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Exploring trade-offs between development and conservation outcomes in Northern Cambodia

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ABSTRACT

Trade-offs between different land use outcomes are inevitable to meet both development and conservation agendas, especially in developing countries where aspirations for development take place within the world's most biodiversity-rich areas. Reports at the national or subnational levels about how trade-offs between conservation and development outcomes materialise once implemented are limited and regionalized analyses are required to understand how they materialise spatially once policies are executed. We take the case study of northern Cambodia, where both protected areas (PAs), as a conservation policy, and Economic Land Concessions (ELCs), as a developmental agricultural intensification strategy, have been implemented. We explore the influences on placement of ELCs and the extent to which they overlap with protected areas, using mixed effect models. We then determine the predictors of deforestation in the study area between 2008 and 2013, including presence of ELCs and PAs. ELC placement does not respond to expected socio-environmental factors related to implementation criteria in policy documents, and is not influenced by the presence of PAs. ELCs represent the most significant driver of deforestation of the factors considered. PAs limit deforestation but only if well-managed. This failure to achieve the balanced trade-off between conservation and development outcomes which policies intend points to development impacts compromising environmental sustainability in the long-run.

1. Introduction

Land as a global resource has become the focus of intensified demands from a variety of users over the past decades (Lambin and Meyfroidt, 2011). In an industrialising and globalized world, reconciling land use policies to achieve aspirations for economic development, food production and biodiversity protection is a tricky task (Tscharntke et al., 2012). Several studies now emphasize that trade-offs between different land uses are inevitable to meet both development and conservation agendas (Cardinale et al., 2012; Halpern et al., 2013; McShane et al., 2011). This is especially the case for developing countries, which are expected to support the bulk of development pressures from now until 2050, but which also host most biodiversity-rich areas of the planet (Balmford et al., 2002; Baudron and Giller 2014; Phalan et al., 2013). Notwithstanding the challenge of designing adequate development policies, governments must also devise appropriately matching conservation strategies.

Land use change and deforestation follow complex dynamics, with agriculture as a central feature. More than half of the new agricultural land across the tropics was carved out from intact forests between 1980 and 2000 (Gibbs et al., 2010). This trend continued into the new millennium, with conversion of forests to agricultural plantations being considered the main cause of forest loss since 2000 (DeFries et al., 2010; Gibbs et al., 2010; Stibig et al., 2014). The increased competition for finite land resources entails trade-offs between preserving biodiversity and meeting food demand, yet several configurations exists for the integration of both agricultural and environmental aims (Balmford et al., 2012). Two contrasting alternatives are land sharing, which integrates both objectives on the same land, or land sparing, which separates high yield farming zones from conserved high biodiversity areas (Phalan et al., 2011b). Over the years, several studies have pointed to the over-simplicity of the land sharing/sparing discourse, arguing land use planning should consider combinations of sharing and sparing strategies in order to address the integrated challenges related to land scarcity, food security and land governance (Fischer et al., 2014; Grau et al., 2013; Tscharntke et al., 2012).

Nonetheless, agricultural intensification has been adopted by several countries across the tropics as a policy for reducing pressure on forest from extensive farming over the past decades (Phelps et al., 2013; Green et al., 2005). Proponents argued the strategy can satisfy

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agricultural demand and growth in the face of rising population (Angelsen 2010; Phalan et al., 2011a; Shively and Pagiola 2004; Ziegler et al., 2012). Intensification also offers potential reductions in carbon emissions from deforestation, but also from mitigation when reduced farmland areas can be actively restored into natural habitats (Green et al., 2005). In theory, agricultural intensification aims to maximize synergies between development and conservation; increasing national yields and reducing carbon emissions by transitioning from smallholder slash-and-burn agriculture to larger-scale commercial agriculture, increasing employment for local labour, and facilitating investment in already degraded areas rather than new unconverted areas (Foley et al., 2004; Foley et al., 2011; Lambin and Meyfroidt 2011b; Tilman et al., 2011).

The potential economic benefits of agro-industrial projects are huge, yet major concerns have arose around the poor adaptation to local conditions of certain preferred plantation crops such as rubber, and the economically volatile and unsustainable conditions this creates for the future livelihoods of local farmers (Ahrends et al., 2015; Gironde and Peeters 2015). The opportunity cost of these investments represent a passive disinvestment in financing development and better access to markets for small land holders, and a failure to deliver poverty reduction in rural communities (De Schutter 2011; Sperfeldt et al., 2012; Vrieze and Naren 2012). Critiques of agro-industrial plantations additionally point to the lack of standardized sustainability assessments of the plantation projects, the displacements which often result from the corporate takeover of local community land, and lack of power that communities have over such decisions (Feintrenie, 2014; Gerber, 2011; McCarthy and Zen, 2010). Recent research has further highlighted that large-scale agro-industrial conversion can drastically alter landscape soil and hydrological functions by clearing high-biodiversity value land for single species plantation (Fox et al., 2014; Ziegler et al., 2009).

Reports at the national or subnational levels about how trade-offs between conservation and development interventions materialise once implemented are limited, but point to the influence of a multiplicity of local geographical and historical contexts (Ferraro and Hanauer 2010; Pender et al., 2004; Gurney et al., 2014). These include land conversion drivers such as illegal logging, infrastructure construction, large-scale agricultural plantations, smallholder clearance by farmers and by resettlements (Stibig et al., 2014; Baird 2014a; Lambrick et al., 2014; Michinaka et al., 2013). The nature of specific attributes related to agro-industrial development policy in Cambodia including soil fertility, accessibility and population density, are also key in determining trade-offs between different land uses (Peeters 2015). Hence regionalized analyses are required to better understand how land use trade-offs materialise spatially once policies are executed (Geist and Lambin 2002; Rudel et al., 2009).

Here we explore influences on the spatial placement of large-scale agro-industrial development interventions, their outcomes in terms of deforestation rates, and the extent to which development interventions trade off against conservation goals. While the overlap between development and conservation interventions can be observed in several developing countries, Cambodia presents an interesting case study for the analysis of the impacts of trade-offs between development and conservation on land cover change in a context of growing and industrialising economy. The Cambodian context reflects similar situations in developing countries where large-scale land acquisitions have been taken place on a background of weak governance and insecure customary tenure rights (Clements et al., 2010; Sekiguchi and Hatsukano, 2013). Yet overlaps between ELCs and other land uses such as small-scale agriculture and different levels of conservation activities highlight the importance of a regional-scale analysis using accurate data (Milne and Mahanty 2015; Messerli et al., 2015; Edelman, 2013).

2. Background

2.1. Development and conservation policy in Cambodia

Both conservation and development are stated as priorities of the Royal Government of Cambodia (RGC)'s long-term development 'Rectangular Strategy' and the related National Strategic Development Plans (NSDP, 2014). The Cambodian protected area network, designed in 1993, includes 23 protected areas covering 3.3 million hectares, or 18.3% of Cambodia's total area (MRC, 2003). In 2010, forests covered about 55% of the country, representing a substantial source of its natural wealth and contribution to local livelihoods (USAID, 2012). Political commitments to biodiversity conversation in Cambodia have been sustained in recent years, with policy objectives of the country's forest cover reaching 59% of its total area by 2013. Despite these statements, Cambodia recorded the world's fifth highest national deforestation rate between 2000 and 2012, with a 7% loss of its official forest cover during that period (Hansen et al., 2013). Deforestation proves additionally tricky to identify under large scale land conversions to plantations such as rubber, which has similar spectral characteristics compared to natural tropical forest and can change seasonally (Dong et al., 2013; Li and Fox, 2011). Moreover, the RGC's official forest classification which considers mature plantations as forest, including plantations such as rubber, oil palm, teak, acacia and eucalyptus in which trees are higher than five meters, covering at least 0.5 ha and with a canopy of more than 10% (RGC, 2010).

In parallel, Cambodia has also seen rapid economic progress, registering annual GDP growth of almost 10% per year between 1998 and 2008, along with an average annual population growth rate of 1.7% between 2000 and 2013 (World Bank 2011; World Bank 2013). More specifically, the RGC has increased the number of Economic Land Concessions (ELCs) being granted per year over the past decade. While Cambodia had already started granting land to private companies for investment in plantations and large-scale agriculture in the 1990s, ELCs as a process for agro-industrial development became formalized through the 2001 Cambodia Land Law and the subsequent Sub-decree n°146 (RGC, 2001; RGC, 2005). According to RGC's strategic policy documents, ELCs respond to the national impetus for economic development by boosting agricultural production and generating work for local communities (Arias et al., 2012; MAFF, 2015; Phelps et al., 2013).

Cambodia recognizes five categories of land tenure; privately owned land, state-owned public land, state-owned private land, common property, and indigenous land. State land, both public and private, accounts for 75–80% of Cambodia's total land area (GTZ, 2006; Thiel, 2009; USAID, 2011a). State-owned private land can be leased, granted as a concession or held in usufruct. In turn, state-owned public land is classified as land that contains property of 'natural origin' which carries a public interest use and which may not be sold or transferred. For example, state-owned public land includes land designated under the protected area network (Bolin 2013).

The 2001 Land Law and sub-decree n°146 on ELCs outlines the criteria against which proposed ELC projects must be evaluated (Article 5). First, the law requires ELCs to be located in state-owned private land, which is considered to be 'free' or 'non-use' land. This is in contrast with state-owned public land under which protected areas are designed (MAFF, 2015; NSDP, 2014; RGC, 2005). ELCs must primarily generate state revenues and increase agricultural production. Additionally, they must: create local employment to diversify livelihoods in rural areas; promote living standards of the people and avoid or minimize adverse social impacts; and perpetuate environmental protection and natural resource management (Article 5).

Lastly, sub-decree n°146′s Article 4 also mentions that comprehensive environmental protection provisions must be development within the concession management plan. Towards this, proposed ELCs must by law complete an environmental and social impact assessment and develop a sustainable land use plan, both of which have to be put to public