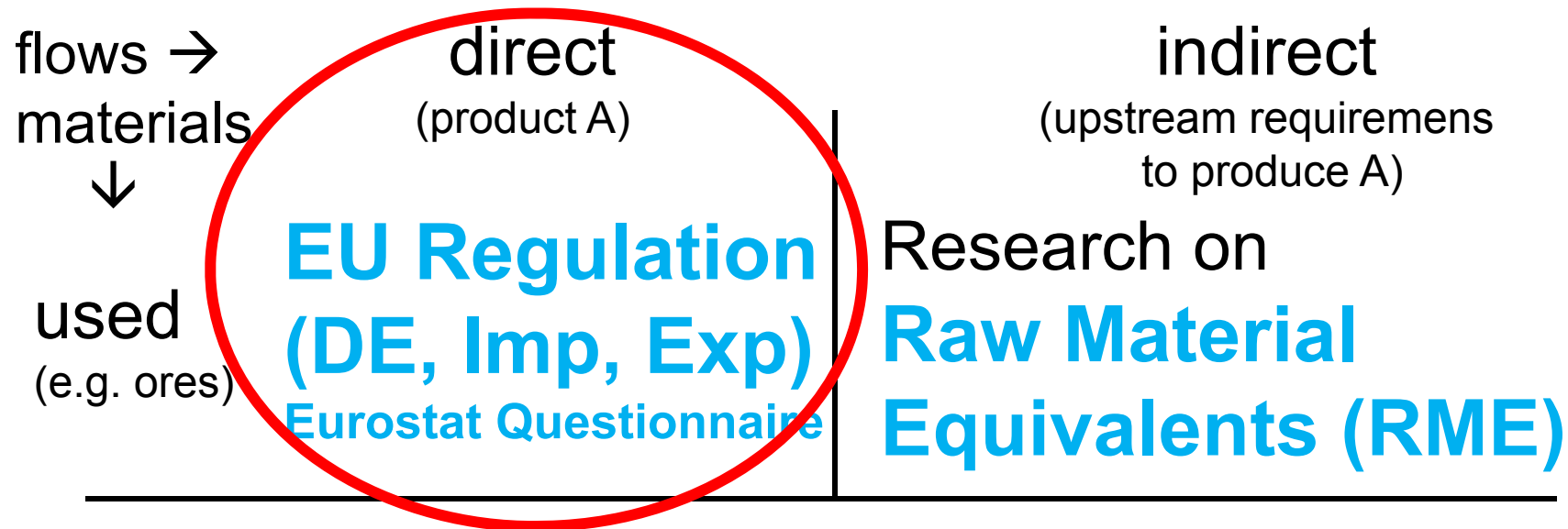
- **EU Sustainable Development Strategy: Sustainable Consumption and Production Theme**
Headline indicator: **Resource productivity** (GDP/DMC)
- **Europe 2020 strategy:**
Flagship initiative ***A resource-efficient Europe***

REGULATION (EU) No 691/2011 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 July 2011 on European environmental economic accounts



also: OECD, UNEP-International Resource Panel, ...

What do European statistical offices do?



unused
(e.g. mining overburden)

Also relevant in terms of environmental pressure, but usually neglected. They would deserve the attention of official statistics

Istat: unused flow coefficients per unit of used material

(Sources:

- EEA TMR study by S. Bringezu and H. Schuetz - Wuppertal Institute for metals and other minerals from mines;
- estimates based on Ispra waste statistics for quarry materials)

Eurostat EW-MFA Questionnaire

Domestic extraction:

- Biomass
- Metal ores (gross ores)
- Non metallic minerals
- Fossil energy materials/carriers

Data sources:

Production statistics (Istat)

Administrative data

Modelling (coherence checks)

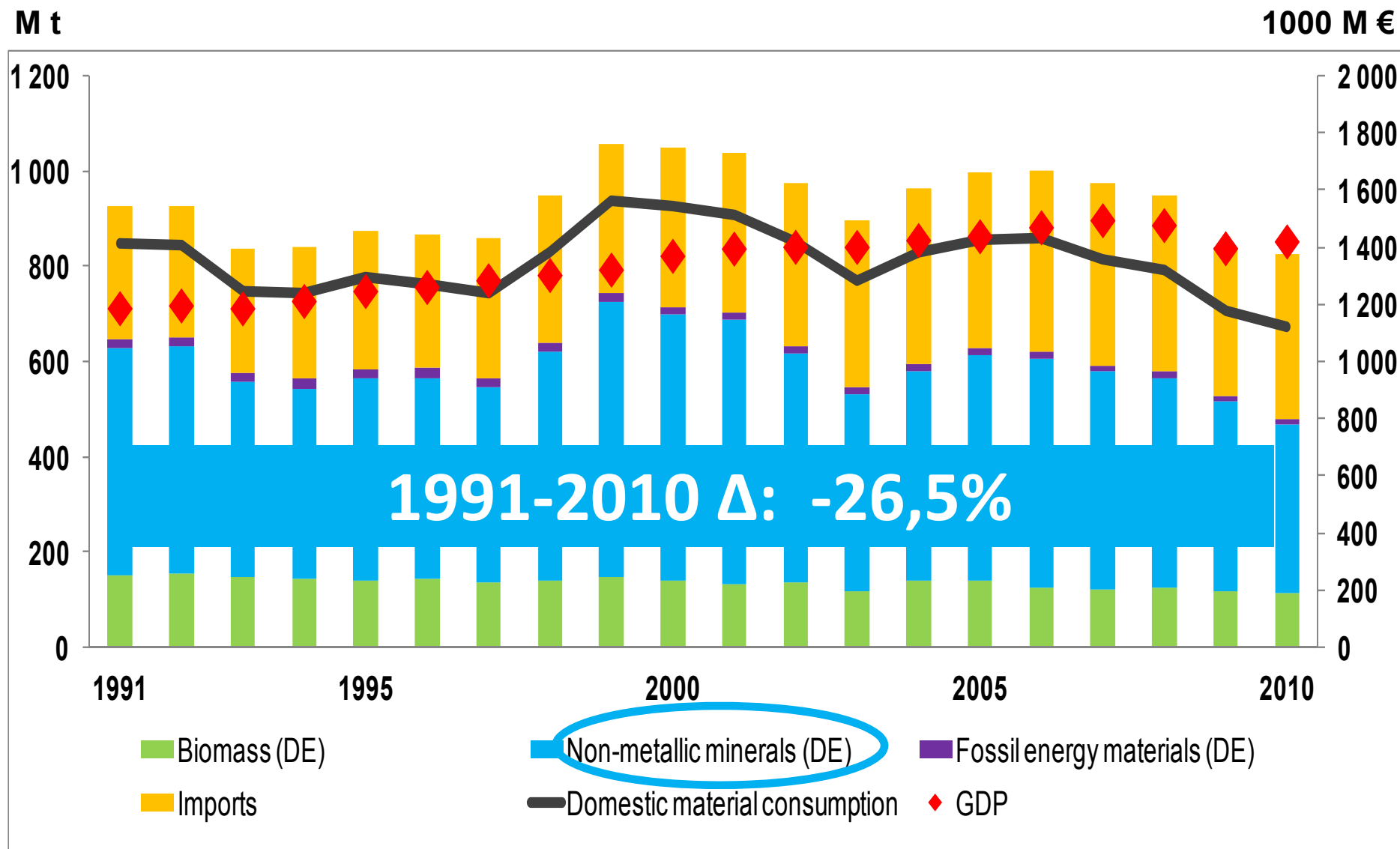
Imports and Exports (intra and extra EU-27 trade):

- Biomass and biomass products
- Metal ores and concentrates, raw and processed
- Non metallic minerals, raw and processed
- Fossil energy materials/carriers, raw and processed
- Other products
- Waste imported and exported for final treatment and disposal

Data sources:

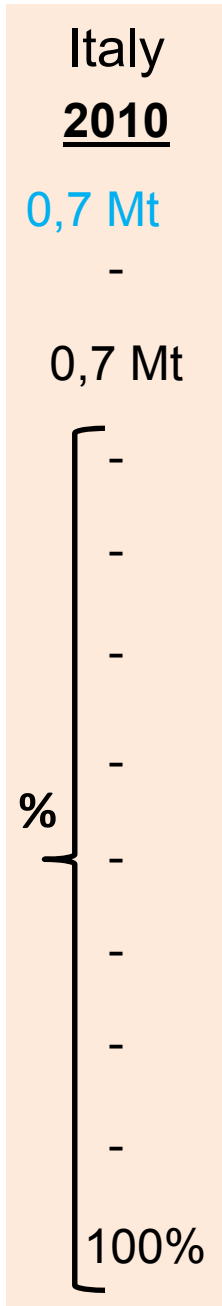
External trade statistics (Istat)

Direct Material Input, Domestic Material Consumption and GDP. Italy, 1991-2010



Eurostat EW-MFA Questionnaire / DE

Metal ores (gross ores)



Iron

Non-ferrous metal

Copper – gross ore*

Nickel – gross ore*

Lead – gross ore*

Zinc – gross ore*

Tin – gross ore*

Gold, silver, platinum and other precious metals

Bauxite and other aluminium

Uranium and thorium

Other n.e.c.

Source: Istat

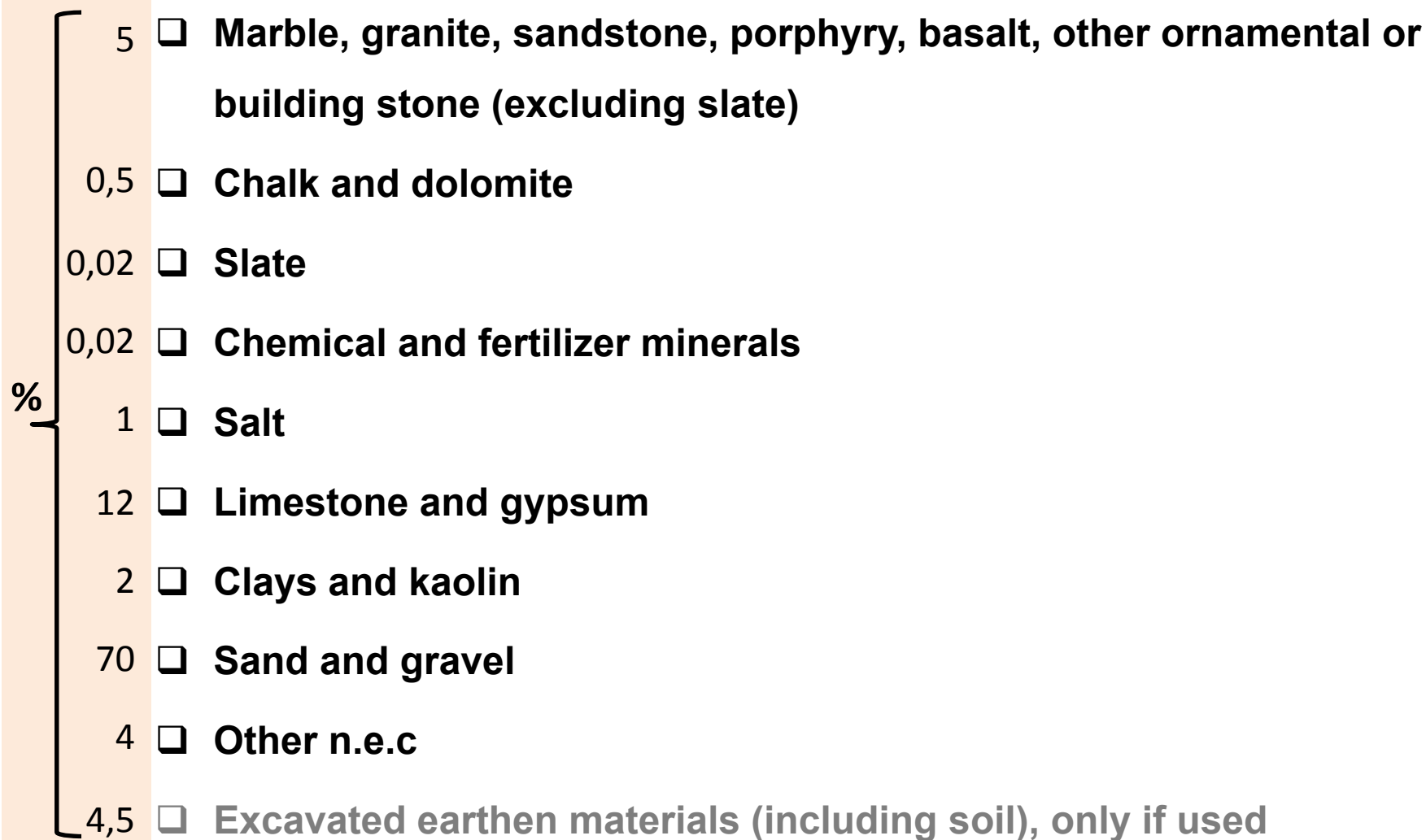
* optional reporting: metal content

Italy
2010

350 Mt

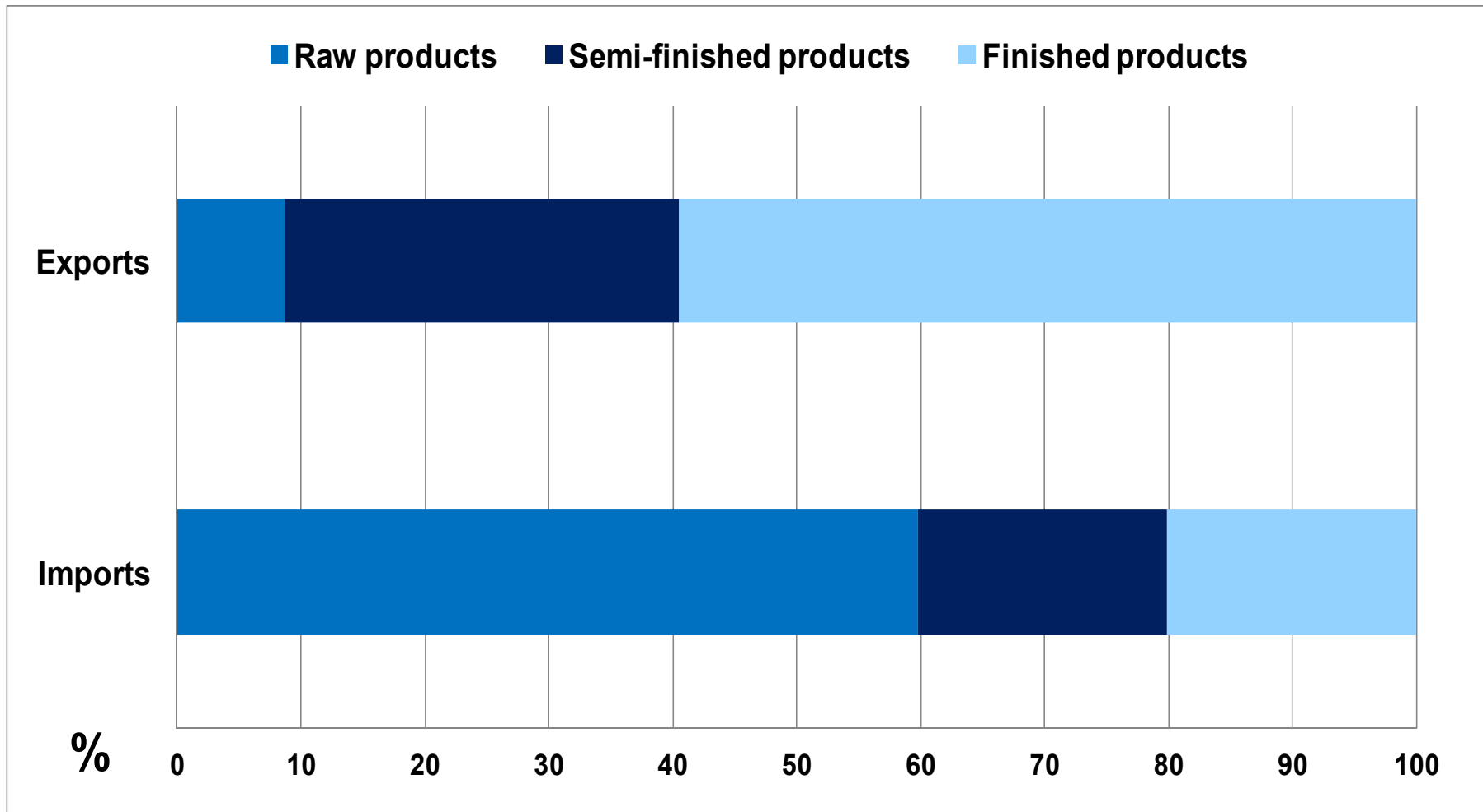
Eurostat EW-MFA Questionnaire / DE

Non metallic minerals



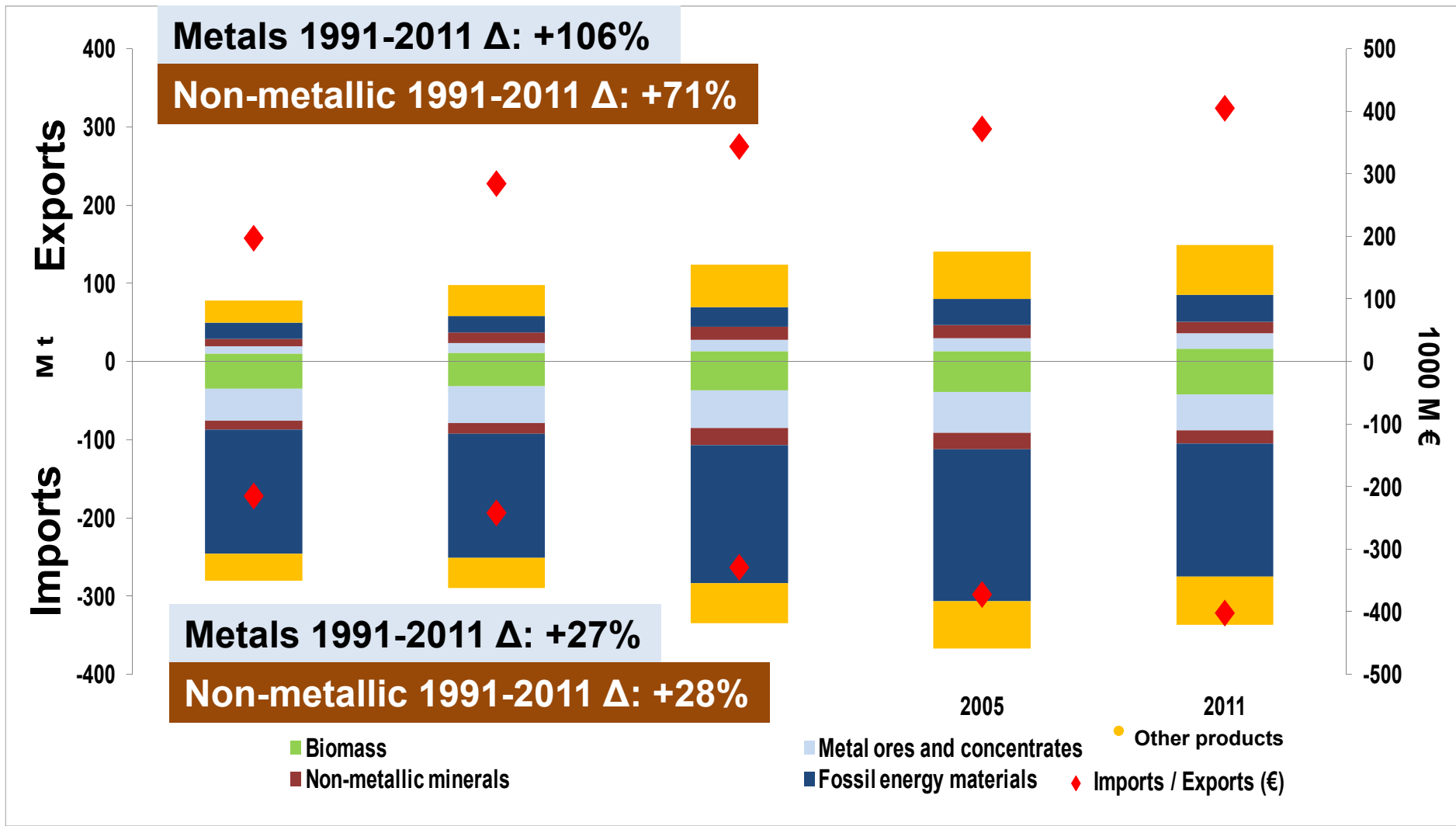
Source: Istat

Imports and Exports by stage of manufacturing. Italy, 2011



Source: Istat

Imports and Exports in physical units by material category; Imports and Exports in monetary units. Italy, 1991-2011.



Italy

Imp
2011

57,4 Mt

Eurostat EW-MFA Questionnaire

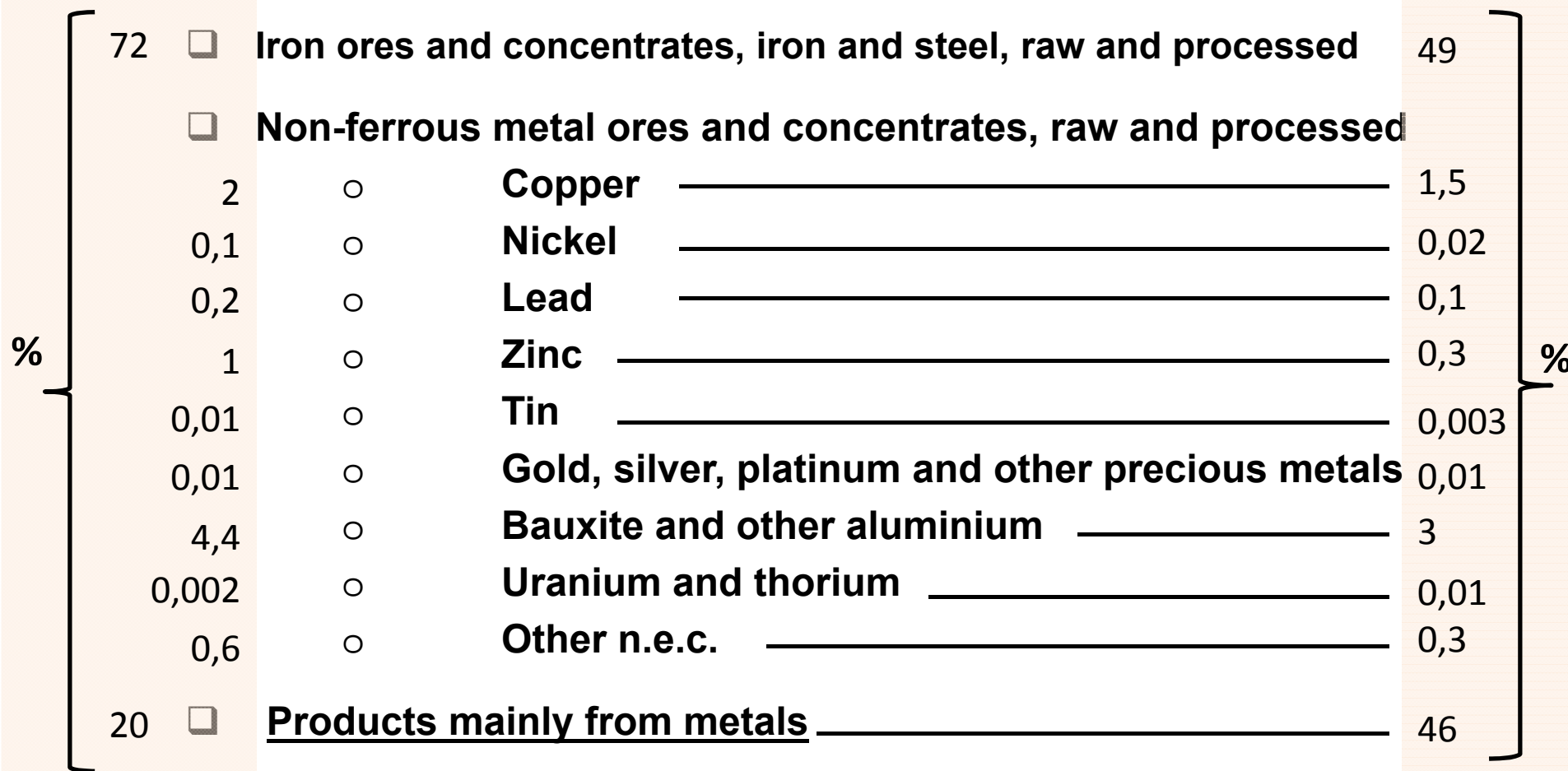
Imp-Exp

Italy

Exp
2011

36,3 Mt

Metal ores and concentrates, raw and processed



IT Imp
2011

Eurostat EW-MFA Questionnaire / Imp-Exp

Exp IT
2011

20,9 Mt

Non metallic minerals, raw and processed

19,3 Mt

8	<input type="checkbox"/> Marble, granite, sandstone, porphyry, basalt, other ornamental or building stone (excluding slate)	16
0,1	<input type="checkbox"/> Chalk and dolomite	0,4
0,3	<input type="checkbox"/> Slate	0,02
15	<input type="checkbox"/> Chemical and fertilizer minerals	5
5	<input type="checkbox"/> Salt	5
0,1	<input type="checkbox"/> Limestone and gypsum	0,3
20	<input type="checkbox"/> Clays and kaolin	29
17	<input type="checkbox"/> Sand and gravel	6
13	<input type="checkbox"/> Other n.e.c	15
-	<input type="checkbox"/> Excavated earthen materials (including soil), only if used	-
21	<input type="checkbox"/> <u>Products mainly from non metallic minerals</u>	23

The external constraint of the Italian economy (share of Imports on Direct Material Input)

Material		1991	2010
		%	
Crops		17	31
	<i>Cereals</i>	31	46
Other biomass		40	55
	<i>Timber (industrial round-wood)</i>	80	85
Metal ores		99,7	98,2
Non-metallic minerals		2,4	4,8
Fossil energy materials		89	93

Source: Istat

What do European statistical offices do?

flows →
materials
↓

Used
(e.g. ores)

direct

**EU Regulation
(DE, Imp, Exp)**
Eurostat Questionnaire

indirect

Research on
**Raw Material
Equivalents (RME)**

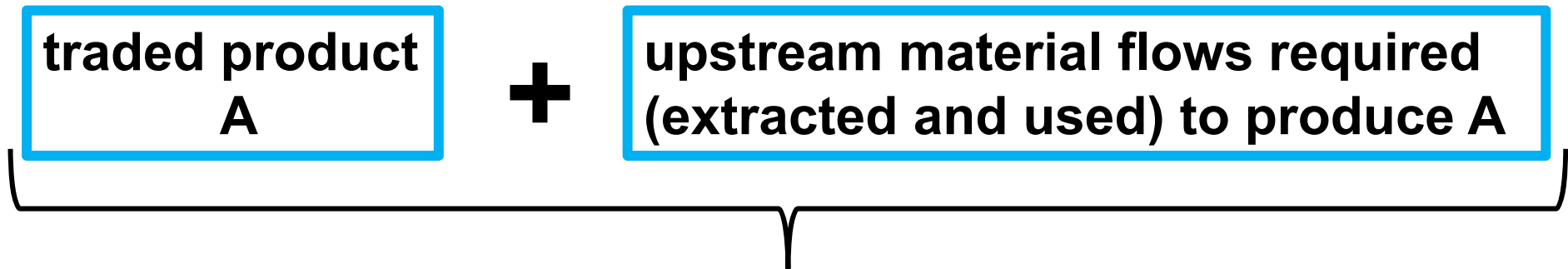
Unused
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Istat: unused flow coefficients per unit of used material
(Sources:

- EEA TMR study by S. Bringezu and H. Schuetz - Wuppertal Institute for metals and other minerals from mines;
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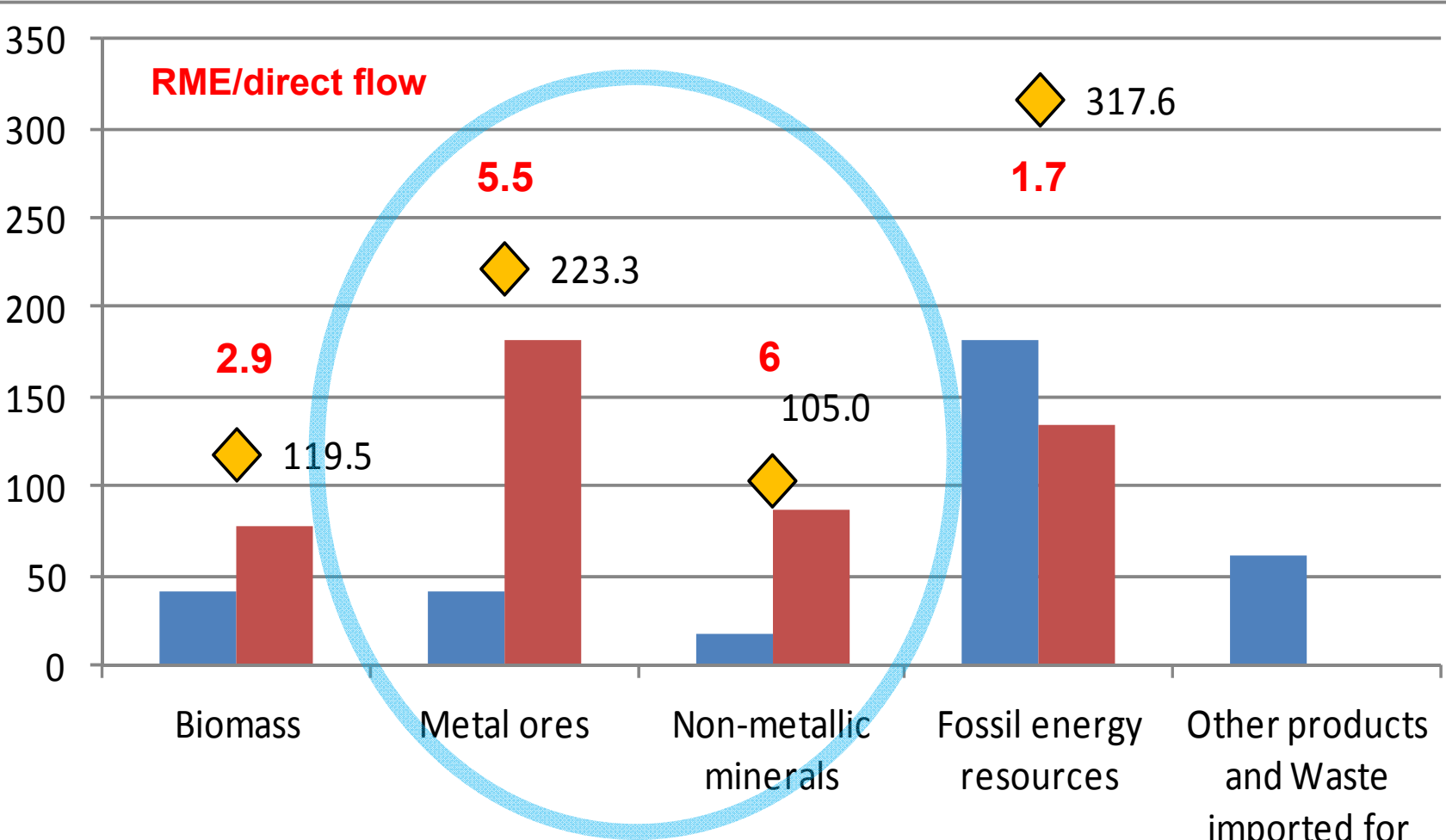
Direct and indirect flows: Raw Material Equivalents (RME)



- ❑ avoid DMC components' **asymmetry**
- ❑ whole production chain: **life-cycle perspective**
- ❑ required materials irrespective of whether they are extracted from the domestic or from the rest of the world environment
- ❑ environmental-economic link: focus on all the potential environmental pressures associated to domestic final uses (**footprint**) and exports

Direct and indirect flows of Imports. Italy, 2010

M t

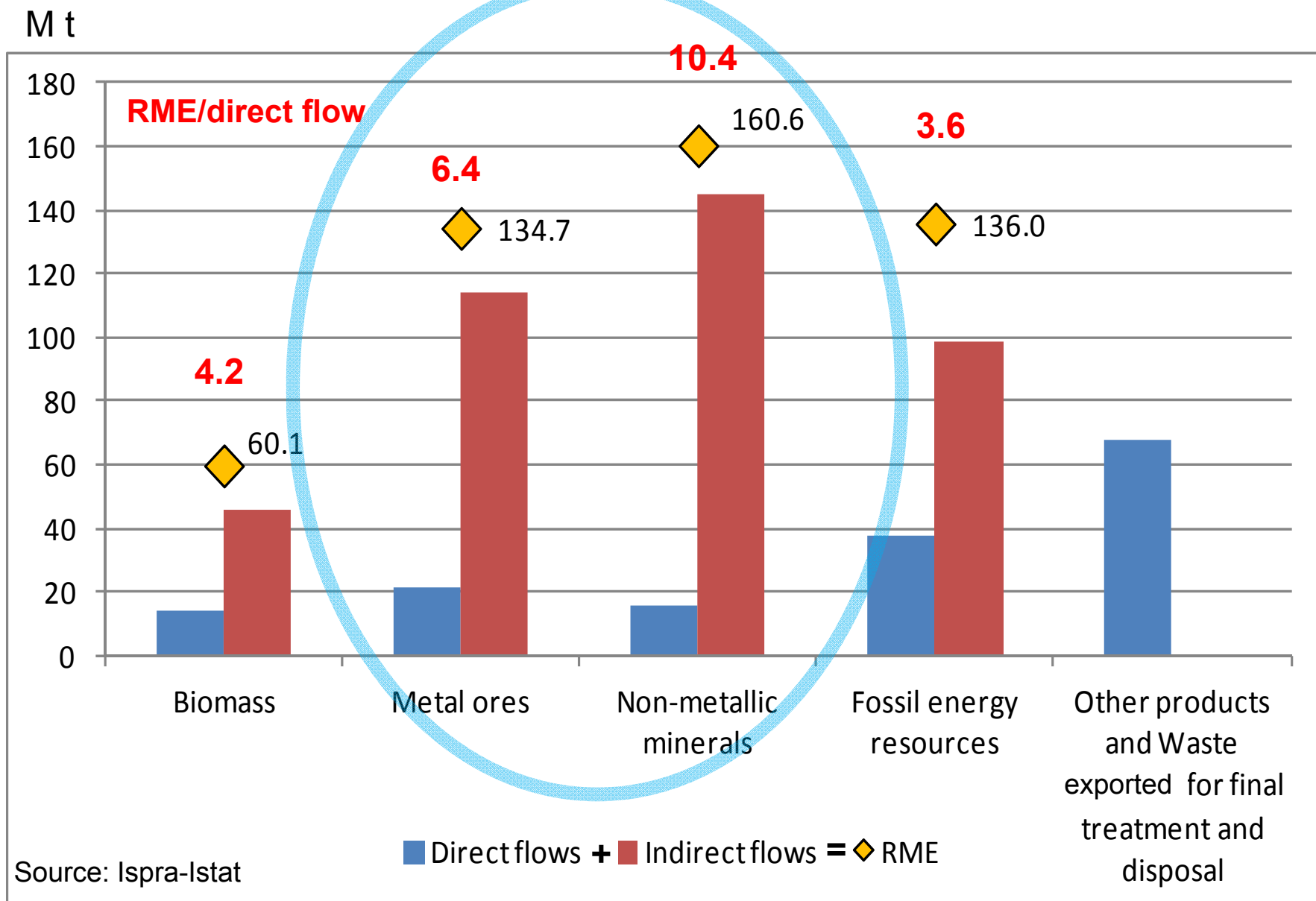


Source: Ispra-Istat

■ Direct flows + ■ Indirect flows = ◆ RME

and Waste imported for final treatment and disposal

Direct and indirect flows of Exports. Italy, 2008



Natural resources embodied in Imports and final use of products by natural resource category and final uses/imports. Italy, 2008 (M tonnes).

$$\text{DE} + \text{Imp} - \text{Exp} = \text{RMC} = a + b + c$$

	Domestic extraction (DE)	Imp. in RME	Exp. in RME	RME of total domestic uses (RMC)
Biomass	124.2	107.8	60.1	171.9
Metal ores	0.7	242.5	134.7	108.5
Other minerals	422.7	104.9	160.6	367.0
Fossil energy resources	12.7	334.4	136.0	211.0
Total natural resources	560.3	789.5	491.4	858.5

Source: Ispra-Istat

Metal ores embodied in Imports and final use of products by final uses/imports. Italy, 2008 (M tonnes).

	Domestic extraction (DE)	Imports in RME	Exports in RME	RME of total domestic uses (RMC)	Final consumption of households in RME	Final consumption of Gov. and non-profit org. in RME	Gross capital formation in RME
Iron ores	-	65.7	36.5	29.2	11.8	2.1	15.3
Copper	-	88.1	51.0	37.1	13.9	2.5	20.7
Nickel	-	6.8	3.9	2.9	1.1	0.2	1.6
Lead	-	1.0	0.6	0.4	0.2	0.0	0.2
Zinc	-	4.9	2.8	2.1	0.8	0.1	1.1
Tin	-	3.6	2.0	1.6	0.6	0.1	0.9
Gold - gross ore	-	17.9	7.5	10.4	5.1	1.0	4.3
Silver - gross ore	-	2.9	1.7	1.2	0.5	0.1	0.7
Platinum - gross ore	-	3.8	2.2	1.5	0.6	0.1	0.9
Bauxite and other aluminium	-	10.0	5.5	4.5	1.9	0.3	2.3
Uranium and thorium	-	0.4	0.1	0.2	0.1	0.0	0.1
Tungsten - gross ore	-	2.6	1.5	1.1	0.4	0.1	0.6
Tantalum - gross ore	-	0.2	0.1	0.1	0.1	0.0	0.1
Magnesium ores - gross ore	-	0.2	0.1	0.1	0.0	0.0	0.0
Titanium - gross ore	-	6.0	3.0	3.0	1.3	0.2	1.5
Manganese - gross ore	0.7	2.0	1.5	1.2	0.5	0.1	0.6
Chromium - gross ore	-	2.2	1.3	1.0	0.4	0.1	0.5
Other metal ores - gross ore	-	24.3	13.3	11.0	4.6	0.8	5.6
METAL ORES	0.7	243	135	109	44	8	57

Non-metallic minerals embodied in Imports and final use of products by final uses/imports. Italy, 2008 (M tonnes).

	Domestic extraction (DE)	Imports in RME	Exports in RME	RME of total domestic uses (RMC)	Final consumption of households in RME	Final consumption of Gov. and non-profit org. in RME	Gross capital formation in RME
Marble, granite, sandstone, porphyry, basalt, other ornamental or building stone	28.6	7.9	11.1	25.4	10.1	1.5	13.8
Chalk and dolomite	2.7	7.3	4.5	5.5	2.2	0.4	2.9
Slate	0.1	0.2	0.1	0.2	0.1	0.0	0.1
Chemical and fertilizer minerals	0.0	2.9	1.0	1.9	1.2	0.2	0.5
Salt	3.5	5.1	2.8	5.8	3.3	0.5	2.0
Limestone and gypsum	43.9	26.5	23.4	46.9	19.0	2.9	25.0
Clays and kaolin	9.3	2.1	3.4	7.9	3.1	0.5	4.3
Sand and gravel	324.4	45.0	108.6	260.8	102.1	16.0	142.7
Other non-metallic minerals n.e.c	10.2	8.0	5.7	12.5	5.3	0.8	6.4
NON-METALLIC MINERALS	422.7	104.9	160.6	367.0	146.3	22.8	197.8

Source: Ispra-Istat

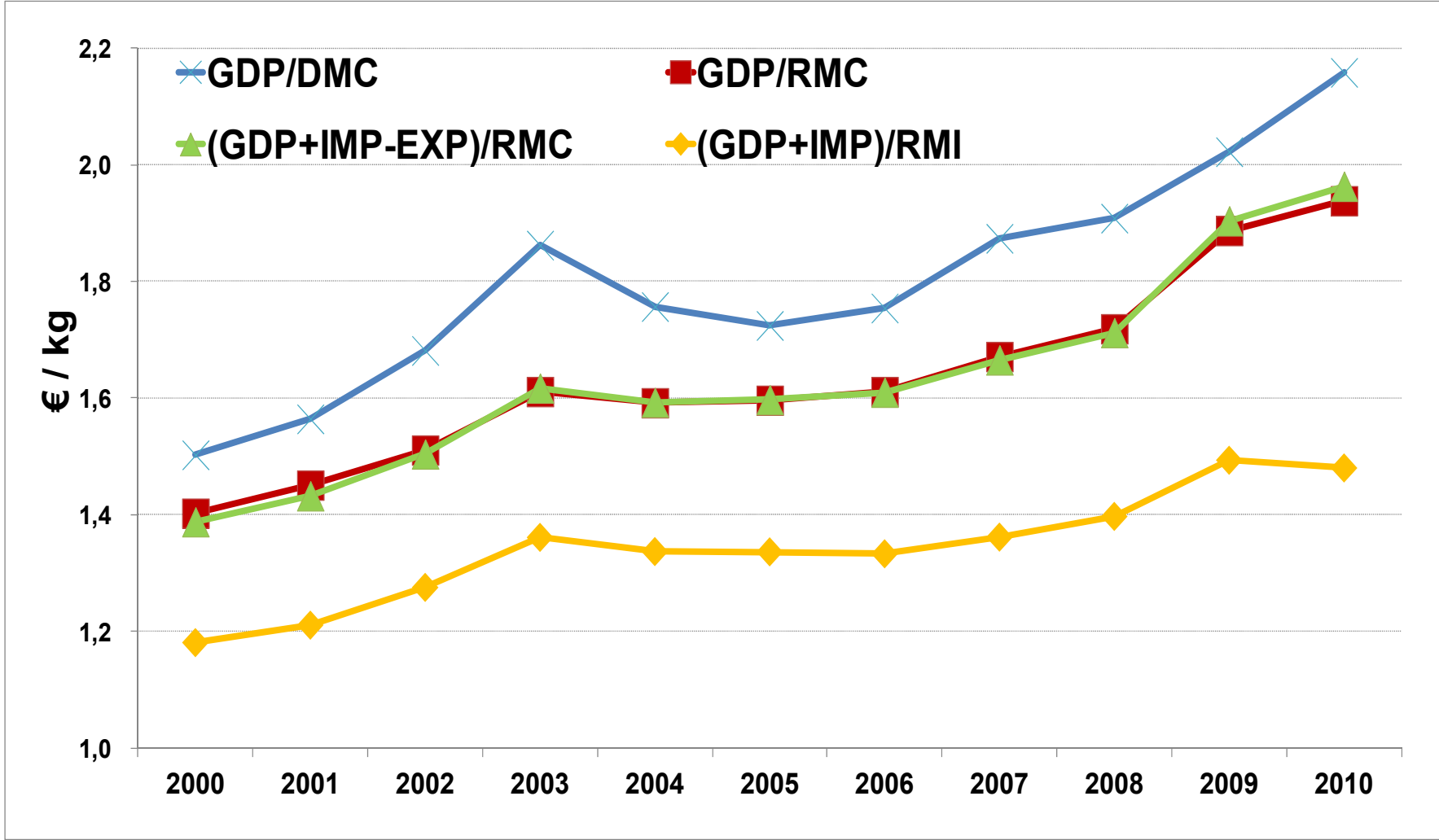
Resource Productivity (RP): alternative formulations?

- Is the proposed lead indicator, **GDP/DMC** an appropriate indicator to measure resource efficiency?
- Are there any better alternatives that should be considered?

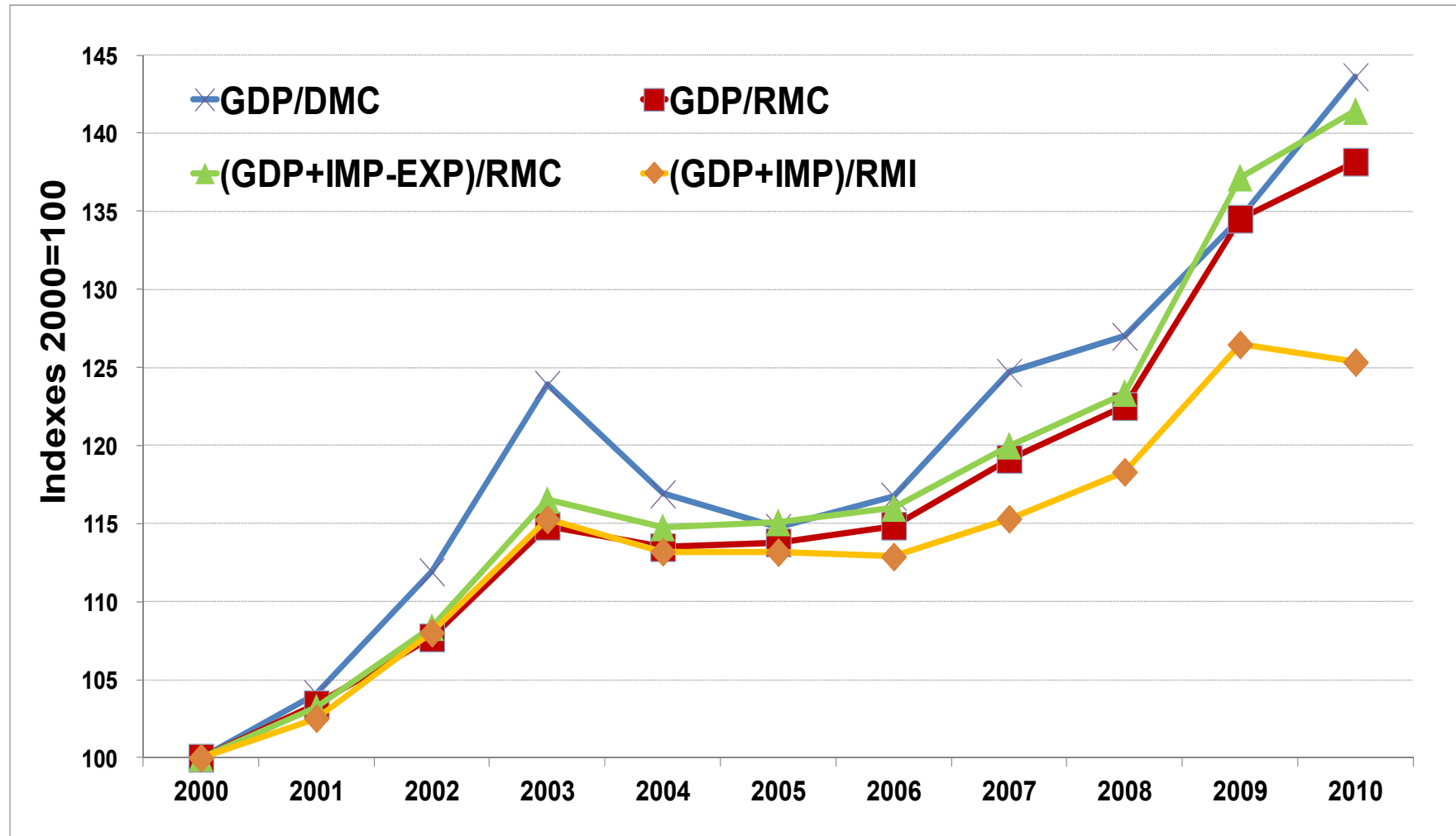
“It is recognised [...] that over time a better candidate than DMC could be found. For this purpose the Commission estimates that monitoring material use in Raw Material Equivalents would be appropriate as is done for the Raw Material Consumption indicator”

European Commission, Directorate-general Environment
Consultation Paper 2012): Options for Resource Efficiency Indicators.
on line: http://ec.europa.eu/environment/consultations/pdf/consultation_resource.pdf

Alternative indicators for Italian RP - 1)



Alternative indicators for Italian RP - 2)



Some References:

- Istat (Italian National Institute of Statistics): <http://dati.istat.it/?lang=en> → National Accounts → Environmental and other satellite accounts → **National materials' use accounts**

- Femia A. ***Changing the priorities: From labour productivity to resource productivity.*** In Factor X - Policy, Strategies and Instruments for a Sustainable Resource use; Angrick M.; Burger A.; Lehmann H., Eds.; Springer: Berlin, Germany, forthcoming

- Femia A., Marra Campanale R. ***Transferring the burden abroad: an environmentally ineffective way to increase resource productivity. Evidence from the Italian Case.*** In Resources, Special Issue "How Much Environment Do Humans Need? +20 Reviewing Progress in Material Intensity Analysis for Transition towards Sustainable Resource Management". Editors: S. Bringezu, F. Hinterberger, C. Liedtke, forthcoming
http://www.mdpi.com/journal/resources/special_issues/sustainable-resource-management

- Schoer, K.; Giegrich, J.; Kovanda, J.; Lauwigi, C.; Liebich, A.; Buyny, S.; Matthias, J. ***Conversion of European product flows into Raw Material Equivalents.*** Final report of the project: Assistance in the development and maintenance of Raw Material Equivalents conversion factors and calculation of RMC time series, commissioned by Statistical Office of the European Communities – Eurostat; Directorate E – Agriculture and Environmental Statistics; Statistical Cooperation Unit E3: Environment statistics; ifeu - Institut für Energie- und Umweltforschung: Heidelberg, 2012