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Forest conservation, wood production intensification and leakage: An Australian case

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ABSTRACT

Over recent decades significant areas of Australia's publicly-owned natural forest have been reallocated from production forest to conservation forest. During the same period, a range of policies have supported the development of plantation forests. This case study analyses whether the intended conservation outcomes of Australian forest policy have been undermined by conservation loss in other natural forests. Our analysis shows that the conservation of additional natural forests in Australia over the 18 years to 2014 has not resulted in the degree of leakage that previous studies have predicted. The analysis shows that the increasing supply of low cost plantation wood has led to substitution away from wood produced from natural forests. The experience of Australian forest policy confirms the principle of land-sparing, in which large areas of natural forest with low wood productivity can be conserved by intensifying wood production from smaller areas of highly productive plantation.

1. Introduction

It is intuitively compelling to design policies that seek to conserve forest ecosystems by creating areas of natural forest that are reserved or protected from wood production in order to maintain or increase their non-wood values.[1] However, wood harvesting is a mobile economic activity, and attempts to conserve forests through restrictions on production in one area can have the effect of shifting that activity elsewhere. This can negate the conservation benefits of forest protection, potentially offsetting the conservation achieved by the original restriction on production. This phenomenon of inadvertently shifting impacts elsewhere is a policy problem referred to variously as 'leakage', 'slippage' or 'displacement'. Understanding and managing leakage is critical to the success of policy designed to conserve natural forest.[2]

The area of the world's forests legally conserved for non-wood ecosystem services is increasing. Globally, the area of forests in protected areas increased from 266 to 360 million ha between 1990 and 2010 (FAO, 2010; p. 61). In Australia the reported area of natural forest in formal conservation reserves grew from 17.6 million hectares in 1997 (SOFR, 1998) to 21.5 million hectares in 2013 (SOFR, 2013). The net area of public natural forest allocated for wood production in Australia declined by 45% over the period 1996–97 to 2011–12 from 10 to 5. 5 million hectares (SOFR, 2013; p. 125).

Wood production from Australia's natural forest declined 56%, from 9.6 million m^3 in 1996–97 to just under 4.2 million m^3 in 2013–14. Over the same period wood production from plantations doubled, from 10.5 million m^3 to 21.1 million m^3, due to policies implemented to increase the area of plantation in Australia. There were two phases of plantation expansion; a federal loan scheme to state governments for the development of softwood plantations from 1965 until the end of the 1980s, which was followed by the National Forest Policy of 1995 which included a vision for a threefold increase in plantation area by 2020. The 1995 policy

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[1] This paper uses the term forest conservation to capture the maintenance of forests in a condition that supports the capacity of forests to maintain and enhance the delivery of non-wood values. These include biodiversity and other ecosystem services such as water supply, climate mitigation, carbon storage and cultural values, that can potentially benefit from an absence or reduction in wood production activity.

[2] The Australian literature refers to 'native forests', which has the same meaning as the more widely used international term 'natural forest'. The latter is used in this paper. While there is a spectrum of forest conditions between natural and plantation recognised at an international level (e.g. Carle and Holmgren, 2003), Australian forests fall nearer to the two ends of the spectrum with clear distinctions between natural forest and plantations. In Australia natural forests are those of indigenous species that became established through natural regeneration or regeneration methods intended to mimic natural regeneration processes. Plantations in Australia are generally intensively managed monocultures of purpose selected tree species (either indigenous or exotic).

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was supported by a favorable federal government tax treatment, Managed Investment Schemes (MIS), which supported the establishment of (mainly) hardwood plantations (Ferguson, 2014).

These policy drivers are consistent with the pattern of change in global trends of wood production to more intensive planted sources (e.g. Jürgensen et al., 2014; Warman, 2014). This shift is driven by factors such as ongoing improvements in wood use efficiency limiting growth in demand for raw wood (Ajani, 2011a; Meil et al., 2007), improvements in tree growing productivity in plantations, as well as declining wood production from natural forest (Shearman et al., 2012; White et al., 2006), and increasing pressure for extensive natural forest to deliver non wood ecosystem services (Millennium Ecosystem Assessment, 2005).

The 1995 revision of Australia's National Forest Policy Statement led to the implementation of a series of regionally-based forest policy initiatives known as Regional Forest Agreements (RFAs) (Dargavel, 1998; Kirkpatrick, 1998; Lane, 1999). While the RFAs were focused on a relatively small area of Australia located in south-east and south-west Australia (Clancy and Howell, 2013; p. 5), they covered almost all of Australia's commercial natural forest wood producing regions. The overarching policy objective of the RFAs was to resolve conflict surrounding the use of natural forest that had been intensifying since the 1970's (Clancy and Howell, 2013; Lane, 1999). The RFAs sought to optimally allocate public natural forest to conservation or wood production. A clear outcome of the policy was an increase in the area of public natural forest allocated to conservation reserves based on a technocratic analysis of their economic, social and environmental value.

Subsequently, it has been asked if the direct gains in conservation have been offset by displacing wood production to other forests in Australia or around the world (Institute of Foresters of Australia, 2011; Whittle et al., 2012). The risk of leakage is a globally recognised phenomenon (Lambin and Meyfroidt, 2011; Pfaff and Walker, 2010), and has been used to caution against unilateral conservation action by governments (Gan and McCarl, 2007). We seek empirical evidence for these concerns in this paper. Australia's RFAs provide an ideal opportunity to analyse the phenomenon of leakage, and to examine the conditions under which public policy decisions to conserve natural forest are likely to be effective.

2. Background

Over the last fifteen years there has been considerable literature written on leakage in greenhouse gas emissions from forest carbon storage, avoided deforestation and avoided forest degradation (for example see recent literature reviews, Atmadja and Verchot, 2012; Henders and Ostwald, 2012). The risk of leakage is also a well-recognised device of reactionary rhetoric used to argue against governments adopting first-mover status across a broad range of policy reforms (Davidson, 2008). Concern over leakage and a need to measure greenhouse gas emissions in ways that are consistent and efficient has led to the development of life cycle assessment, and related international standards (Guinée, 2002). As reviewed below, there is less literature on the displacement of wood production arising from conserving forests (Chomitz and Buys, 2007; Gan and McCarl, 2007; Meyfroidt and Lambin, 2009). Measuring and incorporating leakage into forest conservation projects is technically challenging (Aukland et al., 2003; Rapidel et al., 2011) and research to improve methods is ongoing (Atmadja and Verchot, 2012).

2.1. Leakage: a typology

The process of quantifying leakage is an attempt to account for impacts that are unintended and potentially external to the sphere of influence/concern of decision makers (Fig. 1). The use of the term 'leakage' makes this accidental nature of the phenomenon clear. Leakage can occur as a consequence of bounded rationality (Simon, 1972) or as a form of externality to the policy maker's jurisdiction or sphere of interest. Leakage assessment aims to quantify the impacts of an intervention beyond those explicitly understood and accounted for. It reflects recognition that the sphere of influence (or concern) for most policy interventions is a bounded or limited subset of the overall social and ecological systems involved (Wunder, 2008). Limited knowledge of social and ecological systems or limited concern with externalities means that any planned intervention can result in positive or negative leakage—unintended outcomes that can either reinforce or negate intended outcomes. Because of this, assessments of leakage provide essential feedback for monitoring and reviewing policy design.

Leakage assessment involves comparing the net outcomes following an intervention, with a scenario in which there is no intervention—a counterfactual. Assessments can be conducted *ex ante* to predict leakage, or *ex post* to review leakage following a policy intervention. The former approach requires modeling of both the counterfactual and intervention scenarios, while *ex post* assessment can use data from the intervention scenario and compare this to a counterfactual.

A proliferation of terminologies and typologies accompany the growing field of leakage assessment, with potential for confusion (Aukland et al., 2003). A distinction has been made between weak leakage — general displacement of demand — and strong leakage — the direct unintended consequences of a policy intervention (Henders and Ostwald, 2014). The former tends to focus on shifts

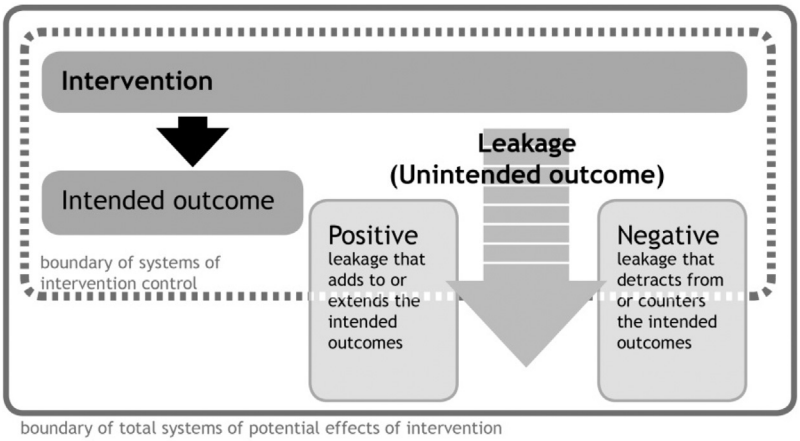

Fig. 1. Basic model of leakage and its relationship to intended outcomes.