ELSEVIER
www.elsevier.com/locate/worlddev

World Development Vol. xx, pp. xxx–xxx, 2014

0305-750X/$ - see front matter

http://dx.doi.org/10.1016/j.worlddev.2014.03.008

Impacts of Protected Areas on Local Livelihoods in Cambodia

TOM CLEMENTS
Wildlife Conservation Society, Bronx, USA
University of Cambridge, UK
Imperial College London, Ascot, UK

SENG SUON
Center for Development Oriented Research in Agriculture and Livelihood Systems (CENTDOR), Phnom Penh, Cambodia

DAVID S. WILKIE
Wildlife Conservation Society, Bronx, USA

and

E.J. MILNER-GULLAND *
Imperial College London, Ascot, UK

Summary. — Impact evaluation methods (mixed effects models and matching) were used to investigate the effect of protected areas (PAs) on poverty and livelihoods in Cambodia, comparing households inside PAs with bordering villages and controls. There was no evidence that PAs exacerbated local poverty or reduce agricultural harvests in comparison with controls. Households bordering the PAs were significantly better off due to greater access to markets and services. Non-timber forest product (NTFP) collectors inside PAs were significantly better off than controls and had greater rice harvests, because they had more secure access to land and forest resources. The PAs in Cambodia therefore have some positive impacts on households that use forest and land resources for their livelihoods.

Key words — Southeast Asia, conservation, impact evaluation, matching non-timber forest products

1. INTRODUCTION

The impacts of protected areas on local poverty—both negative and potentially positive—have been widely debated (Adams & Hutton, 2007; Roe, 2008). Although the global benefits of biodiversity and ecosystem services are well recognized (Balmford *et al.*, 2002; TEEB, 2010), the costs of protected areas (PAs) may be disproportionately borne by local people (Adams & Hutton, 2007; Cernea & Schmidt-Soltau, 2006; West, Igoe, & Brockington, 2006). Debates have focused on whether the environmental goals of protected areas are compatible with poverty alleviation goals, especially in developing countries (Adams *et al.*, 2004). There is now widespread acceptance that conservation policy should, at the very least, do no harm, and where possible should contribute to poverty alleviation (CBD, 2008). Accurate understanding in policy choices is limited by the paucity of information that exists regarding the impacts of current interventions on local poverty (Agrawal & Redford, 2006). For example, high poverty rates have been documented around PAs, but very few studies have attempted to quantify whether this is due to the PA or other factors (Andam, Ferraro, Sims, Healy, & Holland, 2010; Naughton-Treves, Alix-Garcia, & Chapman, 2011; Sims, 2010). The need to better understand the relationship between forest conservation policies and local poverty and the lack of information on impacts has led to repeated calls for the adoption of rigorous impact evaluation methods (Ferraro & Pattanayak, 2006; Pattanayak, Wunder, & Ferraro, 2010; Wilkie, Morelli, Demmer, Starkey, Telfer, & Steil, 2006). Measuring impacts is also necessary during implementation to ensure that interventions do not negatively affect local people (Schreckenberg *et al.*, 2010).

Whether PAs benefit or impose costs on local people depends upon the underlying relationship between local poverty and forest resource use (Angelsen & Wunder, 2003), external drivers, the rules and regulations imposed by the PA and the extent to which these are implemented. The forest-poverty relationship is dynamic and may be different for different groups of people, implying that social impact assessment needs to consider who gains or loses, and when. Forest resources may contribute to local livelihoods through: (*1*) a needs-driven forest reliance, whereby local poor people depend on low-value forest resources to some extent for their livelihoods,

* We would like to thank the village authorities and people in Preah Vihear for taking the time to engage in the research, the field survey teams from CENTDOR for their hard work and dedication and two anonymous referees, as well as Arild Angelsen, Brian Belcher, and Sven Wunder for editorial comments. This research was made possible by the generous support of the American people through the United States Agency for International Development (USAID), under the terms of the TransLinks Cooperative Agreement No. EPP-A-00-06-00014-00 to WCS, ESRC/DFID research grant number ES/J018155/1 to WCS, a Miriam Rothschild scholarship to T.J.C. from the University of Cambridge and a Royal Society Wolfson Research Merit award to E.J.M.G.

Please cite this article in press as: Clements, T. *et al.* Impacts of Protected Areas on Local Livelihoods in Cambodia, *World Development* (2014), http://dx.doi.org/10.1016/j.worlddev.2014.03.008

perhaps in response to shocks ("safety nets"), or (*2*) because they are unable to make the transition out of this resource-dependent mode ("poverty traps"); and (*3*) an opportunity-driven forest reliance, whereby local people use higher-value forest resources as a source of cash products in order to get richer ("pathways out of poverty," Angelsen & Wunder, 2003; Ruiz-Pérez *et al.*, 2004). PA interventions can forcibly influence these relationships by either placing restrictions on forest resource use (Coad, Campbell, Miles, & Humphries, 2008), displacing and resettling people (Brockington & Igoe, 2006), or increasing costs due to wildlife conflicts (Woodroffe, Thirgood, & Rabinowitz, 2005). Alternatively, interventions may encourage and promote local forest resources use, for example through improved marketing or safeguarding access rights, exclusion of outsiders creating local monopolies, and may provide alternative pathways out of poverty through employment and business opportunities (Coad *et al.*, 2008; Scherl *et al.*, 2004; Wunder, 2001).

Rigorous impact evaluation survey designs can be used to untangle the impacts of forest conservation policies from the wider dynamics of the system, by assessing the degree to which changes in poverty can be attributed to policy interventions as opposed to other factors (Ferraro, 2009). Standard approaches use randomized control trials with policy interventions assigned randomly to intervention and control sites in order to eliminate other sources of bias. However placement of forest conservation interventions, such as PAs, is usually non-random (Joppa & Pfaff, 2010a). In these cases, quasi-experimental survey designs such as matching can be used to control for other sources of bias by ensuring that intervention and control groups are comparable in all aspects except that the control groups have not received the intervention (Ferraro & Pattanayak, 2006; Ravallion, 2006; Rosenbaum & Rubin, 1983).

A second methodological problem in social impact assessment concerns how to define and measure poverty in order to assess trends (Ravallion, 2003). Poverty is a multi-faceted concept incorporating social, political, cultural, institutional, and environmental dimensions (McGregor, 2007; Scoones, 1998; Sen, 1999), which can be measured in several aspects: incidence, intensity, inequality, temporality, and spatiality (Agrawal & Redford, 2006). Standard approaches include household consumption and income surveys usually with multiple visits to the same households over the sampling period (Angelsen, Larsen, Lund, Smith-Hall, & Wunder, 2011; Wilkie *et al.*, 2006). These detailed methods can be expensive and time-consuming, and may neglect other non-economic dimensions of poverty. If measuring the impact of environment and development interventions is to become common practice there is a need to develop accurate and cost-effective methods that capture multiple dimensions of poverty and are appropriate for widespread use (Schreckenberg *et al.*, 2010).

This paper uses matching and regression estimators to evaluate the impact of two PAs on the livelihoods of local people in Preah Vihear province, Cambodia. Both PAs contained established villages, and have been the focus of a long-term PA management and development program since 2005. (Clements, John, Nielsen, An, Tan, & Milner-Gulland, 2010). The objective of this study was to investigate impacts due to the PAs since their establishment. It also established a baseline against which the subsequent implementation of three Payments for Environmental Services schemes, which were initiated in 2008, could be evaluated. The principal research questions addressed in this paper are: (*1*) what factors affect household poverty status and agricultural productivity; (2) what has been the overall impact of the PAs on local poverty and agricultural productivity in comparison with bordering villages and controls; and (*3*) have the PAs had different impacts on different types of livelihood strategies in comparison with controls.

2. IMPACT EVALUATION FRAMEWORK

(a) *Background to the study site*

Cambodian PA boundaries were drawn in the 1990s and early 2000s, based primarily upon habitat types, historical records, and very limited fieldwork, due to ongoing conflicts at that time. In general they are located in remote forested areas of Cambodia, where road access is poor and local poverty is higher than the national average (World Bank, 2009). Most PAs contain established villages since the location of settlements was not known when the PA boundaries were drawn, and these villages were not resettled. The impact evaluation focused on the core Management Zones of two PAs—the 1,811 km^2 of Kulen Promtep Wildlife Sanctuary (KPWS) and 1,776 km^2 of Preah Vihear Protected Forest (PVPF)—in Preah Vihear province (Supplemental materials, Figure S1). KPWS was declared in 1993 as part of the Nature Protected Area network managed by the Ministry of Environment, and PVPF in 2002 as a Protected Forest managed by the Forestry Administration of the Ministry of Agriculture, Forestry and Fisheries. Fifteen villages were located inside KPWS and PVPF, the majority of which had existed since at least the 1960s, although there was considerable disruption in the 1970–90s, due to the civil war and forced resettlement by the Khmer Rouge. Resettled people subsequently returned to their original villages from the 1990s onward. Local people are primarily subsistence farmers, practicing either rain-fed paddy rice cultivation or shifting cultivation, and are dependent upon forest resources as a crucial safety net and for cash income (McKenney & Prom, 2002; McKenney, Yim, Prom, & Evans, 2004). One of the most important sources of cash income is the sale of liquid resins from dipterocarp trees, which makes up 16–23% of household income, with resin-tapping households earning $100–$340/year (Evans, Hout, Phet, & Hang, 2002; McKenney *et al.*, 2004).

Gazettment of the PAs protected those areas from development pressures (such as forestry and agro-industrial concessions). However both PAs remained essentially paper parks until the start of a long-term PA management capacity-building in 2004–05, which provided authorities funding of around $2/ha for the management zones, which is broadly comparable to the budget for other PAs in developing countries (Bruner, Gullison, & Balmford, 2004). PA authorities were charged with enforcement of Cambodian Law, under which local uses of natural resources are legal inside PAs, although land clearance, cutting of timber for sale, and wildlife trade are illegal. Villages were permitted to expand agriculture to a limited extent within agreed land-use plan boundaries, and in-migration by outsiders was prevented. In addition, community development interventions since 2005 included local livelihood assistance, helping villages to gain official status and formalize land-use plans. The impact evaluation took place in 2008, 4 years after the PA management activities were initiated.

(b) *Village and household matching methods*

Matching methods were used to select appropriate controls for households and villages inside KPWS and PVPF against which to measure the impacts of PA management. A nested survey design was used, with two levels of matching: (*1*)

Please cite this article in press as: Clements, T. *et al.* Impacts of Protected Areas on Local Livelihoods in Cambodia, *World Development* (2014), http://dx.doi.org/10.1016/j.worlddev.2014.03.008