On Raw Material Equivalents and their correct use in Resource Productivity (RP) indicators

INFORMATION and DISCUSSION PAPER concerning POLICY DEMAND FOR EW-MFA INDICATORS

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Summary

1. Demand for Information on Material Flows
2. Raw Material Equivalents (RME)
3. Italian figures
4. Use of RME in Resource Productivity indicators
5. Italian Figures

The demand for statistical information on material flows

EU, OECD, UNEP-International Resource Panel, …

Green Growth, 3R, Sound Material Cycle…

- **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

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The demand for statistical information on material flows in RME

"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

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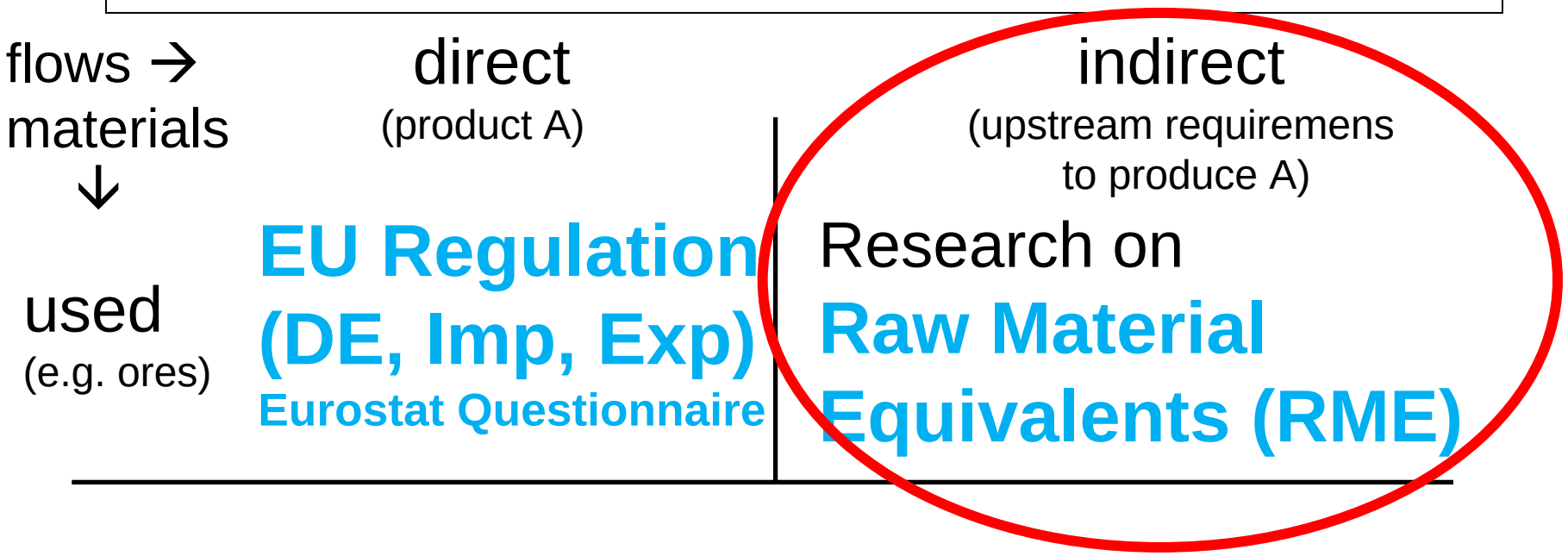
What do European statistical offices do?



Natural resource residuals
(e.g. mining overburden)

Also relevant in terms of environmental pressure, but usually neglected.
Would deserve more attention

Direct and indirect flows: Raw Material Equivalents (RME)

traded product A + **upstream material flows required (extracted and used) to produce A but not physically embodied in A**

- 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

"DEMAND-BASED INDICATORS" (OECD Green Growth)

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Actual product flows and resources required

Product flows by main material (when possible)	Biomass
	Metal ores
	Non-metallic minerals
	Fossil Fuels
	Other Products

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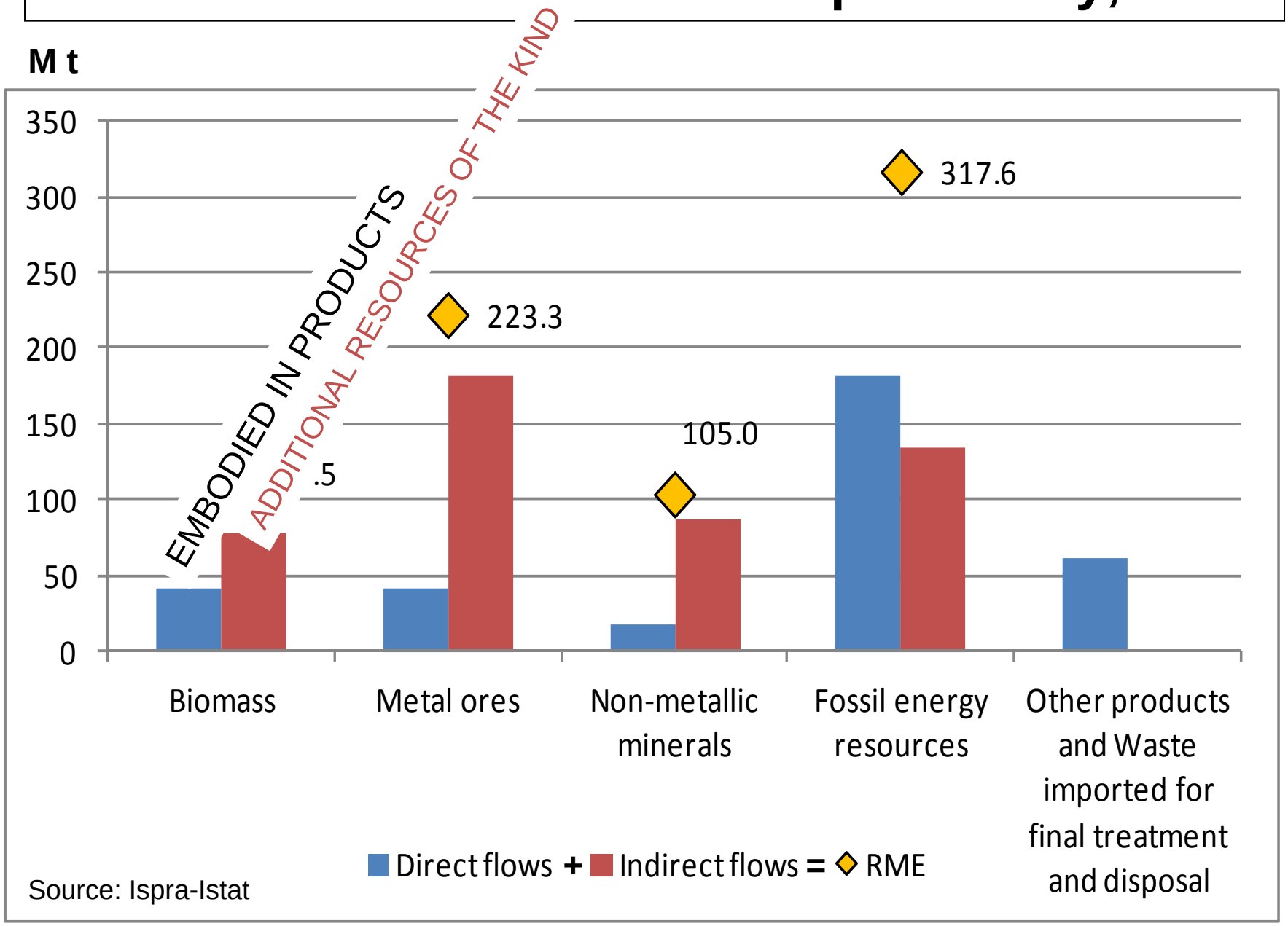
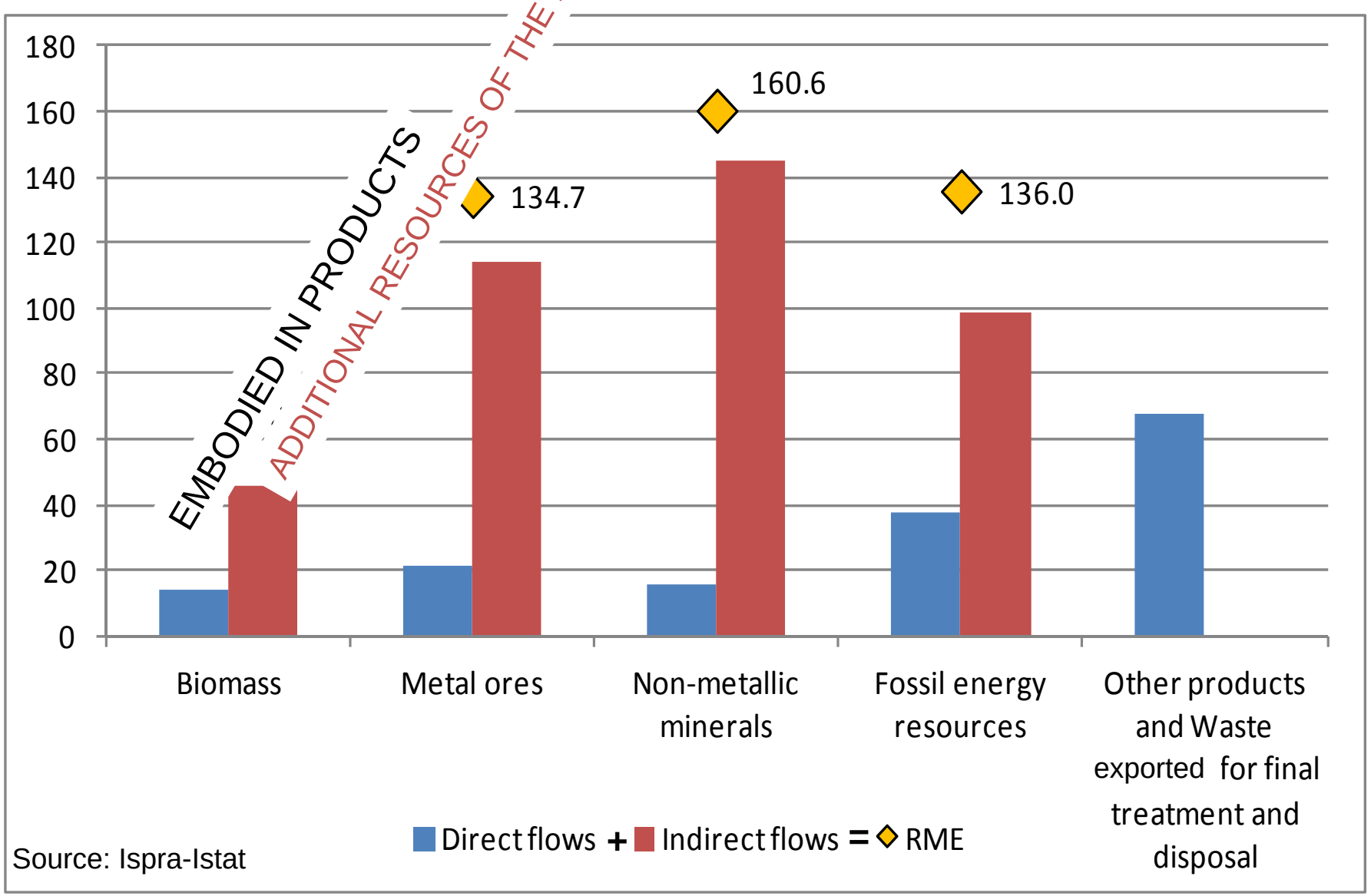
Direct and indirect flows of Imports. Italy, 2010



Source: Ispra-Istat

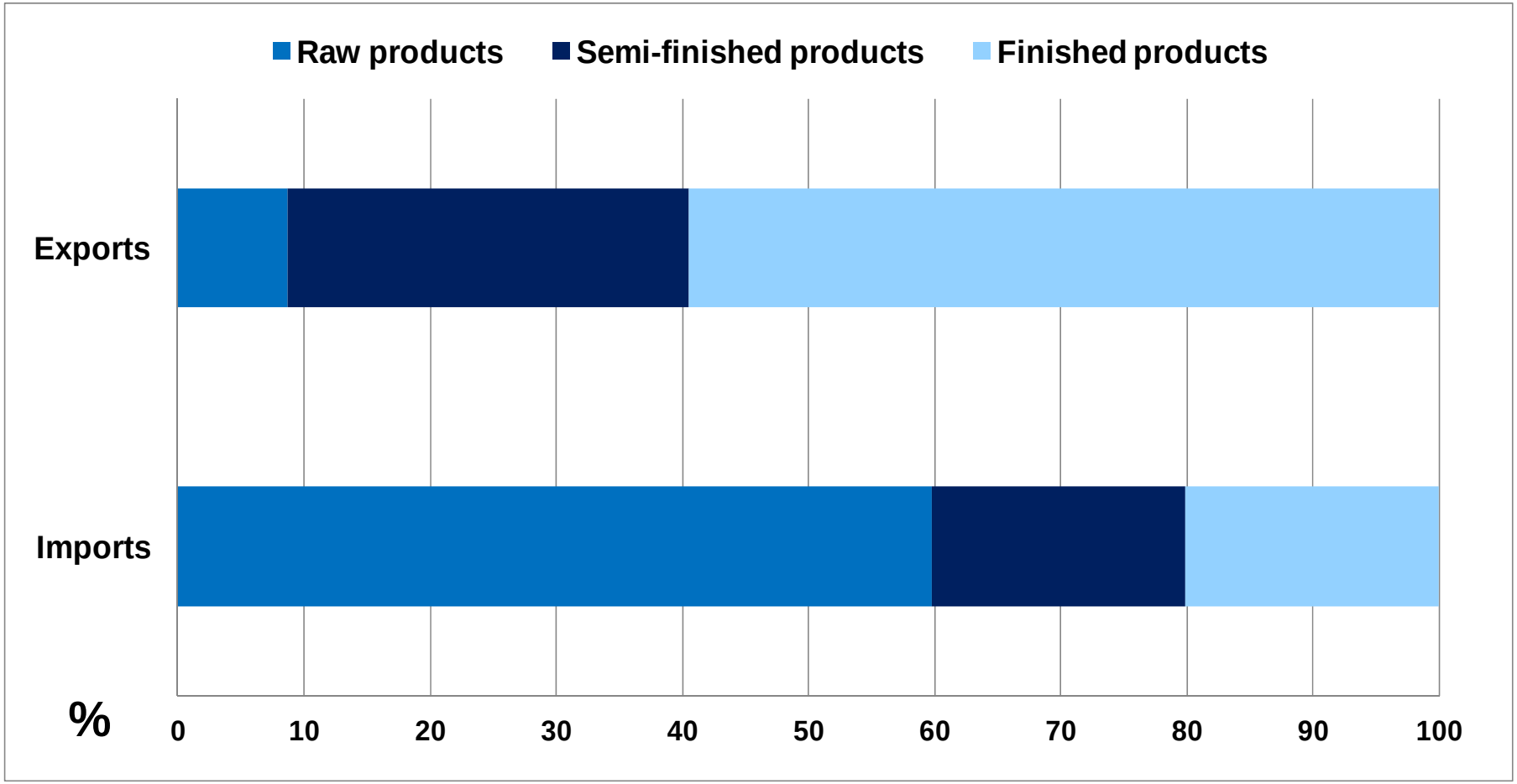
Direct and indirect flows of Exports. Italy, 2008



Source: Ispra-Istat

Why do Italian Exports have a much bigger indirect-to-direct flow ratio than Imports?

Imports and Exports by stage of manufacturing. Italy, 2011



Source: Istat

Natural resources required for the Italian economy by source and final purpose. Italy, 2008 (M tonnes).

DE + RME(Imp) = RMI = RME(Exp) + RME (final cons.) + RME(GCF)

RMI - RME(Exp) = RMC = RME (final cons.) + RME(GCF)

	Domestic extraction (DE)	Imp. in RME		Exp. in RME		Final cons. in RME	Gross capital formation in RME
Biomass	124.2	107.8		60.1		156.3	15.6
Metal ores	0.7	242.5	-	134.6	+	51.7	56.9
Other minerals	422.7	104.9		160.6		169.1	197.9
Fossil energy resources	12.7	334.4		136.0		166.6	44.5
Total natural resources	560.3	789.5		491.2		543.9	314.7

Source: Ispra-Istat

Resource Productivity (RP): alternative formulations?

- **Is the current lead indicator, GDP/DMC, and its variants (e.g. GDP/non-energy DMC) appropriate for measuring RP?**

- **Are there any better alternatives that should be considered?**

DMC's deepest meaning

- DMC is *per se* a significant sustainability indicator, namely a holistic indicator of potential environmental pressure: its significance comes from DMC = materials that become (Waste+Emissions+New stocks);
- it suffers from the asymmetry between its components (DE and Imp/Exp) only when interpreted as resource use (RU) measure;
- it does not correspond, as a RU measure, to any NA aggregate

  => its most appropriate use is not as a RU measure;
- it generates, when related to GDP, not so much a Resource Productivity (RP) indicator, as a significant efficiency indicator, relating to sustainability, as it expresses the productivity of potential pressures ("GDP per potential pressure unit").

What should an RP indicator using RMEs look like?

A value-per-material-flow-unit indicator, genuinely expressing *Resource* Productivity:

- is better expressed in terms of value per RME unit, and
- is better referred to the value of the final results of the production chains, rather than to GDP, as only in this case a precise correspondence between the two terms of the ratio can be found.

Value generation chains are intrinsically global and the resource needs of the value added generated in a given country cannot be disentangled from the resource needs of the value added generated in other countries (double counting will always be unavoidable: each of the subsequent works carried out on the same material adds value).

On the contrary, the “demand perspective” is correctly applied to the products delivered to final uses, and allows to single out the resource requirements of these deliveries (by kind of use and of product).

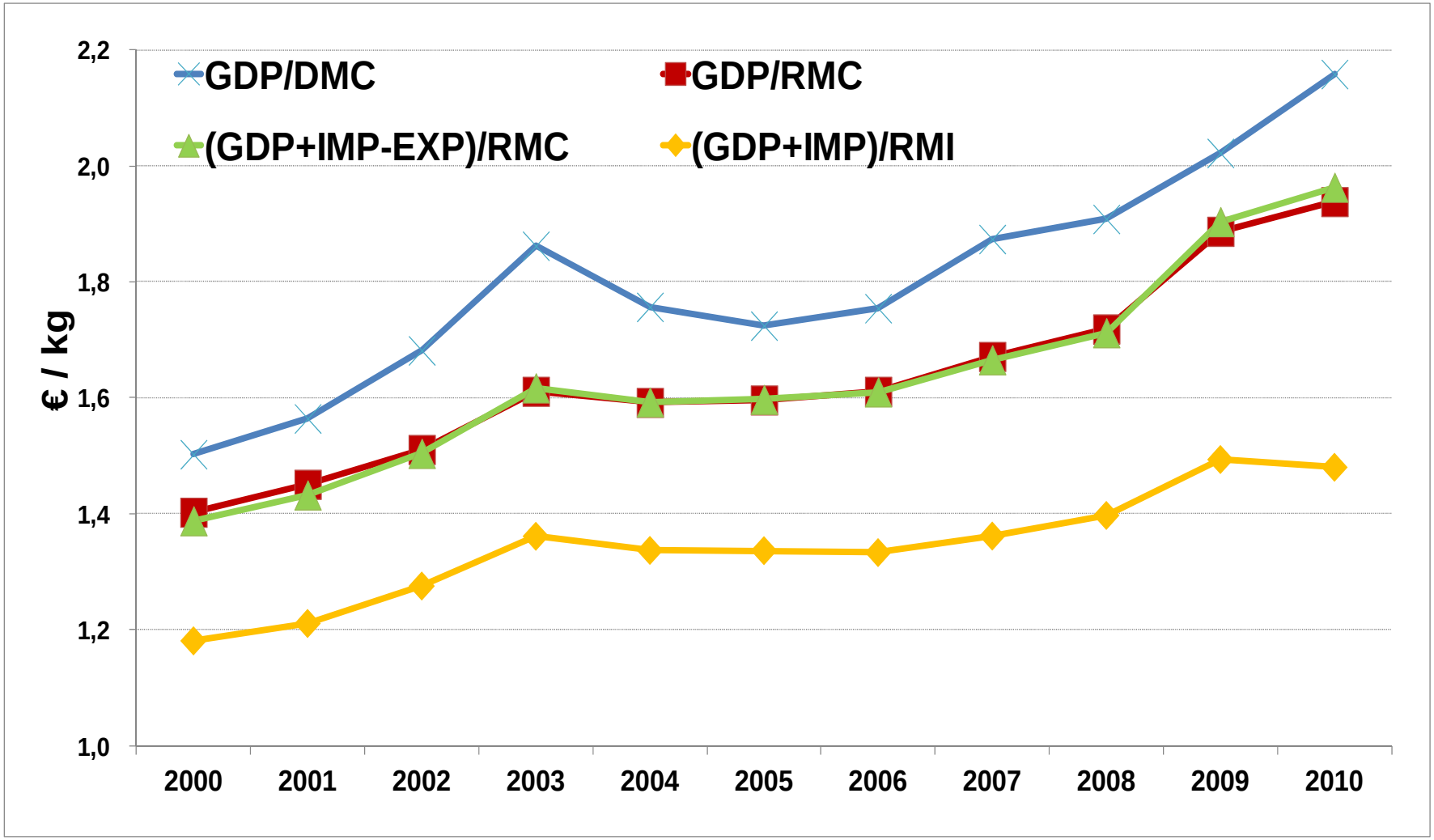
Simply replacing DMC by RMC in RP indicators?

- A correct correspondence between numerator and denominator is a desirable feature of the RP ratio

  => DMC's formal analogue in RME terms, i.e. RMC, is not automatically DMC's best substitute for RP calculation

- Interesting candidates as RP indicators are:
  - Final Domestic Uses/RMC (i.e. Consumption plus Gross Capital Formation per unit of their RME), whose numerator deviates from GDP only by the commercial balance; However this excludes a substantial part of a nation's material resource requirements, namely those of its exporting activities;
  - Total Final Uses/RMI (i.e. Consumption plus Gross Capital Formation plus exports per unit of its own RME), which reflects also the RP of the exporting part of the economy; Neither the numerator nor the denominator are additive across countries, but this may not be a problem (it is a ratio!).

Alternative indicators for Italian RP - levels



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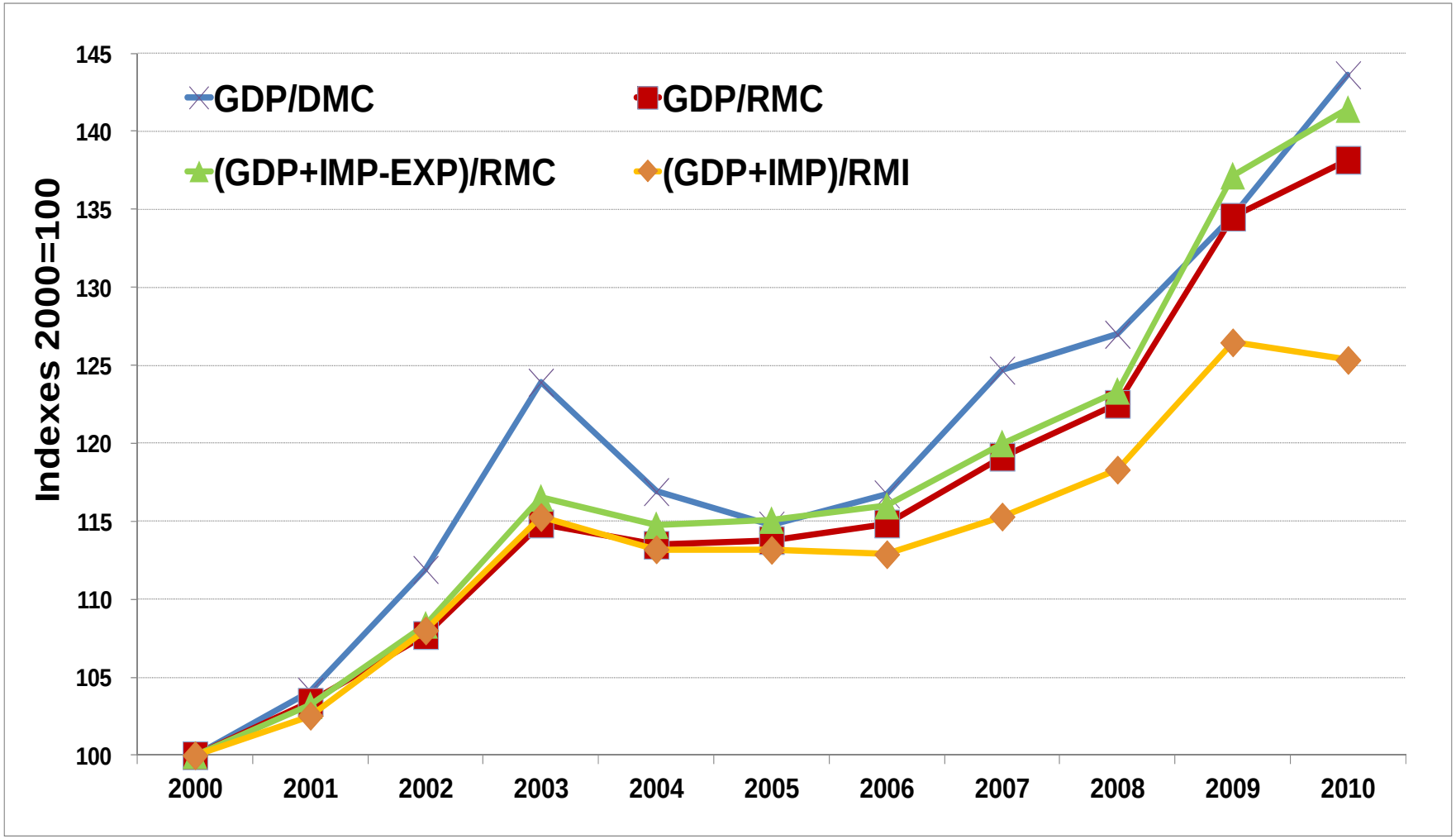
Alternative indicators for Italian RP - trends



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