EUROPEAN COMMISSION

MEMO

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The European Critical Raw Materials review

Raw materials are fundamental to Europe's economy, and they are essential for maintaining and improving our quality of life. Recent years have seen a rapid growth in the number of materials used across products. Securing reliable and undistorted access of certain raw materials is of growing concern within the EU and across the globe. As a consequence of these circumstances, the Raw Materials Initiative was instigated to manage responses to raw materials issues at an EU level. Critical raw materials have a high economic importance to the EU combined with a high risk associated with their supply.

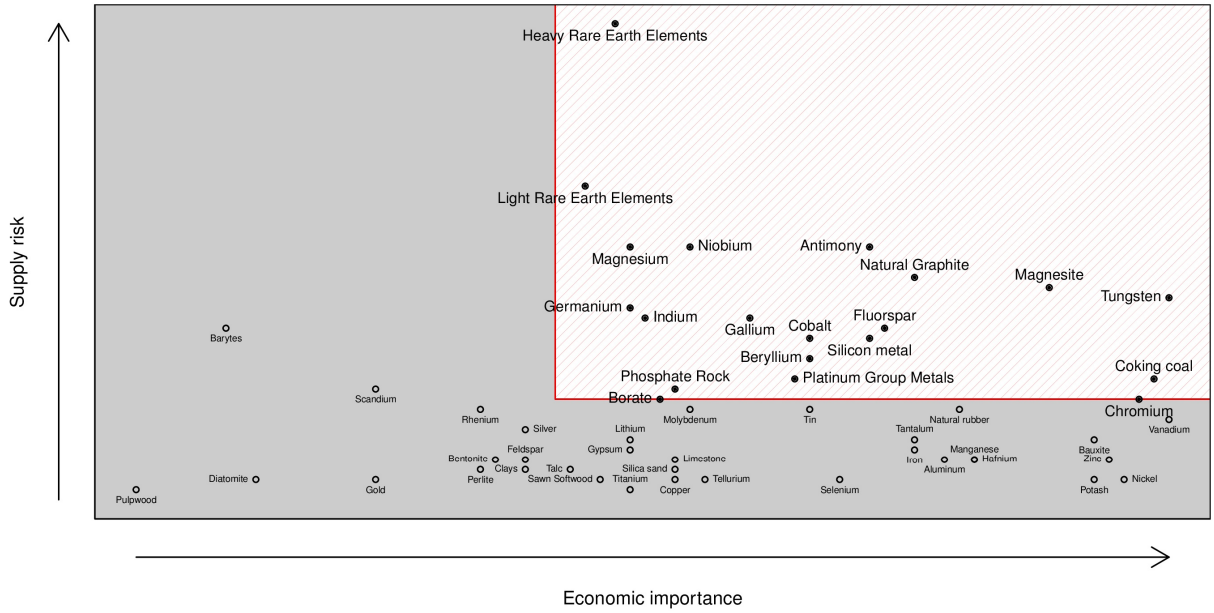
The first criticality analysis for raw materials was published in 2010 by the Ad-Hoc Working Group on Defining Critical Raw Materials, a subgroup to the Raw Materials Supply Group, which is an expert group of the European Commission. 14 critical raw materials were identified from a candidate list of 41 non-energy, non-food materials. In the 2011 Communication on raw materials (COM (2011)25 of 2 February 2011), the Commission formally adopted this list and stated that it would continue to monitor the issue of critical raw materials in order to identify priority actions. It also committed to undertake a regular review and update of this list at least every 3 years.

The current review has used the same methodology, indicators and thresholds as the original 2010 (54 raw materials instead of 41) criticality assessment at EU level, but with updated data and a wider range of materials. This enables a side-by-side comparison of both assessments (2010 and 2013) to understand how the criticality of materials has changed during this time. In the 2013 exercise 54 non-energy, non-agricultural materials were analysed. The same quantitative methodology as in the previous 2010 exercise is applying two criteria - the economic importance and the supply risk of the selected raw materials. Like in 2010, the following assessment components have been used:

- Economic importance: this analysis is achieved by assessing the proportion of each material associated with industrial megasectors at an EU level. These proportions are then combined with the megasectors' gross value added (GVA) to the EU's GDP. This total is then scaled according to the total EU GDP to define an overall economic importance for a material.
- Supply risk: in order to measure the supply risk of raw materials, the World Governance Indicator (WGI) was used. This indicator takes a variety of influences into account such as voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law or control of corruption.

The criticality zone is defined by the same thresholds as in 2010 to ensure comparability of the results. This extended candidate list includes 7 new abiotic materials and 3 biotic materials. In addition, greater detail is provided for the rare earth elements by splitting them into 'heavy' and 'light' categories. The overall results of the 2013 criticality

assessment are shown below; the critical raw materials are highlighted in the red shaded criticality zone of the graph.



Twenty critical raw materials were identified as critical from the list of fifty-four candidate materials:

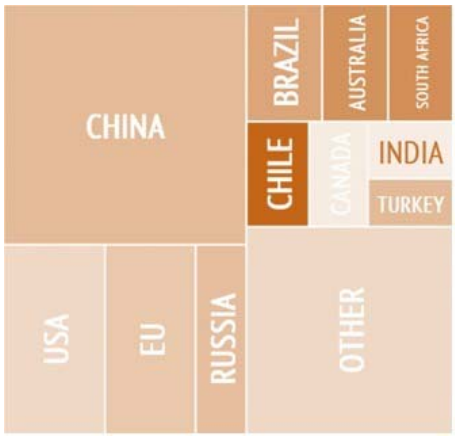
Antimony	**Beryllium**	**Borates**	**Chromium**	**Cobalt**	**Coking coal**	**Fluorspar**
Gallium	**Germanium**	**Indium**	**Magnesite**	**Magnesium**	**Natural Graphite**	**Niobium**
PGMs	**Phosphate Rock**	**REEs (Heavy)**	**REEs (Light)**	**Silicon Metal**	**Tungsten**	

This 2013 list includes thirteen of the fourteen materials identified in the previous report, with only tantalum moving out of the EU critical material list. Six new materials enter the list: borates, chromium, coking coal, magnesite, phosphate rock and silicon metal. Three of these are entirely new to the assessment. None of the biotic materials were classified as critical. Whilst this analysis highlights the criticality of certain materials from the EU perspective, limitations and uncertainties with data, and the scope of the assessment should be taken into consideration when discussing this list. It is worth recalling that all raw materials, even when not critical, are important for the European economy and therefore not being critical does not imply that a given raw material and its availability to the European economy should be neglected. Moreover, the availability of new data may affect the list in the future; therefore the policy actions should not be limited to critical raw materials exclusively. In addition, information for each of the candidate materials is provided by individual material profiles. Further analysis is provided for the critical raw materials within these profiles.

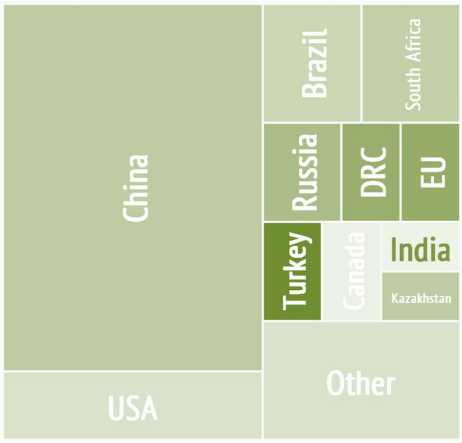
Analysis of the global primary supply of the 54 candidate materials identifies around 90% of global supply originated from extra-EU sources; this included most of the base, speciality and precious metals, and rubber. China is the major supplier when these materials are considered, however many other countries are important suppliers of specific

materials. EU primary supply across all candidate materials is estimated at around 9%. In the case of the critical raw materials, supply from the EU sources is even more limited.

A comparison between supply of the candidate materials and the critical materials is shown below, showing that supply becomes more concentrated for the critical materials, particularly in China.

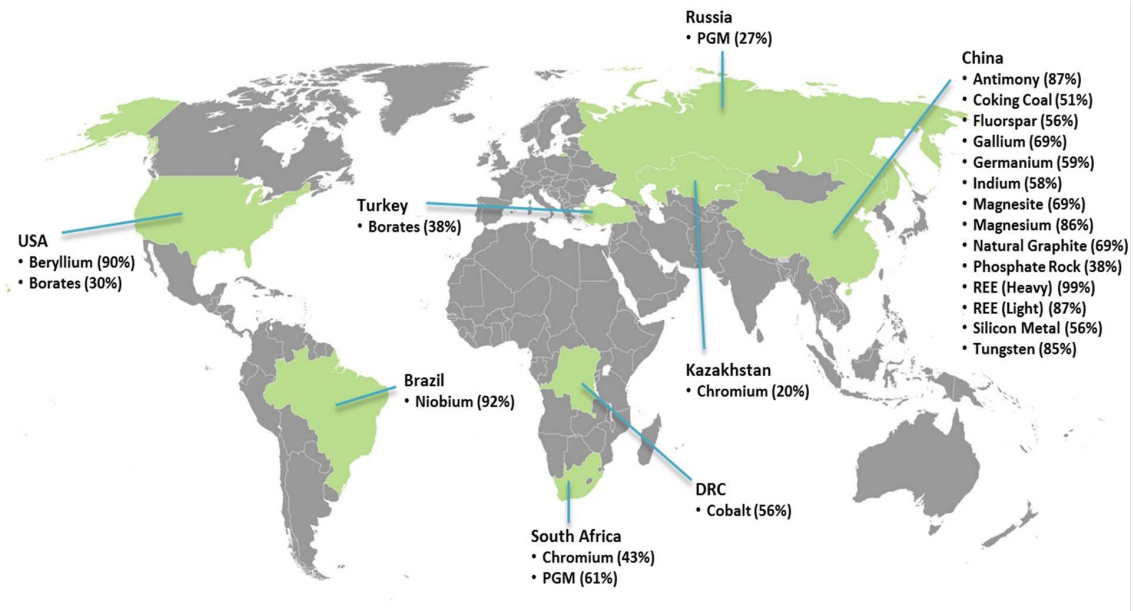


World primary supply of the 54 candidate raw materials



World primary supply of the 20 critical raw materials

The major producers of the twenty EU critical raw materials are shown below, with China clearly being the most influential in terms of global supply. Several other countries have dominant supplies of specific raw materials, such as the USA (beryllium) and Brazil (niobium). Supply of other materials, for example the platinum group metals and borates, is more diverse but is still relatively concentrated.



Recommendations of the Ad Hoc Working Group

The Ad Hoc Working Group (AHWG) recommends:

- To disseminate the CRM study results and findings, accompanied by an introductory guidance on the intended purpose of the list.
- To initiate all the necessary specific actions to ensure undistorted and reliable access to critical raw materials given the combination of their economic importance and supply risk, as well as for non-critical raw materials where appropriate.
- To promote the outcome of the study not only across the EU Institution and the Member States where the study results could be used in relevant policies and initiatives, but also amongst relevant stakeholder, including manufacturers, designers and waste processors, who may benefit from it.
- To regularly update the list. Updating it every three years seems time being appropriate.
- To continue the activities of the Ad-Hoc Working Group into place. Appointment of additional members from relevant sectors may be considered, taking into account the representativeness.
- Keeping the scope on non-energy, non-agricultural raw materials, to review the list of candidate materials for the next update ensuring it remains appropriate for the purpose of the study.
- To review the quantitative methodology and carefully consider possible modifications while maintaining comparability over time.
- To draw lessons from the CRM work regarding the assessment of resources and reserves of critical and other raw materials in the EU. This should, where possible, include the assessment of EU mineral resources, internal EU flows of raw materials, including secondary resources such as tailings, waste rocks and spoiling heaps; internal supply, capacity, imports and exports of different grades of materials; the supply chain stage materials that are required in the EU; as well as detailed trade statistics for the raw materials.

List of critical raw materials

The 20 raw materials listed below are critical because risks of supply shortage and their impacts on the economy are higher than those of most of the other raw materials. The risks associated with concentration of production are in many cases compounded by low substitutability and low recycling rates.

Raw materials	**Main producers (2010, 2011, 2012)**	**Main sources of imports into the EU (mainly 2012)**	**Substitutability index***	**End-of-life recycling input rate****
Antimony (Stibium)	China 86 %	China 92% (unwrought and powdered)	0.62	11 %
	Bolivia 3 %	Vietnam (unwrought and powdered) 3 %		
	Tajikistan 3 %	Kyrgyzstan 2% (unwrought and powdered); Russia 2% (unwrought and		

		powdered)		
Beryllium	USA 90 % China 9 % Mozambique 1 %	USA, China and Mozambique[1]	0.85	19 %
Borates	Turkey 41 % USA 33 %	Turkey 98 % (natural borates) and 86 % (refined borates) USA 6%, Peru 2% (refined borates); Argentina 2% (natural borates)	0.88	0 %
Chromium	South Africa 43 % Kazakhstan 20 % India 13 %	South Africa 80 % Turkey 16 % Others 4 %	0.96	13 %
Cobalt (Cobaltum)	DRC 56 % ↑ China 6%; Russia 6%; Zambia 6 %	Russia 96 % (cobalt ores and concentrates) USA 3 % (cobalt ores and concentrates)	0.71	16 %
Coking coal	China 53 % Australia 18 % Russia 8%; USA 8 %	USA 41 % Australia 37 % Russia 9 %	0.68	0 %
Fluorspar (Fluorite)	China 56 % Mexico 18 % Mongolia 7 %	Mexico 48 % ↑ China 13 % ↓ South Africa 12 % ↓	0.80	0 %
Gallium[2]	China 69 % (refined) Germany 10 % (refined)	USA 49 % China 39 %	0.60	0 %

[1] Subject to strong fluctuations.

[2] Gallium is a by-product; the best available data refer to production capacity, not to production as such.

	Kazakhstan 6 % (refined)	Hong Kong 8 %		
Germanium	China 59 % ↓	China 47 % ↓	0.86	0 %
	Canada 17 %	USA 35 %		
	USA 15 %	Russia 14 %		
Indium	China 58 %	China 24 % ↓	0.82	0 %
	Japan 10 %	Hong Kong 19 % ↑		
	Korea 10 %	Canada 13 %		
	Canada 10 %	Japan 11 %		
Magnesite	China 69 %	Turkey 91 %	0.72	0 %
	Russia 6%; Slovakia 6 %	China 8 %		
Magnesium	China 86 % ↑	China 91 % ↓	0.64	14%
	Russia 5 %	Israel 5 %		
	Israel 4 %	Russia 2 %		
Natural graphite	China 68 %	China 57 % ↓	0.72	0%
	India 14 %	Brazil 15 %		
	Brazil 7 %	Norway 9 %		
Niobium	Brazil 92 %	Brazil 86 % (Ferro-Niobium)	0.69	11%
	Canada 7 %	Canada 14 % (Ferro-Niobium)		
Phosphate rock	China 38 %	Morocco 33%	0.98	0%
	USA 17 %	Algeria 13%		
	Morocco 15 %	Russia 11%		
Platinum Group Metals	South Africa 61 % ↓	South Africa 32 % ↓	0.83	35%
	Russia 27 % ↑	USA, 22 % ↑		
	Zimbabwe 5 %	Russia 19 % ↓		
Heavy Rare Earth Elements	China 99 %	China 41 % (all REEs) Russia 35 % (all REEs) USA 17 % (all REEs)	0.77	0%
	Australia 1 %			
Light Rare	China 87 %		0.67	0%

Earth Elements	USA 7 %			
	Australia 3 %			
Silicon metal (Silicium)	China 56 %	Norway 38 %	0.81	0%
	Brazil 11 %	Brazil 24 %		
	USA 8%; Norway 8 %	China 8 %		
	France 6 %	Russia 7 %		
Tungsten (Wolframium)	China 85 %	Russia 98 %↑	0.70	37%
	Russia 4 %	Bolivia 2 %		
	Bolivia 2 %			

- The six new critical raw materials are in dark grey in the above table. Unlike in the 2010 report, heavy rare earths, light rare earths and scandium were assessed separately, not as one group of 'rare earths'. Heavy and light rare earths are in light grey.
- For the main producers and the main sources of imports into the EU, arrows indicate an increase or decrease of approximately 10 percentage points since the 2010 report on critical raw materials.
- Notes:
- (*) The 'Substitutability index' is a measure of the difficulty in substituting the material, scored and weighted across all applications. Values are between 0 and 1, with 1 being the least substitutable.
- (**) The 'End-of-life recycling input rate' measures the proportion of metal and metal products that are produced from end-of-life scrap and other metal-bearing low grade residues in end-of-life scrap worldwide.
- Source: compiled on the basis of the 2014 'Critical raw materials for the EU' report by the ad hoc working group on defining critical raw materials of the Raw Materials Supply Group

Complementary information:

The Joint Research Centre of the European Commission has created a Materials Information System (MIS) to provide relevant information on the materials used in low-carbon energy technologies. MIS provides information on the usage of materials in each technology and the material's supply chain. MIS will be updated continuously and extended to include more technologies and materials data. MIS can be visited at http://SETIS.ec.europa.eu/mis