



Visual Earth *Dilemma*

Renewable energy transitions underpinned by batteries, solar panels, and wind turbines rely on the use of critical metals such as lithium, cobalt, and rare-earth metals, yet the mining of such metals—which often takes place in tropical countries (e.g., the Democratic Republic of the Congo and Indonesia)—can cause significant environmental damage (e.g., groundwater pollution) and community conflict (e.g., violation of Indigenous peoples' land rights). These tensions between the need for renewable energy transitions and local socio-environmental consequences are highlighted in the artwork *Dilemma*, which was produced as a collaboration between fine artist Ches Mills and geographer Dr. Tim Werner. Combining false-color satellite imagery of metal mine areas across the globe, this landscape depicts open-cut pits, mine wastes, surrounding rivers and vegetation, and roads and human settlements. *Dilemma* highlights the trade-offs between renewable energy development and the mining-associated impacts on the local environment and communities.

The artist

Ches Mills's inspiration is found in the natural environment: rocks, plants, fauna, mountain views, deserts, and especially the ocean. Her current focus is based on her concern for the deterioration of our coral reefs. Within this destruction there is a certain beauty in the bleached-white corals against the backdrop of the vibrant colors of the healthy corals. In portraying the beauty and delicate state of our reefs, she aims to highlight the urgent need to address climate change and the protection of our reefs. Currently, Ches is using acrylic, ink, and gouache on either canvas or paper to create vibrant, detailed works. She lives and works in the Dandenong Ranges, outside Melbourne, Australia. Here, her studio is nestled in the forest and overlooks the stunning Warburton Ranges, giving her much inspiration and joy.

Above image: *Dilemma*, Ches Mills, 2023, ink, acrylic, and gouache on linen, 120 × 180 cm, courtesy of the artist. Based on a combination of satellite images taken of metal mines around the world.

The science

Mining activities can lead to soil and water pollution, deforestation, land-use conflicts, and a range of complex socioeconomic outcomes. Dr. Tim Werner studies these impacts, often by using satellite imagery to map the extent of impacts on surrounding landscapes. He is particularly interested in tracking mining areas that will become important for supplying metals needed for renewable energy transitions and in exploring responsible supply-chain solutions for metals. The analysis of metal mines in satellite imagery inspired Dr. Werner to conceptualize this science-based artwork piece and secure funding for a collaboration (University of Melbourne Art-Science Engagement Initiative). Dr. Werner provided satellite imagery and consulted with Ches on the arrangement and visualization of mine features.

ACKNOWLEDGMENTS

Artwork selection and curatorial statement provided by Ches Mills and Dr. Tim Werner. To learn more about the artist and her work, visit <https://www.chesmillsart.com/>. To learn more about Dr. Werner's work, please visit <https://findanexpert.unimelb.edu.au/profile/831918-tim-werner>.

DECLARATION OF INTERESTS

The authors declare no competing interests.