

NCCARF PhD Travel Grant Report

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In June of 2012 I used the NCCARF PhD travel grant to undertake an extended visit to Belo Horizonte, Brazil to collaborate with Dr. Britaldo Soares-Filho at the Universidade Federal de Minas Gerais. Dr. Soares-Filho is a world leader in the field of landscape ecology and land use modeling; collaborating with him and his lab was an extremely rewarding experience. Together, we calibrated and validated a land use change model that could both quantify the impacts of land use change occurring within our Brazilian case study site and simulate future scenarios of change based on Brazil's developing climate change policies.

Major findings

The major finding was that the implementation of climate change mitigation policies could have impacts on land use system dynamics that extend beyond their intended management goals. In our study site, the *Quadrilátero Ferrífero*, Minas Gerais, mitigation policies have been developed to create financial incentives to aid land users to transition their land to Eucalyptus plantations for bio-charcoal production. In Brazil, bio-charcoal is increasingly used as a substitute for mineral coal in the conversion of iron ore to steel as it reduces the GHG that are emitted throughout the steel production life cycle. Over the past 20 years, the culmination of a booming mining industry, a new bio-charcoal market and decreasing profitability in the grazing sector has resulted in an exponential expansion of Eucalyptus plantations in this region. In addition to producing biofuels, however, Eucalyptus plantations also have other impacts on terrestrial biodiversity and regional land users. In our specific case, these impacts included the displacement of local livelihoods and an increase in regional deforestation. Our modelling results suggested that if policies are developed and employed without an understanding of these

impacts, their management goals may not be achieved.

Major outcomes

A major outcome of the collaboration was establishing a close working relationship with Dr. Soares-Filho and his lab. As both parties considered the collaboration extremely successful, I have since been invited to return to Brazil in the following year to further develop our work together.

While in Brazil we wrote and submitted a manuscript on the land use change dynamics within the study region and the use of current environmental management policies to conserve the region's fragmented Atlantic Forests. This paper has been accepted for presentation at the 2013 Brazilian Remote Sensing Symposium.

Three other manuscripts have also been drafted. The first is a literature review on the current status of land change science. This paper will be presented at the upcoming Association of American Geographer's annual meeting in 2013. The second is an analysis of how land use tradeoffs emerge as a result of environmental management decisions at the regional scale. The third is about quantifying the future impacts of Eucalyptus expansion on regional land use dynamics as a result of developing climate change mitigation incentives.

Significance to adapting and protecting Australia's terrestrial biodiversity

The main lesson learnt from the case study in Brazil was that climate change management policies must be developed with an understanding of regional land use dynamics. This holds true for an Australian context. If policies and management strategies are developed independent of their regional context, implementation may lead to unforeseen and often adverse tradeoffs with other management goals.

Future research suggestions

Designing climate change mitigation policies that incorporate multiple management goals and avoid negative tradeoffs is an essential goal of environmental management. To do this, future research should focus on understanding how landscapes respond to proposed policy alternatives. Developing regional to nation-wide land use change models can be useful tools in undertaking such a task as they provide a simulation tool for investigating possible future pathways under different policy scenarios.

Acknowledgements

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