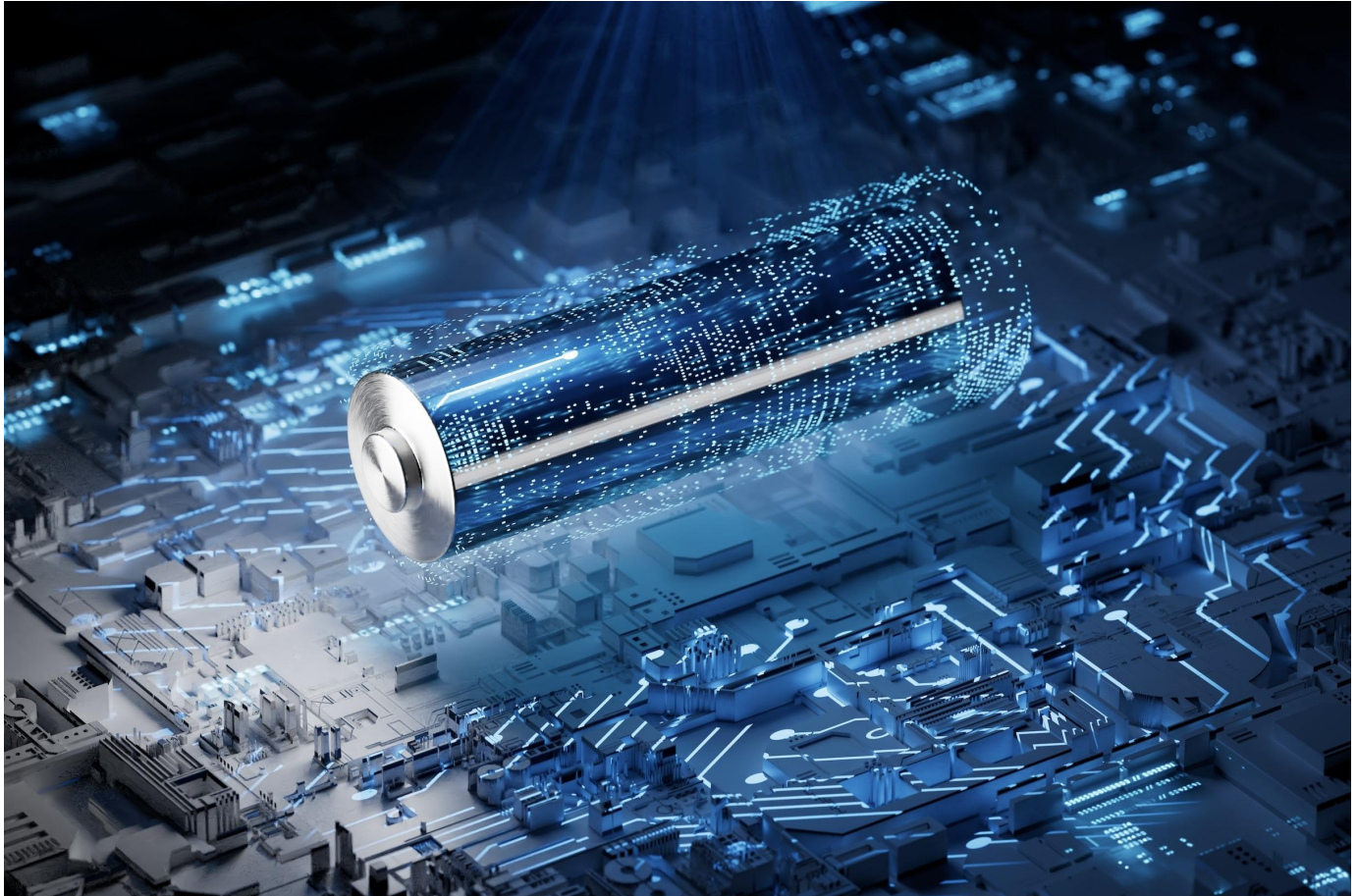


From geology to policy, Tulane researchers redefine the future of critical minerals

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mmccrory@tulane.edu



Critical minerals like lithium, nickel and copper will become increasingly important for powering the energy sources of the future. (Photo by Adobe Stock)

As the world's energy needs require engaging more alternative sources of energy, such as solar panels, hydrogen cells and battery storage, certain minerals have taken center stage.

For instance, by 2040, lithium use is projected to increase fivefold, nickel demand will double and the demand for copper will grow by 30%, although new technologies may reduce these demands.

Meeting that demand poses major challenges, from high capital investment and dwindling mineral yields to growing environmental concerns.

Researchers at Tulane University, in disciplines as varied as political science, geology and urban planning, are working to understand and mitigate those challenges. Cristóbal Molina Baeza, the Favrot Visiting Assistant Professor of Architecture in the School of Architecture and Built Environment, and a participant in this year's Future of Energy Forum at Tulane, focuses his research on Chile's Atacama Desert, the heart of global lithium production.

Chile is the world's top producer of copper and second-largest producer of lithium carbonate, with nearly a third of global lithium originating from the Atacama. Mining, according to Molina Baeza, can bring economic development to rural areas, making the Atacama Desert a place of great opportunity. "It is a global hope for the energy transition," he said.

Much of the critical mineral extraction in the area is in places with thousands of years of history, meaning that cultural traditions and archaeological sites must be considered when mines are opened.

He argues the wealth generated from lithium extraction must also serve the people and ecosystems of the desert. "It is important to address the social, cultural and environmental problems generated by extraction with quality investment in communities," he said.

Molina Baeza envisions using mining revenues to restore water systems, protect biodiversity and enhance the quality of life for local residents.

Those same community-centered investments are what drive the research of political scientist Lucas González, a postdoctoral fellow at the Center for Inter-American Policy and Research in the Roger Thayer Stone Center for Latin American Studies.

González studies how companies, local governments and communities can collaborate to ensure that lithium extraction benefits everyone involved.

"One common misconception is that companies and governments either should or should not care about local impacts," González said. "Our research shows that there are larger implications for both, beyond ideological positions."

His findings suggest what's most important is how effectively companies, governments and local communities negotiate contracts, share resources and invest in local development. The best outcomes, González found, occur when corporations engage sincerely with communities and when governments are strong enough to regulate responsibly.

Not all solutions lie in opening new mines. Cynthia Ebinger, the Marshall-Heape Chair in Geology in the School of Science and Engineering, sees promise in revisiting old ones.

"We can actually go to (existing) sites and remine them," she said. "Many times, a mining company has a permit to extract one or two metals. But there are other products there."

Ebinger said such a practice allows companies to obtain critical minerals from areas that have seemingly been depleted. "Now more than ever, we need these partnerships between companies, academics and the federal laboratories to implement these strategies," she said.

Remining abandoned mines is only part of the solution, however. Recycling electronics for those materials is another.

"If we had an efficient collection system," Ebinger said, "we would be collecting and retrieving a large proportion of what we need."

The United States is falling behind Europe in recycling rates, particularly for electronics recycling, she said.

Energy challenges like the need for more critical minerals cannot be solved by one field alone, and experts agree that it is essential that researchers in multiple disciplines continue coming together to find the best solutions for mining communities, the economy and the environment.