The intensified export restrictions outlined in China's first White Paper on rare earth metals (REM) in 2012 have prompted Japan, the largest REM importer for China, to increase its resource security in terms of diversifying supply. Currently, China produces 97% of the world's REM and has a dominant role in the REM industry. Its unilateral restriction of REM exports has impacted the global supply of REM and raised concerns among importers. In March 2012, Japan, the United States (US) and the European Union (EU) jointly filed a World Trade Organization (WTO) dispute settlement case against China over its limits on rare earth exports, but failed to restore Chinese REM supply to a satisfying level. This REM tension creates a confluence between Japan's urgent need for alternative REM suppliers and Asian countries' desire for foreign investment. However, while Japan attempts to decrease REM dependency on China, it is confronted with numerous obstacles when dealing with new partners. This article examines the rationale behind China's REM policy and explores the challenges to Japan's new REM partnerships with Kazakhstan and Vietnam.

Rationale behind China's REM export restrictions

In its White Paper *Situation and Policies of China's Rare Earth Industry*, China claims that excessive mining with no significant regulation results in depleted REM reserves and serious environmental problems. Thus, restrictive policies on the REE industry are needed. This includes measures that strictly control the volume of rare earth mining, production and exportation, reinforce supervision over REM enterprises, tighten customs control and enhance compliance of enterprises with industrial regulation. The White Paper additionally emphasized the need for an annual export quota – the most controversial part of the Paper. Rationalization of export quota as an environmental remedy is unconvincing as long as China has not imposed a domestic consumption restriction at the same level. Exported REM and domestically consumed REM are both produced in Chinese mines and contribute to the same environmental problems. Therefore, limiting exports for environmental reasons but forgoing domestic restrictions creates a double standard. The Chinese government has attempted to ensure the industry is running for the benefit of the country.

Firstly, the White Paper conveys China's previous export restriction on REE. It also outlined the disorganized governmental regulation of the REM industry. Beginning in the early 2000s, China gradually imposed various export restrictive policies—export quotas and export tariffs being the key policies of restriction. According to a

US Geological Survey

, export quotas for Chinese REM were not formerly stringent in the past. From 2005 to 2009 there was a slight drop from 65,680 tons to 50,145 tons in REM. Yet 2010 showed a reduction to 30,258 tons representing a rapid drop of almost 40%. In 2011 and 2012, REM remains approximately at the same level upsetting the international market. Increasing export tariffs is another burden for REM importers. The Chinese government added a 10% export tariff on certain REM in 2006 and further raised the export tariff for light and heavy REM to 15% and 25% respectively in 2008. These changes prompted an international dispute on rare earth elements which reached its climax in October 2010 when a Chinese fishing boat crashed into two Japanese guard boats after a Sino-Japanese territorial conflict. Major REM importers such as Japan and the US complained to the World Trade Organization (WTO) that China failed to comply with the General Agreement on Tariffs and Trade (GATT) on free trade and that China's restriction on exporting rare earth metals distorted the global market. Despite these criticisms, China did not give in. China's White Paper has defended the imposition of export quotas in the past few years as necessary to protect the environment and safeguard a scarce resource.

Secondly, although China's White Paper addresses international cooperation, REM can still be a means of both economic and political leverage as long as China retains a monopoly over the market. Critics contend that limiting exports of REM creates pressuring on non-Chinese rare earth producers to relocate their operations, technologies and jobs to China, to get rid of the added costs associated with export quotas. In order to obtain the ore, a foreign company would have to invest in China by moving their production line to China and by employing Chinese laborers. China has also reinstalled the Value-Added Tax (VAT) rebate to attract foreign investments. The Chinese government is also interested in foreign companies because of their capacity to introduce advanced mining technology in China. The Chinese government is also interested in foreign companies because of their advanced technology. Although China is the most advanced in rare earth extraction and smelting technologies, and has two large-scale national laboratories conducting rare earth research, Prof Xu Guang-xian, well-known as the Father of Chinese Rare Earth, criticized the country for not investing enough in researching the technology for rare earth functional materials and industrial development. Compared to the US and Japan, China lacks advanced rare earth products, such as neodymium magnets. From this perspective, REM could be traded for advanced technology. Politically, although the Chinese government has indicated it will not use REMs for diplomatic bargaining, in the summer of 2010 the Chinese government suspended rare earth exports to Japan after a territorial dispute regarding claims to the Senkaku Islands. Additionally, there was a similar economic sanction in the summer of 2012. Taking a lesson from Japan, it is possible for China to impose psychological threats by way of REM export restrictions on other rival countries during disputes, although it has not yet brought this to the negotiation table.

Thirdly, China has a growing domestic demand of REE totaling around 70-80% of the world's supply. Other than merely mining the ore, China aims to develop its own production line of rare earth products. The demand for REE is driven by the production of high technological and green products in sectors such as light industry, agriculture, the oil industry and metallurgy. Among them, the production of fluorescent and magnetic materials consumes over half of China's REM with a high increasing growth rate (almost 40,000 tons in 2007). Lots of green facilities, such as wind turbines, require rare earth components in their designs.

China's 12th Five Year Plan (2011 – 2015) aims to increase the use of non-fossil energy to 11.4% of major energy consumption. Wind power is also identified as a key component of China's sustainable development. Therefore, it is expected that there will be an increase in the production level of wind turbines as well as for the demand for REM. Similarly, REM is crucial to the design of environmentally friendly electric motor cars. As the world's largest car market, China might require tons of REM if demand for electric vehicles increases.

Shifts in the REM market

Major REM importers such as Japan and the US remain doubtful about whether China is a reliable REM supplier. There are a number of clues that reveal the potential for future shortages. China's White Paper is just another form of confirmation in terms of future reductions, unilaterally and officially informing the world that they should look toward domestic supplies for their own needs. The worldwide demand for REM was around 137,890 tons in 2010 and is expected to reach 248,020 tons by 2015. The gap between these numbers and the export quotas of Chinese REM would disrupt the Western market and interrupt technological

advancement in terms of green energy. Jack Lifton, the Director of Technology Metals Research LLC, argues that the West would have to choose between “ guns and butter ”.

In 2010, over 80% of Japan’s imported REM came from China. Japan is the largest REM consumer. The high-tech industry in Japan relies on these metals and also, in turn, exports these high-tech products to the US and throughout the rest of the world. Without raw materials, a lot of Japanese industries, from multinationals to tiny factories, will be forced to suspend activity. Since Japan is prominent in the production of certain high-tech products, a disruption of REM supply to Japan would not only upsets the country, but would disrupt the entire market. Therefore, Japan has responded swiftly to address potential shortages. In 2010, Japan planned to stockpile REM as a buffer against future supply disruptions. The plan works in a way that mimics the stockpiling of rice to prevent famine. The government had also considered recycling programs as well. Yet, these are not long term solutions because, without new imports, stockpiled REM could be exhausted even within a single day time-frame. The core of the problem is essentially China’s monopoly, therefore, Japan has moved ahead with alternative suppliers. Although China is producing over 95% of the world’s REM, it holds only 35% of the world’s reserves.
Additionally, there are REM deposits in other countries. Japanese companies have developed ties with REM reserve holders such as Vietnam, Kazakhstan, Australia, Brazil and Serbia. These countries supply Japan with alternative sources so that the Japanese are not reliant solely upon China. Gradually, the REM market has shifted from being China-centric to non-China-centric.

Japanese-Kazakhstan REE industry

Following China, Kazakhstan is one of the biggest producers of REM, especially uranium. Although uranium is not a REM, its tailing, a byproduct in uranium mining, is rich in dysprosium and neodymium, two indispensable REM to high-tech industry . While Kazakhstan is a new player in the REM industry, Japanese companies are helping it become a significant competitor to the Chinese. In 2010, in order to lower dependence on China, Japan’s Sumitomo and Japan Oil, Gas and Metals National Corp (JOGMEC) partnered with Kazatomprom—the most influential actor in the Kazakh REM industry—for the extraction of REM. Large-scale projects are already being implemented by the Japanese in Kazakhstan to develop deposits. At the moment, Kazakhstan is producing only 4.5% of the world’s REM supply and can provide approximately 1,200 tons of REM per year to Japan. Japan expects that the Kazakhstan REM venture will undergo rapid growth and they plan to increase the total production to 15,000 tons per year by 2015, this would account for 10% of the current entire world supply. In 2012, the Japanese and Kazakh governments signed an agreement to jointly develop REM critical to electronic applications, weaving a path for partnership between Japanese and Kazakh companies. In this joint development, a REM plant will be built in Stepnogorsk—located in northern Kazakhstan—to produce dysprosium which is crucial to the production of the motors of electric and hybrid vehicles. The agreement ensures Japan will receive 55 tons of dysprosium per year from the plant. This number makes up around 10% of the Japanese annual demand for dysprosium and is expected to increase yearly.

Japanese-Vietnamese REE industry

Vietnam holds one of the largest REM reserves in the world. Many of the Vietnamese reserves are untapped and are located in the northwestern part of the country, such as in the Province of Lai Chau. In order to decrease its dependence on REM supply from China, Japan plans to have Vietnam as a partner for mining, separation and the production of REM. Both governments sig ned an agreement in 2010 to exploit REM in the Province of Lai Chau. Meanwhile, Toyota Tsusho Corp., a Japanese rare earth importer, teamed up with several Vietnamese companies in a rare earth mining project. This venture is followed by preparations for a refinery plant focusing on the production of cerium, lanthanum and neodymium. Through these projects, Japan could ensure receiving a stable annual supply of REM from Vietnam of 3,300 tons by 2013 and around 7,700 tons by the flowing year. This supply would comprise about one-forth of the Japanese total demand. In 2012, Japan and Vietnam launched a joint rare earth research and technology transfer center in Hanoi to carry out research on the production of the materials utilized in the technology industry. Japan funds the equipment for the center and Vietnam pays the construction costs. There are Japanese scientists who stay in the center and collaborate with Vietnamese researchers from the Institute for Technology of Radioactive and Rare Elements.

Challenges faced by Japanese overseas REM projects

Japan has made huge investments in the REM sectors of both Kazakhstan and Vietnam and remains confident about their profitability, yet there remain five notable challenges. These challenges include: lack of experience and lack of technology, potential competitors, legislative gaps and environmental problems.

Experience and Technology

Although both Kazakhstan and Vietnam are rich in REM—particularly in the REM that are crucial to alternative energy, military technology and the aerospace industry— they are not key players in the sector presently. For example, Kazakhstan did have several REM plants during Soviet times which supplied strategic materials to the USSR's defense industry but these plants were closed or reconstructed after 1991. Additionally, Kazakhstan lacks the advanced technology necessary for extracting REM and, furthermore the industry is reluctant to make massive investments. Kazakh companies prefer to focus on the production of traditional metals, such as gold, cooper or iron as these have lower manufacturing costs. Similarly, Vietnam lacks the advanced technology required for REM production. It would be a waste of resources if Vietnam were to merely tap and export resources because the profit made from refined mineral products is much higher than the profit made from raw materials. The Vietnamese government needs to upgrade its REM sector either to become a new player in the global market or simply for the future good of the country. In any case, the Vietnamese REM industry needs the technology.In any case, Vietnam needs the technology. As a result, Vietnam should not just ship the minerals away.

Competition

Japan is not the only partner of Kazakhstan and Vietnam who have both been linked with a number of foreign companies in REM cooperation in last three years. Other than Japan, China also may be interested in cooperating with the two countries. There are three possible benefits for the Chinese. Firstly, importing REM could help to reduce the pressure from domestic demand for REM. Secondly, importing can also work as leverage in terms of increasing China's

bargaining power in the market. Thirdly, increasing the production of REM in the two countries could serve to ease international pressure against export restrictions. Other than official competitors, there are unofficial ones. For example, China is buying REM from Vietnam via unofficial channels, including illegal mining and shipping of REM. It was reported in 2012 that thousands of tons of rare earth ore in Province of Lai Chau disappeared. This rare earth ore was believed to be illegally exploited and exported out the country to China. In any case, Japan has to be aware of these official and unofficial potential competitors.

Legislative gaps

The REE industry in Kazakhstan is controlled by Kazatomprom, a state-owned company. It was originally a nuclear holding company which mainly mines uranium. t is also involved in the production of other precious metals such as dysprosium, neodymium, tantalum, and niobium. In 2006, it was appointed as the official producer of REM in Kazakhstan and became the only company authorized to trade the metals in international markets. Additionally, there are other market players with close connections to the Kazakhstan government such as Kazakhmys, KazZinc and the Eurasian Natural Resource Corporation (ENRC). Although the Kazakh government considers REM strategic material—material to be used carefully for the sake of national security—its regulation over production remains undeveloped. There is no legislative norm for mining, extracting or producing REM, yet the government is entitled to terminate contracts of REM deals with third parties. This legislative gap implies that there is a lack of transparency in the REM industry in Kazakhstan.

Environmental problems

Mining and producing REM cause serious environmental problems. Without significant regulation, illegal mining of REM often leads to the destruction of land, farms, and water supplies. Its production is also a radiational and unhygienic process. Miners and local residents suffer most and seem unwilling to support REM projects because of health reasons. Perhaps Japan could learn a lesson from Australian-Malaysian cooperation. The Australian mining company Lynas has constructed a plant in Malaysia to treat REM extracted from mines in Western Australia but, although Lynas stressed that the government will strengthen monitoring of the plant and will close the plant if it fails to meet environmental standards, Malaysian environmentalists are still worried the foreign business could pollute their region. The situation is reminiscent of a Mitsubishi Chemical owned rare earth refinery in Malaysia, which was closed in 1992 because of environmental and social problems. After local residents blamed the refinery for birth defects and eight leukemia cases in their community, Japanese politicians and environmentalists persuaded Mitsubishi Chemical to fix the problem. Conscious of its image, the Japanese company agreed to close the refinery and clean up the site without a legal order, while simultaneously denying any responsibility for the health problems. The case resulted in environmental protests by thousands of anti-Lynas activists. Japan must be aware of local sensitivity and must also prepare a comprehensive waste management plan and a dismantling plan for the potential future termination of any REM plants.

Conclusion

Since China reduced the availability of REM, Japan has been prompted to act. Although there is no specific target for reducing its dependency on China, Japan aims to control 50% of its own

REM needs by 2030. Kazakhstan and Vietnam are two of the key partners in Japan's supply diversify strategy. These two countries teamed with Japan mainly because of Japan's advanced technology and the country's long experience in the REM market. Japanese companies have a precious marketing network and maintain direct contacts with end users. In spite of these advantages obstacles remain for Japan. Although they are manageable in nature, Japan is still aware that it is difficult for its new REM partners to fill the gap left by China's export restrictions all at once. As a matter of fact, it will take a few years for Japan to run its new plants to their fullest capacity.

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