

EUROPEAN POLICIES ON CRITICAL RAW MATERIALS, INCLUDING REE

Vasili NICOLETOPOULOS

Owner of Natural Resources GP, 11 Maiandrou St , Athens 115 28 , Greece

v.nicoletopoulos@naturalresources.gr

Abstract

This paper deals with the criticality of REE and other materials. 'Critical' raw materials [CRM] have growing economic and technical importance, high risk of supply shortage, low political-economic stability of the main suppliers and low substitutability/recycling rates. EU policies in CRM are studied, from the 2010 EC report to current monitoring of CRM -- including the CRM list review and actions by Member States and stakeholders. Specific EU policies on mining, processing, recycling, or substitution are presented: the Raw Materials Initiative, the European Innovation Partnership on Raw Materials, taxation & trade policies, R&D in substitutes/recycling and the EU-US Free Trade Agreement. Finally, Chinese CRM policies and the WTO actions on Chinese minerals, including Mg/REE/W/Mo exports, are analyzed.

History of CRM in the EU

EC Definition of 'Critical Raw Materials'

Securing reliable and undistorted access of certain raw materials is of growing concern within the EU and across the globe. CRM have a high economic importance to the EU combined with a high risk associated with their supply¹.

In the framework of the Raw Materials Initiative [RMI] on which see below, the first European CRM analysis, published in 2010, identified 14 CRM from a candidate list of 41 non-energy, non-food materials². The EC formally adopted this list in 2011 and stated that it would continue to monitor the issue and update every 3 years¹. Thus, in May 2014, the EC published a revised and extended CRM list including 13 of the 14 materials from the previous list, with only tantalum moving out due to a lower supply risk. Six new materials appeared: borates, chromium, coking coal, magnesite, phosphate rock and Si metal, bringing the number up to 20 CRM. The other 14 raw materials are: Sb, Be, Co, fluorspar, Ga, Ge, In, Mg, natural graphite, Nb, platinum group metals, heavy REE, light REE and W. CRM are highlighted in the pink shaded zone in Fig. 1.

EU primary supply across all candidate materials is around 9%. CRM supply from EU sources is even more limited. China is the most influential in terms of global supply. Other countries have dominant supplies of *specific* raw materials, eg the USA [Be] and Brazil [Nb]. For the platinum group metals and borates, supply is more diverse but still relatively concentrated

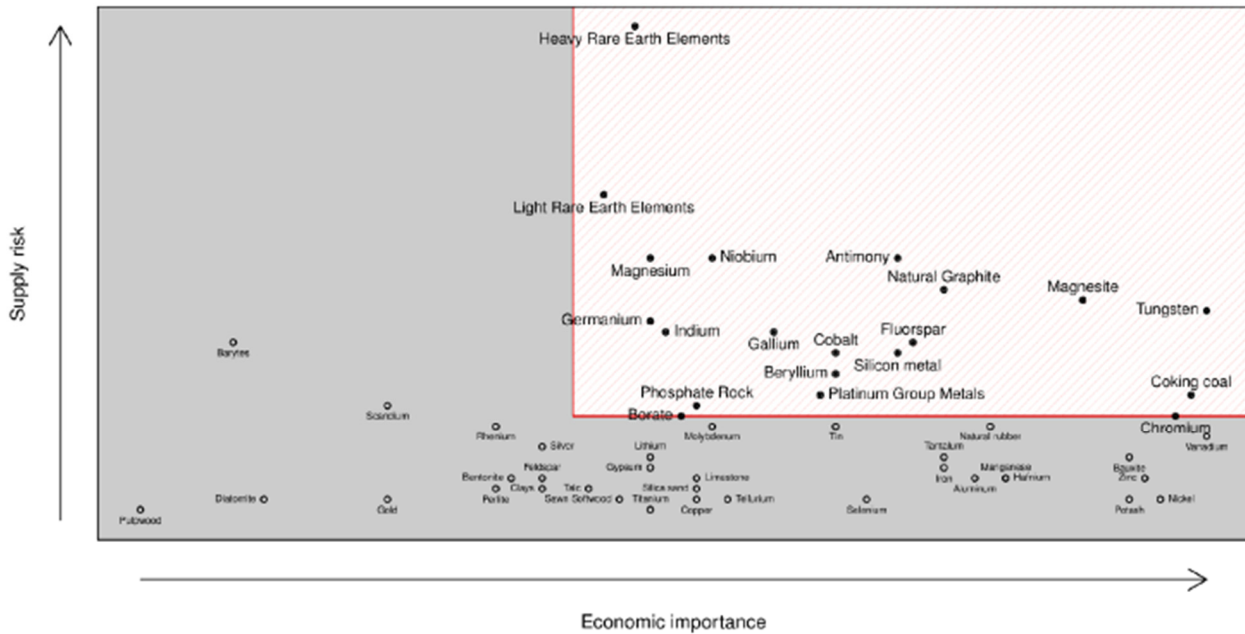


Figure 1: The 2014 Criticality Chart

Raw Materials Initiative

RMI aims at providing the framework conditions to establish an integrated strategy to face the challenges related to the access to non-energy and non-agricultural raw materials and tries to facilitate a sustainable supply of raw materials. Following the November '08 Communication that aimed at improving access to Raw Materials in Europe on a 3-pillar approach³: ensuring a level playing field in access to resources in third countries, fostering sustainable supply of raw materials from European sources and boosting resource efficiency and promoting recycling, in June 2013, the EC adopted a Report⁴ on the implementation of the RMI, providing an overview of the ongoing initiatives while highlighting the joint interest for the EU and third countries rich in raw materials to work in partnership. EU member states were requested to develop national strategies in support of the raw materials industry and of fostering access to resources.

European Innovation Partnership on Raw Materials EIP]

As an RMI follow-up, the EC launched in November '12 the EIP to reduce the EU's dependency on imports of raw materials; to promote production and exports both by improving supply conditions from within and outside the EU, and by providing resource efficiency and alternatives in supply; and to bring Europe to the forefront in the raw materials sector, whilst also mitigating the sector's negative environmental, social and health impacts, bringing together EU countries, companies, researchers and NGOs⁵.

For example, new technologies can help to extract deeper, in more remote areas and under harsh conditions. Action is also needed to develop CRM substitutes and to improve recycling of, among others, the 17 kg electric and electronic equipment waste that each EU citizen produces annually today⁵.

The current situation calls for targeted innovation and research efforts, breakthrough technologies and multidisciplinary approaches, as well as demand-side interventions eg standards, public procurement, regulatory measures. Such efforts are also essential for the manufacture of new and innovative products eg batteries for electric cars, photovoltaic systems and devices for wind turbines⁵.

2. Other national CRM initiatives

Countries are placed in different supply chain stages. *Japan* is focusing heavily on substitution, *China* on processing and metallurgy, *Australia* in sustainable mining and *Canada* in exploration. *S. Korea* is investing \$300m over 10 years for research into 40 technologies covering refining, smelting, processing, recycling and substitution. Russia has an active program on materials stockpiles and export restrictions. China has tightened export quotas ostensibly to secure internal supply. *The US* legislature has long been studying^{7,7a} CRM, the country had a stockpile for strategic defense materials and recently China bought a quantity of MoO for the same purpose⁶.

In a broader context, concerns over conflict minerals arising from the DR Congo and neighbouring states lead to materials stewardship schemes and legislation for responsible sourcing and traceability of raw materials, eg for Co and Au the Extractive Industries Transparency Initiative and the International Council on Mining and Metals Materials Stewardship Scheme. Similarly, the US Dodd-Frank Act requires electronics companies to disclose their sources of cassiterite, wolframite and tantalum. Similar regulation is now under consideration in the EU⁶.

REE Resource Efficiency and Recycling

End-of-life recycling rates for all of REE are below 1%, according a recent report by UNEP. REEs are recycled from pre-consumer scrap eg from permanent magnets. In Japan approximately 1/3 of REE for permanent magnets went into new scraps and then recycled, just like recovering the EU's CRM, including REE, as per a recent study that identified the following recovery opportunities⁶:

- Permanent magnets: hard disk drives are a current opportunity; wind turbines and hybrid/electric vehicles present a long term potential at the end of their lifetime
- NiMH batteries: from both portable electronics and hybrid/electric vehicles if they can be collected and identified. Umicore and Rhodia have now announced a jointly-developed process to recover REE concentrate that can then be refined into REE materials.
- Phosphors: Rhodia has developed a new process for the recovery and separation of REE contained in used fluorescent powder in lighting applications. identified the following recovery opportunities⁶:

US: Strategic Stockpiling of CRM

The Strategic Mineral Advisory Council is encouraging the U.S. DoD to move away from stockpiling strategic/CRM from China to creating and nurturing a U.S.-based REE supply

chain⁷. DOD is in the process of identifying REE resources to stockpile. The Strategic Materials Advisory Council is particularly concerned about the DOD recommendation that \$120.43 million of HREE, which are only produced in China, be added to U.S. stockpiles. “The root cause of these material shortages is our ongoing dependence on Chinese suppliers,” said council executive director Jeff Green. “We urge DOD to move...to the only appropriate and permanent solution—the creation and nurturing of a U.S.-based REE supply chain...[the US] must not rely on research projects and substitutions alone to close the current supply gap [and] must not accept the status quo of material and technological dependence on China. Instead, [DoD should] engage the industrial base domestically and from U.S. allies, to achieve sustainable HREE development for defense and essential civilian requirements.’

Some analysts, however, note that creating a strategic CRM could have also negative side effects eg insufficient flexibility, impact to the price of the commodity.

3. Foreign Trade Policies on CRM

Materials security and criticality has been of growing interest internationally. Several countries, including suppliers and users of raw materials have instigated studies and initiatives to develop national strategies for securing a stable supply of raw materials⁸. A number of outreach activities were pursued in international fora such as G20 and the OECD aiming at fostering a global dialogue on how to achieve a framework to ensure a sustainable supply of raw materials.

EU trade policy will continue to monitor ongoing and future negotiations of Foreign Trade Agreements and other bilateral frameworks to ensure that raw materials are considered and integrated, where appropriate. Import data on the most critical raw materials for wind energy [magnets in turbines], Nd and Dy, are collected. During negotiations for the planned Transatlantic Trade and Investment Partnership in July ‘13 the EC said that raw materials are a key priority sector to the EU and that it wants the US to ban export restrictions on selling raw materials and energy to the EU.

Industrial Minerals Trading

As well as blocking export restrictions, the Initial EU position paper⁹ says trans-Atlantic trade in these products could be promoted by increasing transparency and predictability of trade deals. This would be “the first and most important step towards a better [global] governance of trade in raw materials,” which, in turn, would boost investment, aid production and promoting the functioning and expansion of related infrastructure¹⁰.

Specifically, the EU wants the agreement to “encourage transparency in the process of licensing”, including the allocation license conditions for trade and investment. It wants negotiators to consider incorporating rules inspired by the global Extractive Industry Transparency Initiative [EITI] on declaring payments to governments. This Initial EU position paper⁹ stresses that “once exploitation is permitted [...] non-discriminatory access for resource exploitation, including for corresponding trade and investment related opportunities, should be guaranteed by regulatory commitments.”

US DoD Urges Assessment of REE Supply Risk July 11, '14

The agency is assessing REE supply risks for the US military industry, showing the strategic importance of these minerals and the will of the US to limit its reliance on China¹¹.

4. Chinese CRM policies

Chinese Export License Systems: REE etc

China often uses trade-restrictive measures eg *export duties* and *quotas* on key raw materials, including Sb, bauxite/alumina/aluminium, Co, coke, Cu, fluorspar, In, Pb, magnesite/magnesium carbonate, Mn, Mo, Ni, RE, Au, Sn, W, wood, yellow phosphorus and Zn¹¹. Other discriminatory barriers for the REE processing industry include the unwritten pre-condition of any company to have their request for a *permit evaluated*, blocking new FDI in the sector¹².

Since 2000, China applies *production caps* to regulate REE supply and instated an export quota system, whereby Chinese companies (including foreign JVs) have to obtain a *licence to export* any REE. Licences are attributed separately to domestic producers/traders and to foreign JVs. As from 2007, China collects an *export duty* on RE which depending on the REE varies between 15 and 25%. Since 2009, the export quotas have been reduced significantly¹².

The EU is also concerned about the *flexible export tax* policies in the Non Ferrous Metals Stimulus Plan of 2009. The use of flexible export tax rebates clearly aims at reducing exports of lower value products such as raw materials and this could be interpreted as a government subsidy for high-tech products with high added-value¹¹.

China and the CRM Value Chain

The report “*Dominating the World, China and the Rare Earth Industry*” by the National Institute of Advanced Studies, Sept '13¹³ postulates that China achieved its REE monopoly thanks to US policy oversights, including the permission to *buy Magnequench* in 1995 that allowed China to become a global player in the value chain for REM, alloys and magnets. Some members of Congress opposed the sale, pointing out that the buyers were majority controlled by the Chinese government. Through Magnequench, China gained access to the most important portfolio of REE patents in the world, including REE magnets for cruise missiles and other advanced military hardware. Coincidentally, ‘such components started to spread worldwide after the transfer of Magnequench to China’.

Taxation

The Chinese MIIT is considering raising taxes on REE¹⁴. A counter-argument raised by the industry is that taxes create an uneven playing field for companies operating legally, and paying the taxes, compared with illegal miners, also creating a big pricing gap between legal and illegal enterprises.

Chinese resource taxes have a history of creating unfairness, owing in part to the criteria on which they are implemented. China’s Ministry of Finance and State Ministration of Taxation raised taxes on rare earth ores in 2011, but the impact of the taxes differed greatly between provinces, due to the varying ratios of ore-to-processed REE products. In June '13 the MIIT

sought opinions on whether to continue hiking the resource tax on REE minerals, but could not reach a conclusion, but it seems each domestic government is adopting different standards and the execution is confusing.

REE Recycling – and Smuggling...

Illegal trading practices are often used in China to circumvent direct control of important secondary raw material flows, including recycled REE. Preliminary statistics of June '14 show illegal smuggling hidden among 67 REE recycling projects across the country. MIIT urged the government to regulate REE recycling¹⁵.

Subsidising REE Environmental and Efficiency Upgrades

China government's decision to *subsidise* REE producers pursuing *technological upgrades*, shows the commitment of the country to address energy-efficiency and environmental issue and to promote value-added products¹⁶.

5. WTO

The *first* dispute settlement case on several industrial raw materials was initiated in June '09 by the EU, the US and Mexico¹². No amicable solution with China was found, so a Panel was established in Dec '09 and upheld most of the EU's claims. China appealed certain aspects but the Appellate Body upheld all the key claims raised by the EU, and confirmed the findings made by the Panel, including [a] that China's export restrictions on several industrial raw materials are in breach of WTO rules and are not justified for environmental protection or conservation policy reasons and [b] that China had committed not to levy export duties. For procedural reasons, the Body could not rule on additional claims regarding technical aspects of China's administration of export quotas and licences and to a minimum export price. Preliminary analysis indicates that China has taken steps to comply with the ruling but in practical terms there are still significant barriers, eg minimum export prices seem to still be in place.

In March '12, the US, the EU and Japan initiated a *second* complaint with respect to China's restrictions on the export of various forms of REE, W and Mo used in the production of electronic goods¹⁷. These restrictions include export duties, export quotas, minimum export price requirements, export licensing requirements and additional requirements and procedures in connection with the administration of the quantitative restrictions. A panel established with key findings that China imposes three export restrictions: export duties (taxes); export quotas on the amount of those materials that can be exported in a given period; limitations on the enterprises permitted to export the materials -- all inconsistent with China's WTO obligations.

On 17 April 2014, China notified of its decision to appeal certain issues. At the same time, a very interesting suggestion appeared in a *China Daily* report : 'Beijing should try and get around the WTO ruling by offering to remove the export quotas on LREE but keep ones on medium and HREE, which have smaller production volumes'¹⁷.

The Ministry of Commerce says the Chinese position is really just about protecting resources¹⁸ and the environment for sustainable development. But the next sentence is something more of a stretch: 'It has no intention of favoring domestic industry through distorted trade'.

Gao Wei, general manager of Shanghai Huaming Gona Rare Earth New Materials, welcomed the removal of the current tariff and quota systems that had weakened Chinese REE competitiveness in terms of pricing and Chinese products are priced higher than their foreign rivals because of the tariff and quota systems and said that 'Lifting the quota and reducing tariffs will help domestic producers digest their massive volumes of REE and bolster the production of medium and HREE'.

The president of the US National Mining Association, welcomed news of the WTO ruling but pointed out 'this was no panacea to solving the US's mineral supply chain woes. American companies were still 100% reliant on China for supplies of REE and other minerals [and should] develop local resources and also look downstream, in Africa, Australia, Canada and elsewhere — after all, it was a processor once upon a time and could be so again¹⁸...So far, many REE projects around the globe have secured financial backing from Chinese, S. Korean or Japanese interests. Japan is clearly aiming to end its reliance on China for REE supplies for its downstream industries. Perhaps rather than joining the long line of exploration companies looking for REE deposits, the strategy for America would be to provide the downstream money and technology¹⁸.

Chinese Retaliation?

Chinese authorities may deal with the WTO by imposing higher taxes on producers of REE on the basis of the value of minerals, rather than the volume as is the case now. This change will result in higher production and, of course, export prices. But China's revenge could be longer-term and designed to cause deeper damage¹⁹.

6. What next?

The EC report from on the Implementation of the Raw Materials Initiative' of June 24, '13⁴ stated that 'a wide-ranging public consultation on the strategy was going well; the majority of EU member states had responded...along with non-EU countries, regional governments and the industrial minerals industry'.

The report confirmed that by 2020 actions would include: setting up innovative pilot projects, including demonstration plants on exploration, mining and processing; finding substitutes for raw materials in short supply; creating a network of research centers on sustainable raw materials management; using EU-standardized instruments for surveying resources; creating a 3D geological map; modelling raw material trends; and undertaking complete lifecycle assessment of EU raw materials needs.

However, Roskill²⁰ point out some disadvantages of the report, 'hence it should be read with caution':

- "Terms like 'risk' and 'critical' are emotive," and the end result could be panic and 'unnecessary substitution

- Considering “the wider supply chain dynamics” Roskill provides a case study of cobalt as CRM. Although it is right to highlight the supply risk situation in the DRC, “a volatile state does not necessarily result in volatile levels of raw material exports.” Indeed, from 1996 to 2003, when main periods of conflict occurred, mine production increased at a 28 pct CAGR
- Metals and oil make up 95 pct of DRC’s total export revenue, with mining and quarrying accounting for ~12 pct of its GDP, hence DRC is unlikely to put policies in place that would negatively impact those industries.
- DRC is not the sole determinant of Co supply. For instance, 2/3 of Co is produced as a by-product of Ni and Cu, meaning that demand for either of those metals has the ability to impact Co supply.

On the specific issue of recycling, the following comments were made by Zboril²¹. Regulations on recycling have not been framed coherently and tend to focus on individual, isolated aspects of collection and recycling and do not take account of the market forces at work in the systems and processes. The conflict between market forces and the existing regulatory framework should be analyzed in detail to achieve better balanced results. The EU should possibly negotiate emergency terms with the WTO, setting clear and transparent conditions for export restrictions/duties on wastes of strategic importance. Recycling should be supported by improving collecting infrastructure, creating legal certainty and an equal level playing field and by removing unnecessary administrative burdens. Lastly, all individual elements of the EU Climate Change Policy should be the result of consistent energy, raw material and industrial policies.

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