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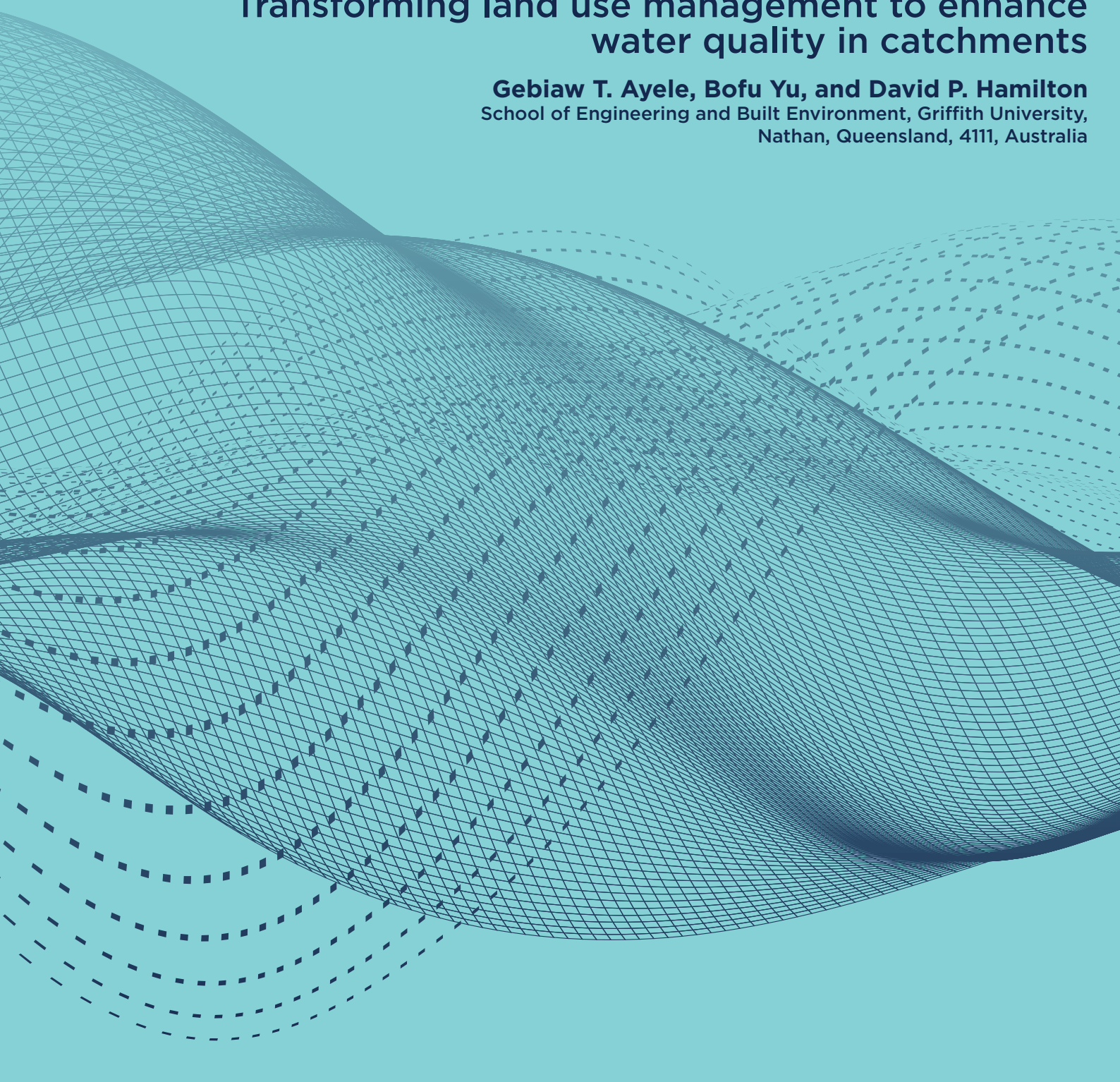

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ABSTRACT

Transforming land use in catchments to protect water resources and reduce nutrient pollution.

Imagine a world where changes in land use can effectively mitigate nutrient pollution, improve water quality, and secure sustainable water resources. A groundbreaking PhD study has explored the impacts of afforestation in a small temperate catchment, demonstrating its potential to enhance water quality while addressing environmental challenges.

The primary goal of the study was to assess the effectiveness of land use change (LUC), particularly afforestation, in reducing nutrient loads and managing water quality in the Lake Ōkareka catchment, North Island of New Zealand. Using a cutting-edge combination of statistical analysis and numerical modelling, this research provides valuable insights into the hydrological and nutrient impacts of afforestation.

WHAT DOES THIS MEAN FOR WATER MANAGEMENT?

The study shows that planting trees can significantly improve water quality and reduce water flow. In a 384-hectare catchment, where 57 hectares were converted into forest, afforestation resulted in a 7.2% decrease in annual water flow, a 13.1% reduction in nitrogen load, and a 33.3% decrease in phosphorus load. These changes demonstrate how altering land use can help protect vulnerable waterways from nutrient pollution, providing a sustainable and effective way to improve water quality and support healthier ecosystems.

One of the most innovative aspects of this research is its ability to combine field data with numerical modelling to predict the long-term outcomes of afforestation. By integrating these methods, policymakers and water managers are equipped with reliable tools to guide sustainable land management. Additionally, the research demonstrates how afforestation reduces reliance on downstream chemical treatments and fosters natural nutrient attenuation. By adopting such practices, catchments can be transitioned to a circular, self-sustaining ecosystem, aligning with broader sustainability goals.

THE FUTURE OF CATCHMENT MANAGEMENT

The ultimate aim of this research was to inform decision-making for water quality management, empowering stakeholders to adopt LUC as a viable strategy for achieving water quality targets. By prioritising afforestation and similar practices, sustainable water use is promoted, and the footprint of intensive land uses can be better mitigated.

This study validates the transformative potential of land use management in enhancing water quality. It provides a robust framework for policymakers, industries, and environmental agencies to address pressing water challenges of nutrient and sediment pollution of receiving waters.

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