Bauxite Mining & Greenhouse Gas (GHG) Emissions

Part 2: Monitoring & reducing net emissions from forest clearing

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BACKGROUND

Since the late 1950s, around 36,000 ha of native forest (savanna woodland) near Weipa in northern Australia has been **cleared and burnt** to make way for bauxite mining. The **burning of around 8 million tonnes dry biomass** of valuable forest resources **has resulted in around 13.6 million tonnes of greenhouse gas (GHG) emissions**. Another **30,000 ha of forest or more will likely be cleared over the next 30 years** as bauxite mining expands in the region. Very little forest resources have been salvaged. Also, the mine rehabilitation around Weipa has not successfully restored the cleared native forest, missing opportunities to restore biogenic carbon cycles and store CO_2 in rehabilitation. Bauxite mining practices in the region need to change to reduce both waste and GHG emissions.

We propose alternatives to the current pre- and post-mining forest management practices. Instead of burning the biomass to waste, valuable timber products can be recovered and utilized to support local Indigenous community economic development (Figure 1). Mine rehabilitation can be improved to enhance its carbon storage and other ecosystem services and community benefits. **Here, we demonstrate the impact of these proposed 'better practice' scenarios if they had been adopted by industry from 1988 -2020.**

Figure 1. Forests cleared and burnt to make way for bauxite mining could instead provide timber products and economic development opportunities timber for local Indigenous communities.

METHOD (What we did)

We generated six alternative **Better Practice (BP)** scenarios, each adding an additional layer of improved practice upon the **Historic (H)** scenario. The H scenario simulates historic clearing, rehabilitation, and re-clearing patterns as observed by forest cover time series data. The scenarios were simulated using the FLINTpro software program.

The results of a forest inventory conducted within the mining lease area (Figure 2) were integrated as input parameters in the simulation.

Details of the H and BP scenarios are provided in the section at right (see the 'Better Practice' Scenarios section). The results of the BP scenarios can be compared directly with the H results and give insights into the potential impacts of future BP management decisions.

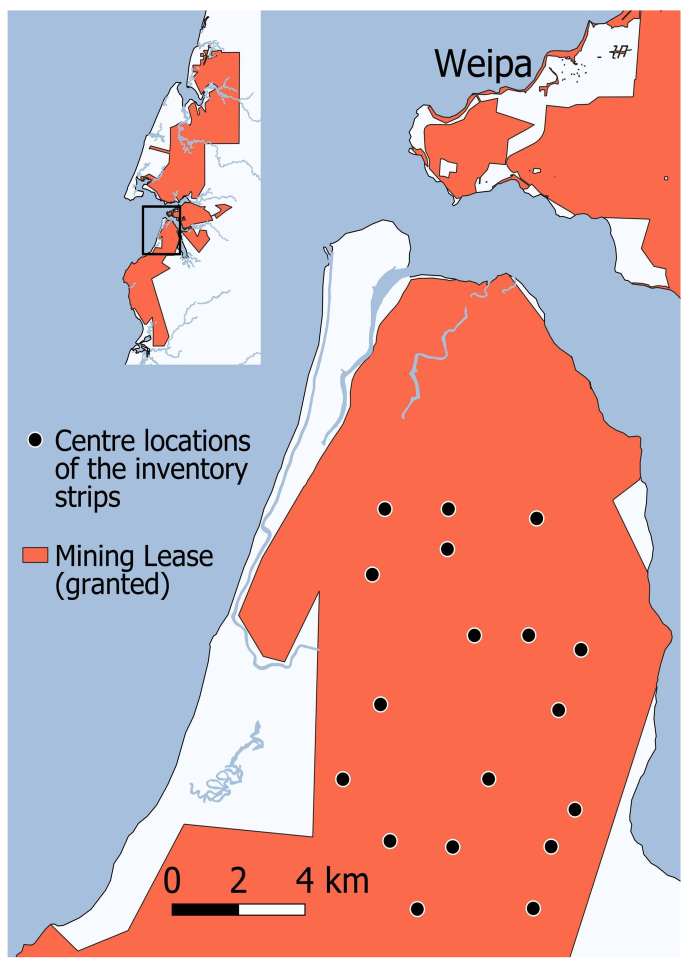


Figure 2. Locations of the forest inventory striplines. (Data Sources: State of Queensland 2020 for mining leases, and watercourse areas)

'BETTER PRACTICE' SCENARIOS

- **BP1** assumes no re-clearing of mine rehabilitation.
- BP1 + **BP2**: Mining sites not needed for infrastructure are also rehabilitated within 1-year after a clearing event.
- BP1 + BP2 + **BP3**: Sawlog and veneer quality forest products are salvaged before burning occurs.
- BP1 + BP2 + BP3 + **BP4**: All remaining forest residues (including chips logs and stumps) are also not burnt and are instead mulched and applied to reinstated topsoil to help improve the soil and mine rehabilitation.
- In addition to the above scenarios, **BP5.1** and **BP5.2** are two alternative mine rehabilitation scenarios assuming (5.1) diverse biocultural plantings without product recovery and (5.2) mixed native species timber plantations with timber product recovery.

KEY FINDINGS

- Compared to the H scenario, 1988-2020 **net emissions** (i.e., emissions minus sequestrations) **could have been reduced by 3.5 Mt CO2eq** (a reduction of roughly **35%**) by adopting the BP4 scenario (Figures 3 & 4).
- **Ceasing windrow and burn practices achieved the largest cut in GHG emissions** as it avoids CH_4 and N_2H emissions and a large proportion of the instant CO_2 emissions.
- The BP4 scenario (BP1+BP2+BP3+BP4, involving timber products recovery, and mulching/no burning of forest residues) resulted in the greatest reduction of GHG emissions (Figure 4).
- Opportunities to rehabilitate mining sites have been missed in the past (Figures 5), with implications for CO2 storage.

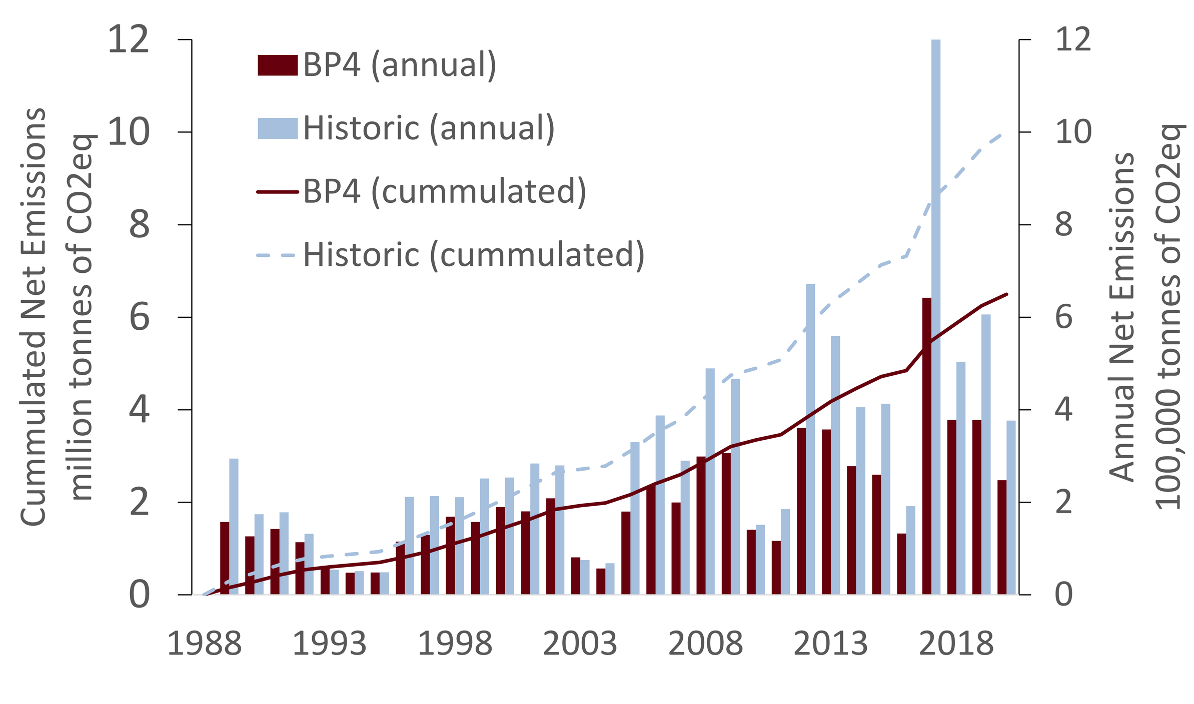


Figure 3. Comparing the BP4 scenario with the H scenario, with a focus on 1988-2020 net emissions (both annual and cumulated).

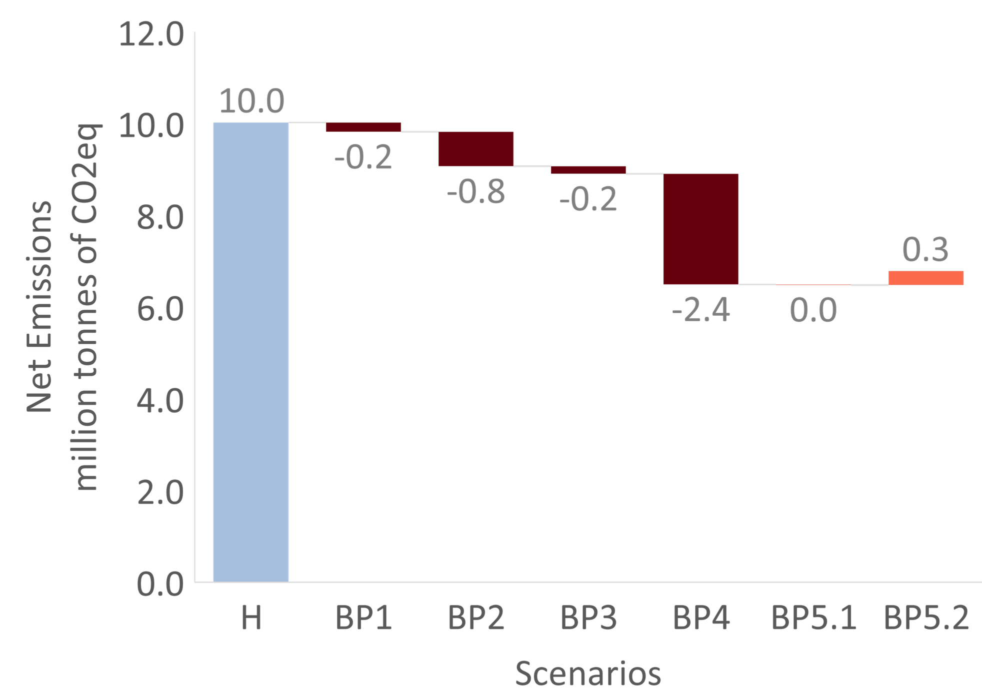
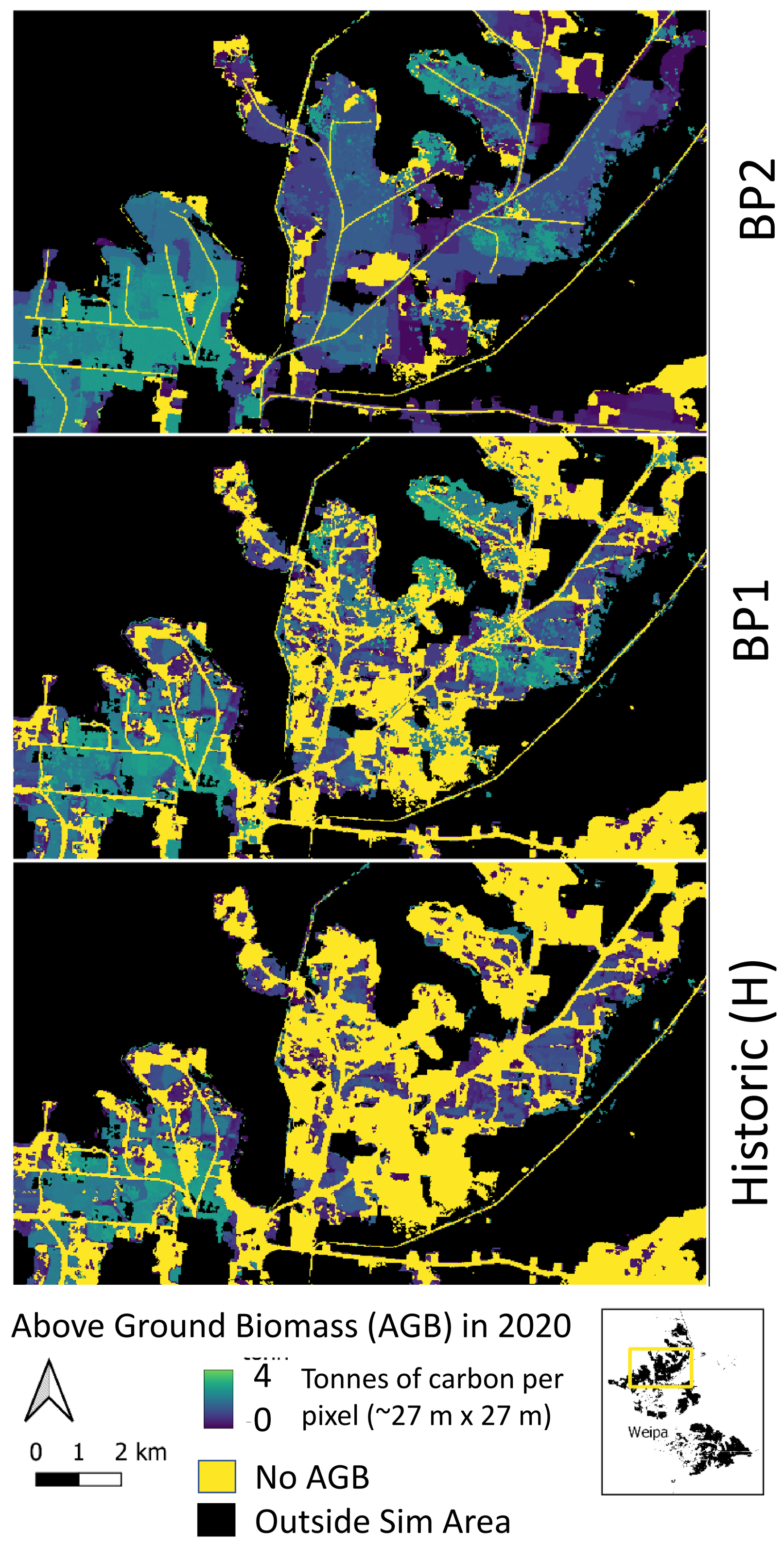


Figure 4. Comparing net emissions of the BP scenarios with the H scenario, with a focus on 1988-2020 net emissions.

Figure 5. Opportunities to rehabilitate mining sites have been missed in the past. This is evident in the images at right, showing the spatial distribution of Above Ground Biomass (AGB) on a section of the mining footprint in 2020 under the H scenario, compared to the BP1 & BP2 scenarios.



(Source FLINTpro 2022; based on DEE, 2021; OpenStreetMap contributors, 2021; State of Queensland, 2018, 2020various, and Geoscience Australia, 1997)

WHERE TO FROM HERE?

The study demonstrates how an operational GHG Monitoring, Reporting & Verifying (MRV) system can be used by mining companies and other industry stakeholders to transparently plan, evaluate, monitor, and report their forest related GHG emission reduction strategies and outcomes.

Mining companies should adopt the proposed BP scenarios. This will reduce the mining industry's carbon footprint while simultaneously generating socioeconomic benefits for impacted Indigenous communities.

Acknowledgements

This work was funded by UniSC through the '*Indigenous Employment, Forestry Livelihoods, Mining*' project and the Aluminium Stewardship Initiative. Simulations were conducted with the FLINTpro software and supported by FLINTpro. Special thanks to Dr Rob Waterworth and Mr Geoff Roberts at FLINTpro.