



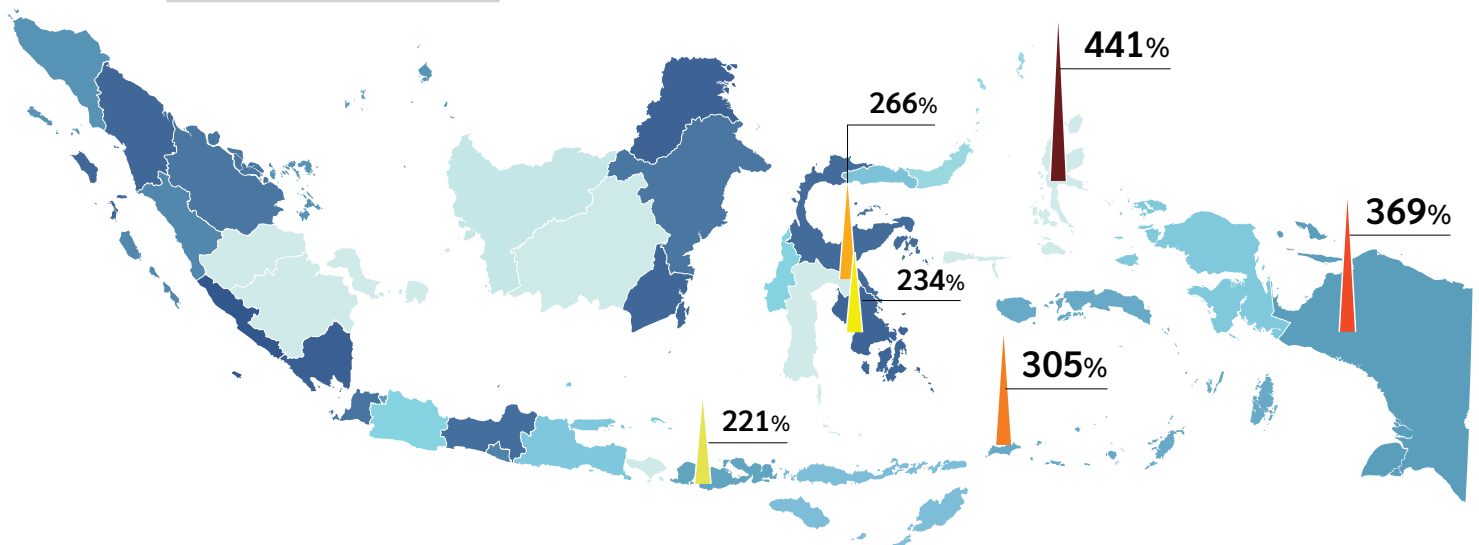
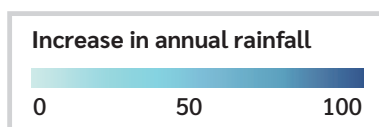
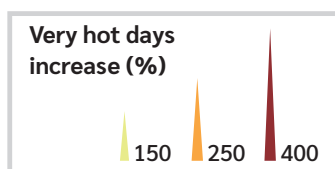
Building climate resilience into Indonesia's critical mineral supply chains

About TMP

TMP is a group of dedicated experts who understand the complex social, environmental and security problems caused by climate change. Founded in 2009, we are the only organization completely focused on the impacts of climate change in the 2020s. Our mission is to help stakeholders prepare for and address short-term climate change impacts in the 2020s. We do this via charitable and commercial projects with partners including governments, investors, corporates, research institutions, NGOs and foundations. This brief introduces one of our non-profit initiatives, which aims to build climate resilience into the supply chains of key materials needed for the global energy transition.

Indonesia is in the midst of a pivotal moment as it seeks to take advantage of the opportunities afforded by the global energy transition, while grappling with the very risks associated with the underlying driver of the transition: climate change. Growing demand for clean energy materials provides a real opportunity for Indonesia to leverage its abundant natural resources for industrial growth and socio-economic development, but this will require urgent and effective adaptation and resilience actions to reduce exposure to imminent climate change impacts.

Our climate risk modeling for Indonesia¹ suggests that key mining areas and assets² (e.g. in Sulawesi) are significantly exposed to an increase in extremely hot days and/or more rainfall in the next 5-10 years. Excessive heat exposure increases the risk of health and safety issues (e.g. heatstroke), lower worker productivity or worker stoppages.³ Meanwhile higher rainfall increases the risk of flooding, landslides and contamination events that are disruptive to normal operations, threatening for social license to operate, and potentially devastating for surrounding communities and ecosystems.⁴



- 1 TMP is partnered with the [IBS Centre for Climate Physics \(ICCP\)](#) for its climate data, which uses the latest CMIP6 climate models - adopted by the IPCC and other climate scientists. We model climate changes between a 1 and 1.5°C world of global warming. We passed 1°C in ~2017, and most climate projections suggest we will pass 1.5°C by ~2029, if not earlier.
- 2 The map provides a relative risk score for an “increase in annual rainfall” at the provincial level, where the scoring system is compared to the rest of the world. E.g. a score of 100 indicates the area is the most exposed in the world. The map also picks out six large critical minerals mining operations and shows their exposure to an increase in the number of very hot days, where “very hot days” are defined as days above the 90th percentile of the hottest days at 1°C of global warming.
- 3 <https://www.ilo.org/publications/major-publications/working-warmer-planet-effect-heat-stress-productivity-and-decent-work>
- 4 For example, the Grasberg copper / gold mine was forced to suspend operations for approximately 1 month in 2023 after major flooding and landslides. Similarly, PT Archi Indonesia Tbk ceased operations in North Sulawesi after two flooding and landslide events in 2022 and 2024.

On the upside, there are opportunities to mitigate these risks through targeted and urgent adaptation actions, and Indonesia is in a better position than some of its counterparts (e.g. China, Brazil, New Caledonia) to successfully take advantage of these. This is because:

- The country is already in a strong position in several key supply chains;⁵
- New infrastructure is still being developed, which creates opportunities to avoid embedded legacy issues and to ensure new developments are climate adapted;
- As an increasingly diversified and powerful economy, Indonesia has increasing capacity to implement the improvements required.

While not an exhaustive list, some adaptation solutions Indonesia might

consider include investments in cooling technologies and training to protect workers from extreme heat. Heavy rainfall impacts can be mitigated via early-warning flood systems, flood prevention infrastructure, dry-stack tailings management systems and forest restoration initiatives. In addition to these more technical solutions, investment and policy support for community-led initiatives, including regenerative agricultural projects, and community-based water monitoring can help to improve local resilience and strengthen social license in key mining areas.

Proactive climate adaptation actions can help to reduce vulnerability to the worst impacts of climate change, improving local stability, minimizing operational disruptions and ultimately increasing long-term market competitiveness.

How can TMP help?

TMP is philanthropically funded through 2026⁶ to radically improve intelligence about cumulative climate risks to critical mineral supply chains, while enabling key stakeholders (e.g. mining companies, investors, governments) to better prepare and address these risks. We are doing this by providing state-of-the-art climate risk information focused on the next 5-10 years, alongside analysis of the way these risks interact with existing social, economic, political and environmental conditions for a more comprehensive risk picture.



We are using our unique information edge to initiate convenings with key decision-makers⁷ in 15 countries⁸ that are important for global critical mineral supply chains – including Indonesia – with the aim of triggering urgent climate action in this important sector. TMP is a relatively small organization and so we are supported by some powerful partners to help achieve our ambitious aims, including the likes of Anglo American, British Geological Survey, Nikkei BP, University of Melbourne, Natural Resources Canada and others.

5 Indonesia accounts for 50% of global nickel supply (largest global producer), 7% of global cobalt (second largest producer), 5% of global bauxite (sixth largest producer) and 4% of global copper (seventh largest producer): <https://pubs.usgs.gov/periodicals/mcs2024/mcs2024.pdf>

6 This 3.5 year, non-profit initiative is funded by the Hewlett and Quadrature Climate Foundations.


7 We have co-hosted a larger event with [NikkeiBP](#) in Tokyo, attended by representatives from large Japanese companies like Honda, Nissan, Hitachi, Panasonic, Sumitomo Corp. and others, as well as a smaller workshop with the UK's leading security think tank, [RUSI](#), in London, with participants from the UK Cabinet Office, Ministry of Defence, Japanese Embassy, USA State Dept. and others.

8 These include Australia, Brazil, Canada, China, Chile, DRC, India, Indonesia, Japan, Peru, South Africa, South Korea, United Kingdom, United States, Zambia.

What next?

Thanks for taking the time to read through this brief. We are most interested in seeking partners and organizations interested in our data, our convenings, and/or discussions about a broad set of solutions we are working on to address some pressing issues in the sector. Briefly, these include:

- A de-risking mechanism for copper exploration, which seeks to identify and mitigate non-technical risks (e.g. social risks) during exploration and early stages of development to improve chances of project success and increase access to capital;
- A climate risk assessment tool, which will enable users (e.g. companies,



investors, governments) to input their own data for a simple climate risk assessment of a given location(s), to inform further decision-making.

- An open-access database for the minerals sector, which provides key asset-level information (e.g. name, commodity, location, production capacity, etc.) for mines and processing assets globally. The dataset will integrate useful ESG and climate risk information for further risk analysis and mitigation strategy development.

If you would like to learn more, or want to get involved, please contact justin.muhl@asktmp.com.