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12/12/16

ENVS02 Discussion Wrap-Up- "First it was Oil, Now it is Rare Earth Metals?"

After only briefly hearing about the importance of rare earth metals in a news article a year ago, I decided to use this opportunity to explore this topic more in-depth with my fellow classmates. The four chosen readings for the discussion broadly introduced the dependency we have developed on rare earth metals and potential solutions to solving our reliance among the precarious supply of these resources. They also introduced the environmental and human destruction brought by the current mining methods of these metals from the earth. I assumed that this topic and the materials was fairly new for the majority of the class, so the chosen readings were relatively succinct to really focus the conversation on the broad issue and potential solutions.

The discussion began with a brief introduction from myself on some of the critical points from outside the readings that could help shape the argument, like the rapid changes that have occurred in the types of materials we use everyday from just a dozen at the start of the 20th century to dozens today. Another point I brought in at the onset of the conversation was the fundamental question of at what cost has our species' technological progress in the last century affected our earth. The discussion was then opened up to the rest of class to talk about what stood out to them from the readings. One of my fellow students brought up a point from the Geology.com article about the reliance that the US military has placed on using rare earth metals in advanced military gear and the potential conflict that could arise from this dependency on these parts that mostly come from China. I connected this to the current relationship between the US and China that has been in the headlines in recent months as President-Elect Trump has promised to challenge China and their economic prominence. Our professor also drew the parallel between OPEC's dumping of oil in the 1970s to control the market and China's restrictions in the early 2010s on the supply of rare earth metals that were mentioned in a reading.

We then transitioned to focusing on the environmental impacts of mining rare earth metals and the issue that these harmful mining methods are being used prominently in green technologies like wind turbines and electric car batteries. A fellow classmate brought up the idea of the lesser of two evils in response to my question and how coal mining is far worse for the environment than the mining and construction of wind turbines. We all were generally in agreement to their point, so we turned towards what methods are out there to make the usage of rare earth metals as clean as possible. One of the proposed solutions to reducing the dangerous effects of rare earth metals were stricter government regulations on the extraction processes in these mining towns in China. Another solution to reducing the destruction brought by mining is the recycling of the rare earth metals that are in discarded products similar to the way we recycle

car batteries. The concept of extracting expensive materials from the ground for just one sole use, according to a student, is an absolute waste and makes no sense that recycling isn't everywhere. One student brought up the point that only 1% of rare earth metals get recycled and that there is plenty of potential for the expansion of recycling of them. However, someone else pointed out that the costs of the mining and refining are artificially lowered in China and other countries, and recycling simply isn't cost-effective now. In relation to recycling, our class also discussed the concept of subsidies and their effectiveness in encouraging recycling of rare earth metals. Although the reasons for recycling lead car batteries are a bit different, it is nevertheless a potential model to follow with the recycling of personal electronics and other items with a high amount of rare earth metals.

Another potential solution introduced in the conversation is finding other mines in other regions of the world that could rival the production of China and create more economic security as well. I provided a bit more detail on this point by referencing the Yale Environment 360 article where the author states that there are hundreds of sites around the world being investigated for potential mining, including some right here in the United States. However, they face several obstacles like the small supply needed of each element, stanch competition from China, and an intensive and laborious process of extracting the materials. One important thread of the conversation that was discussed was the concept of a "tech fix" and how this could completely erase the need for the metals all together. For example, one student discussed how Tesla's electric car batteries are made mostly of lithium instead of rare earth metals, and what this could mean for the future of hybrid or electric car batteries. Another member of the class also introduced the work being done to produce graphene ultracapacitors that they knew from outside of the class that could essentially eliminate the need for batteries altogether.

As the conversation was coming to an end, a fellow student also introduced the human effect on the environmental destruction brought by the harmful mining of rare earth metals in places like Baotou, China, that was prominent in the Guardian article. We were all in agreement that the human perspective on this issue is largely ignored by governments and companies around the world because they are primarily concerned with the economic benefits that come from the work that thousands and thousands of people perform every day.

Although we didn't come to a definite answer of how to solve our dependency on rare earth metals, the discussion was fruitful in exploring a variety of methods and solutions that could be used to move away from the fragile relationship that we have. We did come to a consensus on the fact that the current economic and geopolitical setup with rare earth metals is harmful and that more needs to be done to change this current situation. However, our society depends so heavily on the existence of the trace amounts of these metals that we still need them to be produced because, without them, much of the technology we use today would be obsolete.

Readings for the Discussion

-“Rare Earth Elements”, *Geology.com*. <http://geology.com/articles/rare-earth-elements/>

-Jones, Nicola. “A Scarcity of Rare Metals is Hindering Green Technologies”. *Yale Environment 360*. Nov. 18 2013. Web.

http://e360.yale.edu/feature/a_scarcity_of_rare_metals_is_hindering_green_technologies/2711/

-Kaiman, Jonathan. “Rare earth mining in China: the bleak social and environmental costs”. *The Guardian*. March 20 2014. <https://www.theguardian.com/sustainable-business/rare-earth-mining-china-social-environmental-costs>

OPTIONAL- Lee, Chris. “Rare earth recycling: Is it worth it?” *ArsTechnica*. March 25 2014.

<http://arstechnica.com/science/2014/03/rare-earth-recycling-is-it-worth-it/>