Mining Affects Rangeland Management and Integrity

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Coal seam gas wells crisscrossing farming land near Chinchilla.
(Photo: ABC News 16-12-2016)

Rangelands are a rich and often readily accessible source of minerals, coal and conventional and unconventional gas, and this has much potential for mining activities to impact the rangeland environment and farming of grazing animals. This gives rise to a conflict that is often an unequal contest because of the relative capital investment capacities of mining companies and grazing land resource managers. Mining always involves land disturbance of some nature, much of which is irreversible.

Mining often has a major impact on rangeland hydrology, often over a considerable area, e.g. increase in erosion propensity and fine-particle transport to streams and potentially the Great Barrier Reef; saline and acid water contaminant released inadvertently to the ground surface or to aquifers; and drainage of aquifers into voids created by the mining activity. This can impact on landholders' ability to conduct their enterprises effectively and sustainably. It can also affect the value of their land tenure through the environmental damage making the grazing enterprise less profitable.

The mining companies' efforts to gain access for exploration and production activities can lead to stress on families such that they feel forced to sell their land to the mining company in order to minimise the effects on family health. This is usually done with a nondisclosure confidentiality agreement regarding the conditions of the sale contract. Proximity to mining activity *per se* and having coal seam gas (CSG) wells on a property (or neighbouring property) reduce land valuations, affecting the ability to borrow money and driving down property land values towards a negative equity outcome. Mining company property 'buy-up' also affects the

fabric and health of rural communities (Haswell & Shearman, 2019).

It is difficult for mining companies to restore the land they have used to something approaching the original environmental values, and very few cases of land restorations have been signed off by government as successful. The Queensland legislation on mined land rehabilitation partially addresses this for new activities through financial provisioning, but appropriate risk assessment based on the precautionary principle and local community engagement is needed to ensure that the mining occurs with least impact on the environment and that rehabilitation occurs satisfactorily, e.g. such that voids are filled in and not left. Some existing voids perform a useful role in pumped hydro production of electricity. The legislation around mining does not address industry insurance to ensure that landholders are adequately covered for impacts of mining. Landholders themselves are unable to obtain such insurance, e.g. against soil and water contamination by CSG mining and loss of aquifer (well) water. This affects land valuations, investment and future land use. (Governments themselves often require sureties from mining companies for environmental damage, but are these adequate?)

Mining uses large amounts of water, and this is often competitive with other land-water uses. Aquifer drawdown is a major issue because of the long time taken for recharge, and it affects lateral flow of water into streams and springs. Much of the rangeland water accessed for mining processes is from the Great Artesian Basin, and interconnectivity of aquifers within the Basin is an issue affecting available water quantity and quality, particularly in the Channel Country. Fracking for unconventional gas (shale and CSG) water requirements, estimated in the USA to be between 42 and 90 million litres per shale gas well (Ingraffea, A. R., Cornell University, pers. comm.; Kondash et al., 2018), places a large burden on water resources in Australia (and road resources, as this water may be trucked in). The CSG industry in Queensland is now extracting 60,000 megalitres of produced water per year, and the way this is used, along with the disposal of the salt produced (by reverse osmosis remediation of produced water to enable disposal to waterways or agricultural/environmental use), is very controversial and not yet settled. This water is a public good but is not managed as such (Monckton, 2019). The aquifer 'make-good' agreements in land access contracts between mining companies and landholders do not ensure restoration of the loss of aquifer water, only a monetary compensation, or a new bore – maybe into another aquifer if available. The number of bore drawdowns from CSG mining is increasing, with significant impact on 571 water bores predicted for the Surat Basin (Office of Groundwater Impact Assessment, 2019).

Mining-related seismic events are a more regular occurrence than usually acknowledged and are another risk for aquifer integrity, with the faults opened up allowing water and the contained contaminants to move between aquifers (e.g. Concerned Health Professionals of NY, 2019).

Mining company vehicle movement poses a very large risk to biosecurity and particularly the spread of weeds such as parthenium (Bajwa et al., 2018; https://www.abc.net.au/news/rural/2014-02-10/csg-weeds/5249638?site=southqld). CSG mining companies have moved onto properties to establish pipelines without washdown, and this causes landholders considerable distress. Washdown of vehicles is required but not policed/monitored, and facilities are often not available or do not provide adequate cleaning (Khan et al., 2018).

Fugitive emissions are not adequately measured on a continuing basis, and usually baseline measures are not taken before mining starts. Such fugitive emissions contain not only greenhouse gases with a drastic feedback effect on weather events (drought, severe rainfall intensity and flooding), but also volatile organic compounds (VOCs) which can affect human and animal health as the Linc Energy underground gasification case illustrated (see also Haswell & Shearman, 2019).

An aspect of unconventional gas extraction is the potential for blow-outs. Capping wells with cement concrete may not cut out fugitive emissions as concrete shrinks, and bentonite is currently being assessed as an alternative. The concrete lining of the metal tube in the well also can allow fugitive emissions to flow through an inadequate sealing against the rock wall. In the USA, research published by the EPA and other organisations showed that aquifer contamination and fugitive emissions occur with fracking for shale gas extraction.

Agro-economic modelling by the CSIRO of the effects of CSG mining in Queensland's rangelands showed that losses of up to 10.9% of agricultural revenue could occur (Marinoni & Garcia, 2016).

Conclusion

Mining for minerals (especially coal) and unconventional gas can alienate large areas of good-quality agricultural land and deplete and contaminate water resources used in farming and by natural ecosystems. Mining can also introduce weeds into ecosystems. Fugitive emissions of greenhouse gases resulting from mining are considerable, contributing to climate change which is affecting land condition. Mining is a short-term land-use phase and rarely is mined land rehabilitated to re-establish the original land condition and ecosystem function. Dealing with mining companies over land access and competition for labour is often a very stressful process for landholders, impacting on their health with considerable flow-on costs to the community. Mining changes the dynamics of rural community socioeconomic systems.

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Author Profile

Peter Dart, School of Agriculture and Food Sciences, University of Queensland, is concerned about the loss of good-quality agricultural land to mining and the associated detrimental effects on the environment, particularly on soil quality, hydrology and fugitive emission effects on air quality and climate change.