

Committee on Natural Resources
Subcommittee on Oversight and Investigations
Oversight Hearing
1324 Longworth House Office Building
December 12, 2023
10:15 AM

Oversight Hearing titled “The Mineral Supply Chain and the New Space Race”

Questions from Rep. Gosar for Dr. Greg Autry

1. How are space resources natural resources?

I'd be hard pressed to understand how space resource would be “unnatural.” They are not fabricated by humans. They were created by God or nature through the same natural process that created the Earth and everything in our solar system. In fact, many of the metals and minerals we mine from the crust of the Earth were deposited there by the impacts of asteroids in the past. The heaviest materials present in the original formation of the Earth sunk to the core and are inaccessible to us.

NASA routinely refers to space resources as “natural resources.” Examples:

On their website NASA defines In-Situ Resource Utilization (ISRU) as follows “ISRU is the harnessing of local *natural resources* at mission destinations, instead of taking all needed supplies from Earth, to enhance the capabilities of human exploration.” (emphasis on “natural resources” added)

<https://www.nasa.gov/mission/in-situ-resource-utilization-isru/>

Another article is entitled “NASA Challenge Seeks Ways to Use Mars’ Natural Resources for Astronauts.” <https://www.nasa.gov/news-release/nasa-challenge-seeks-ways-to-use-mars-natural-resources-for-astronauts/>

Academics routinely refer to space resources as “natural resources.” Examples:

Coffey, Sarah. "Establishing a legal framework for property rights to natural resources in outer space." *Case W. Res. J. Int'l L.* 41 (2009): 119.

Tronchetti, Fabio. *The exploitation of natural resources of the Moon and other celestial bodies: a proposal for a legal regime.* Vol. 4. Martinus Nijhoff Publishers, 2009.

Jakhu, Ram, and Maria Buzdugan. "Development of the natural resources of the moon and other celestial bodies: economic and legal aspects." *Astropolitics* 6.3 (2008): 201-250.

USGS believes that space resources are “natural resources” under its domain. Examples:

Surveying natural resources was the key job Congress gave the USGS when it was created on March 3, 1879... In 2017 we published a study that showed that the methods the USGS uses on Earth can be applied to asteroid resources with only modest modification.

<https://www.usgs.gov/index.php/news/usgs-prepares-assess-resources-moon>

"The USGS realized that our congressional mandate to assess natural resources extends to space" Kestay said. At this time, the USGS does not have a funded program to conduct full-scale assessments of space resources. "But we are anticipating that the USGS may be directed to do so soon, and we are taking a number of steps to be prepared for that possibility," he said. (Space News quoting Lazlo Kestay, a USGS research geologist)

<https://www.space.com/41707-space-mining-usgs-resource-survey.html>

Relevance to the Natural Resources Committee

I see no reason why the location of resources would change their nature or affect the relevance of this committee's oversight over them. The fact they would be accessed via rockets and spacecraft doesn't change the nature of the material. We would not insist that because minerals are transported by rail, ship, or truck that only Transportation & Infrastructure Committee could discuss those materials. The technology of the mode of transport is far less relevant than the economic and strategic importance of these natural resources.

2. How can the House Committee on Natural Resources help America secure the celestial mineral supply chain?

As I stated in my testimony I recommended six items, not all of which are directly within the Natural Resources Committee's portfolio but for which the committee could take an active role in leading and supporting. My first recommendation is directly within the committee's jurisdiction, and I believe that there funds in USGS and other buckets that could be applied to this important task.

Provide funding for R&D into dual use mining technologies that enable both space resource extraction and advanced terrestrial mining. Most importantly, support technologies for the detection of subsurface mineral deposits and AI enabled autonomous deep mining systems.

Additionally, appropriate the funding that Dr. Kestay is referring to above. As he notes, the Astrogeology Science Center is ready and waiting to do this work.

I also want to be clear that we are not talking about "billions of dollars" as was oft repeated in the hearing. NASA is spending billions to get us back to the Moon. DoDo is spending billions on space capabilities. Natural Resources can leverage those huge expenditure and accomplish a great deal with the judicious application of a few \$million. China is certainly far more than that to beat us to these resources.

Form an Advisory Commission to the Committee or an Advisory Committee to USGS on how best to utilize funding and resources and most importantly coordinate with NASA

and DoD lunar efforts. Appoint individual to that body that understand the science, engineering, economics, business aspects of space mining. Ensure there are individuals who have experience working with NASA and DoD leadership.

Questions from Rep. Lamborn for Dr. Greg Autry

1. What are the opportunities and barriers to greater coordination and investment in space resources research within academia?

I am convinced there are significant opportunities for the coordination of research and investment in space resources within academia. Firstly, there are a number of academic institutions already doing this work, albeit on a shoestring budget. Among these:

The Colorado School of Mines
The University of Central Florida
Purdue
Arizona State University
University of Alabama at Huntsville

These schools and others could use funding or the opportunity to access USGS grants. Some grants for technology development and the like at USGS could perhaps be expanded to allow for space related applications. I think this is particularly important in the “dual use” category where work done on a space related project, such as automated assaying equipment or AI enabled mining robotics, would produce benefits for both space and terrestrial applications. This addresses the relevance to “problems here on Earth” questions.

NASA is already working with these institutions in many ways including running Robotic Mining Competitions for several years.

<https://www.nasa.gov/news-release/nasa-announces-robotic-mining-competition-2/>

<https://www.nasa.gov/learning-resources/stem-engagement-at-nasa/collegiate-miners-excavate-soil-for-nasas-robotic-mining-competition/>

Provide funding for USGS to partner with NASA on this and other academic projects and grants.

Additionally, it is important to not just spend the taxpayer’s money, but to create an environment that is conducive to public-private partnerships. Leveraging the private sector is America’s greatest strength and how we beat China, which is certainly funding their academics to devise ways to beat America to these resources.

There are billionaires, private equity firms, (friendly) sovereign wealth funds and many other investors eager to get in on the ground floor of America’s commercial space boom. Most of them are investing in rockets and satellites, but they understand the opportunity in lunar and

asteroid resources. Providing small grants to *business schools* with space related programs so they may establish centers of excellence or startup incubators would help attract this private capital into the university ecosystem. These centers and incubators could connect investors with researchers and entrepreneurs.