



Dr Melanie Blanchette (left) and Associate Professor Mark Lund (right)

Mine Closure: enhancing the prospects for future generations

Australia is a resource-rich nation, with mining still very much an economic contributor, but with mining comes the issue of environmental and social responsibility; how can miners effectively rehabilitate mine pit lakes that can form in old open cut operations, to minimise a potential intergenerational legacy?

At closure, the public expects mined land to be returned to the condition it was in before the project commenced, however with open cut pits this is very difficult. Regulatory responses to this issue have been largely around prevention, requiring backfill to prevent a lake forming. This is problematic due to the cost of backfill, the availability of material and losing access to any resource that remains in the pit. Miners can and do rehabilitate the lands disturbed by mining, but for pit lakes the main difficulty is defining the target for rehabilitation.

ECU's Mine Water and Environment Research (MiWER) Centre was formed in 2007 as a result of ECU's involvement in the State Government Centre of Excellence for Sustainable Mine Lakes. Associate Professor Mark Lund, current principal and co-founder of MiWER, has been researching the long-term legacy of pit lakes to develop strategies that can be used to reduce those legacies.

Research from Germany had previously suggested that the only viable technique for remediating acidic waters common to pit lakes was ongoing neutralisation using lime. This approach is expensive and requires ongoing commitment from those managing the lake. ECU's research challenged this notion, investigating ways of treating the extreme consequences of acid mine drainage in pit lakes at remote sites in cost-effective ways.

Diversion of acidic mine water into a sewage treatment pond at a mine in Queensland was a valuable demonstration that sewage could treat acidic pit lake water. MiWER followed that with a full-scale one-off treatment of a pit lake within the Collinsville Coal Project with sewage which was able to restore pH to 4 in a substantial part of the lake despite the negative effects of inflowing acidity from the catchment during two cyclones. The success of that work was used as partial justification to renew the Coal Industry Research Program. This project later won the Ergon Energy Environmental Innovation Award.

Investigating the opportunities that pit lakes could offer communities, MiWER has been working on understanding the ecology of pit lakes in Collie, Western Australia. The team conducted a number of surveys examining water quality and biota within the lakes.

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MiWER is currently concluding a study that investigates in detail the impacts of a closure strategy that involves diverting the Collie River through Lake Kepwari (a former coal pit lake). Data from this research has led to the development of a new model for pit lake closure. The research has provided the mining industry and particularly the coal industry with new, economical strategies to deal with pit lakes that have extreme water qualities. Premier Coal has used some of these strategies by planting vegetation in a filling pit lake below the eventual waterline to stimulate biological activity. Experiments identified that nutrients, specifically carbon, were the most important factor for pit lake ecosystem development.

Dr Melanie Blanchette, MiWER Research Fellow, has further developed river sampling techniques from the river diversion sampling, particularly using microbes, forming the basis of a new project in the Hunter Valley, NSW. This project aims to challenge current approaches to establishing the targets for successful mine closure, providing better environmental outcomes and more guidance for industry.

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More Information:
www.miwer.org