India fuels the issue of resource security as the Chinese restrict rare earths and tungsten exports

India discovers the strategic price of an inadequate critical materials supply – a lesson for the US

The development of countries like China, Brazil, India, Turkey, Mexico, or Indonesia has generated a shift in the global economic map thanks to the rise of so called "South-South" cooperation. The formation of the BRICS (Brazil, Russia, India, China and South Africa) is perhaps the most startling example of this phenomenon. Of course, Europe and the United States remain pillars of global technology, trade and finance but they face much greater competition, especially when it comes to resources, than was the case in the 1950's or 60s. In fact, over the past two decades the rise of the BRICS and similar powers has substantially and permanently changed the map of the supply and demand for raw materials. China, in particular, accounted for over 50% of the increase in global consumption of industrial metals between 2002 and 2005.

Beyond this overall increase in demand, changes in technology have given cause for rare earths (essential for the advancement of many 'green' technologies) to be especially vulnerable to geopolitical whims and strategies. Tantalum is widely used in the electronics industry. Such minerals, given their uneven geographical distribution, difficulty of

extraction and processing or the concentration of their production chain, represent a challenge for rising and existing economic powers alike. This has fueled the issue of resource security: the growing demand for unprocessed metals and the consequent difficulties in access to raw materials will generate an ever more complex international struggle over the exploration, extraction, processing of raw materials.

Millions of jobs depend on access to raw materials and there has been an increase in demand for minerals and metals, accompanied by significant difficulties in the supply of certain raw materials, such as price volatility and market distortions – i.e. China's rare earth export restrictions. Countries and companies have invested billions in research to promote technological innovation in the value chain of raw materials through a wide range of initiatives such as new concepts and technologies for exploration efficient in terms of costs and identifying alternatives for critical raw materials even as research will help to improve processing and waste management technology to make mining and recovering critical materials more socially and environmentally acceptable. However, in the face of growing demand, supply is becoming problematic due to the concentration of supply in very few countries: China, Russia, the Democratic Republic of Congo and Brazil; add to this the low 'substitutability' and rudimentary recycling technology and it is not hard to see why the European Commission in 2010 identified 14 raw materials as having strategic importance. **They are antimony, beryllium, cobalt, fluorspar, gallium, germanium, graphite, indium, magnesium, niobium, platinum group metals, rare earths, tantalum and tungsten – in short known as 'moly' products**. Such is the context in which China has decided to continue applying export duties on several such materials including rare earths and tungsten, even though it had been expected to lift them on January 1 of this year to comply with the World Trade Organization (WTO) ruling deeming that export controls on such critical materials (including REE's, molybdenum and

tungsten) were illegal. China has until 1 May 2015 to comply and its decision to uphold them is borne out of geo-strategic concerns.

On December 31, it was reported that China would restrict rare earth and tungsten supplies to India, presumably to contrast the rise of India's military industrial complex. Indeed, moly products are essential in the manufacturing of stealth radar evading technology, in targeting mechanisms and temperature resistant magnets and materials used in jet engines and aerofoil components in manned aircraft and increasingly in unmanned drone aircraft, which are playing an ever more important role in special operations. Missiles use samarium-cobalt (Sm-Co) magnets as do the ion plasma propulsion engines of future spacecraft. Neodymium-iron-boron magnets are able to withstand extremely high temperatures and are used in special munitions. Cerium and other REE are used to produce phosphors in lighting, radars and night vision equipment; even the 'humble' smart-phone can become an invaluable piece of defense equipment, facilitating communication. While not a rare metal in the chemical sense, rhenium is a highly temperature resistant element that is needed to produce the Joint Strike Fighter (JSF) aircraft to be supplied to the US and many of its NATO partners.

The REE industry has become extremely lopsided in China's favor and many countries, India increasingly so, need to invest more in securing dependable supplies of critical metals. India, for the time being, lacks the technological capability or the right rare earth ores to avoid reliance on raw material imports; just as the US and Japan were caught off guard in 2010, when China restricted exports of critical minerals, India too has been drawn to the need to develop buffer reserves. India has been especially keen to develop its aerospace technology sector – as has China in recent years – but it lacks the materials to develop the advanced alloys needed to make aerospace frames and engines alike. It is not

enough that titanium, tungsten and chromium (among others) are hard to find in India (essential to produce high-stress components from special bearings to turbine and compressor blades), modern aerospace technology us experimenting with materials able to withstand extreme temperatures and stress such as ceramic composites and borides and zirconium for the leading edges of wings.

Rare earths today represent what titanium and tungsten were in the 1930's and 40's and it is essential that reliable supplies of these essential materials be available. One of the most important development initiatives launched by Indian Prime Minister Narendra Modi is known as "Make in India". A shortage of critical materials for the defense and high technology sectors will severely limit the impact of the campaign according to Avinash Chander, Scientific Adviser to the Defense Minister and Director-General of the Defense Research and Development Organization. India has sought Japanese help in improving extraction and processing. India does have some rare earth production capability; it is minimal when compared to China, but the partially State owned 'Indian Rare Earths Ltd' sells some ore material such as monazite and a few value added products for magnets. Japan has already made investments in India. A subsidiary of Toyota Tsusho called Toyotsu Rare Earths India Pvt. Ltd. is based in Vishakapatnam, in the state of Andhra Pradesh, and is involved in the production of some rare earth elements. The company operates a base in which it is produced monazite sand, rare earth element, and is responsible for the preparation of rare earths such as neodymium, lanthanum and cerium; receives the supply of monazite sand from Indian Rare Earths Ltd (IRE), which falls within the jurisdiction of the Department of Atomic Energy.

Recently, IRE has requested authorization to extract rare earths from the sand along a coastal stretch of approximately 2500 hectares in Brahmagiri (Puri district). Japan is said to have contributed at least a half billion dollars for the

development of alternative sources of rare earths in India, which wants to attract Japanese investment.

Both India and Japan understand that the rare earth industry offers trade, strategic and diplomatic advantages. At the same time, ensure regular supply of rare earths will be a process that will take a long time. If you invest today in various projects, then it may take about five years to double or triple production. Over the years, many countries in the world had stopped investing in the extraction of rare earths because, from a financial standpoint, it was more feasible to import from China. However, this had led China to develop a monopoly in this area. For countries like India there is much to learn from the experience of the rare earths. It is important to understand that with regard to critical materials and essential minerals, planning is vital. India has learned the hard way that dependence on other countries – especially other competing economic and military powers such as China – should be minimal with respect to strategic materials required in the energy, aerospace, nuclear power and in defense sectors. In addition, there is a constant need to monitor trends in progress in areas such as semiconductors, silicon technology, production of microcircuits, thin films, nanotechnology, and so on. The presence or absence of strategic materials are two factors that have an impact in the short and long term on the economy of the country, as well as on military preparedness. The United States may be caught equally unprepared in this matter and India’s lessons apply to it as well.