It never rains but it pours: Improving extreme-rainfall resilience in Australia's iron ore regions

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ABSTRACT

The expansive, open-cut iron-ore mines in Western Australia typically experience few days of rain per year, often amounting to less than 250mm. Unlike mines where rainfall is frequent, they may be less prepared for extreme rainfall events. Such events can cause erosion, flooding and sedimentation, altering drainage, wetting spoil and stock heaps and effecting slope stability. Such impacts may threaten personnel safety, infrastructure and production.

The CRATER ('Climate Related Adaptation from Terrain Evaluation Results') framework collates and interprets a mine's pre-existing data and semi-quantitative information to assess vulnerability to, and ultimately plan to avoid or minimise, flood-related risk to infrastructure, people, downtime, environment and revenue. Outputs assist decision makers to design investment strategies for minimising mining operations' vulnerability to climate.

Previously developed for smaller, wetter mines in Queensland's coal region, the outputs provide a hotspot map, fault tree analysis and an assessment of the mine's capacity to adapt. The multi-criteria evaluation (MCE) within a geographic information system (GIS), equally suits iron-ore mines' site-conditions (elevation, slope, drainage, soil and vegetation) to identify critical inundation areas. Hotspot results provide target zones for in-depth fault-tree analysis that, in turn, present a range of site-specific adaptation options.

Rainfall-intensity and the number of rain days since the 1970s have increased over central and eastern parts of the Pilbara Region. While tropical cyclones may become less frequent, they are projected to increase in intensity. Although some parts of the Hamersley Ranges receive more than 500mm per year, rainfall in the Pilbara is generally very low. Therefore, experience of the impacts of extreme rainfall events in the constantly changing topography of Western Australia's iron ore region may be sparse. Minimising potential effects can be proactively assisted using CRATER.

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