ENVIRONMENTAL SCIENCE & POLICY 14 (2011) 697–708

available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/envsci

Wildlife conservation and reduced emissions from deforestation in a case study of Nantu National Park, Sulawesi

1. The effectiveness of forest protection—many measures, one goal

Ewan A. Macdonald [a,c,*], *Murray Collins* [b,c], *Paul J. Johnson* [c], *Lynn M. Clayton* [c], *Yadvinder Malhi* [a], *Joshua B. Fisher* [a], *E.J. Milner-Gulland* [b], *David W. Macdonald* [c]

[a] *Environmental Change Institute, School of Geography and the Environment, Oxford University Centre for the Environment, South Parks Road, Oxford, OX1 3QY, United Kingdom*

[b] *Department of Life Sciences, Imperial College London, Silwood Park Campus, Buckhurst Road, Ascot, Berkshire, SL5 7PY, United Kingdom*

[c] *Wildlife Conservation Research Unit, Department of Zoology, University of Oxford, The Recanati-Kaplan Centre, House, Abingdon Road, Tubney, Abingdon, OX13 5QL, United Kingdom*

ARTICLE INFO

Published on line 3 April 2011

Keywords:
Protected area
Sulawesi
REDD
Wildlife conservation
Measures of success

ABSTRACT

Discussions on how to reduce carbon emissions from deforestation and degradation have prompted scrutiny of methods for measuring rates of forest loss, as well as discussion of the role of protected area (PA) status in reducing tropical deforestation. This study employs a range of techniques including GIS analyses and local stakeholder interviews to examine the effectiveness of three comparable PAs in Sulawesi, Indonesia in preventing deforestation over a 16-year period. Our analyses demonstrate that all three of the protected areas have proved effective at conferring forest protection to some extent, after controlling for other factors that influence deforestation rates. However Nantu Nature Reserve, the only recipient of broad-based conservation investment, proved to be substantially more effective than the PAs without international investment. In contrast with the recent hopes for integrating conservation with development, interviews with local stakeholders revealed that despite community development projects, the primary contributor to conservation had been the presence of a team of armed park guards. Despite the potentially divisive nature of this situation the villagers recognised the benefits of the forest and looked forward to a time when protectionism might be less necessary and instead villagers would be motivated primarily by the benefits rather than the costs of conservation. The use of remotely sensed data to evaluate conservation effectiveness in this data-poor region has challenges, but we demonstrate that, with the addition of contextualising data from locally based social surveys, it is possible both to quantify the additionality of individual PAs in preventing deforestation, after controlling for other factors, and to understand the reasons behind this success. This type of study will become increasingly necessary as REDD (reducing emissions from deforestation and degradation) implementation progresses.

* *Corresponding author at*: Environmental Change Institute, School of Geography and the Environment, Oxford University Centre for the Environment, South Parks Road, Oxford, OX1 3QY, United Kingdom.
E-mail address: ewan.macdonald@ouce.ox.ac.uk (E.A. Macdonald).

1462-9011/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.envsci.2011.03.001

1. Introduction

Tropical forest conservation programmes are difficult to fund and implement and their efficacy is hard to evaluate. There is interest in funding forest conservation to provide climate services, for example through reduced emissions from deforestation and degradation (REDD; Kremen et al., 2000; Ebeling and Yasué, 2008; Collins et al., 2011). It is yet to be decided how REDD will be implemented, but under potential proposals for a payments for ecosystem services (PES) like approach, payments to service providers would be contingent on demonstrable service provision (Wunder, 2007). Transparent, verifiable demonstration of conservation outcomes has often been neglected or imprecise (Ferraro and Pattanayak, 2006), with few convincing examples (Walker et al., 2008; Linkie et al., 2010; Andam et al., 2008). This is partly because the task of demonstrating success is difficult and available methods are unrefined (Ferraro and Pattanayak, 2006; McDonald-Madden et al., 2009). However, funds are scarce, so it is essential to demonstrate to those investing in conservation that an intervention is effective.

No single metric covers all facets of conservation performance (McDonald-Madden et al., 2009), and inflexible adherence to any one metric is likely to risk short-sighted judgments (Mace et al., 2007). Nonetheless, when a project's original objectives are explicit, success can be measured against these. Stem et al. (2005) review methodologies for evaluating project success. Detailed case-by-case assessments probe important strengths and weakness of a project, acknowledging realities on the ground.

The problems of evaluating and quantifying success apply to any conservation project. However, some cases offer more scope than most for disentangling the relevant factors. Here, we evaluate the conservation success of the Nantu Nature Reserve (Nantu) in Gorontalo, Indonesia; a particularly revealing case study for six reasons. First, the general and specific purposes of this protected area (PA) are clear: to protect pristine rainforest and, within it, an emblematic, endemic large mammal – the Babirusa (*Babyrousa celebensis*; Clayton and Macdonald, 1999). Second, the threats to these purposes are well defined, with Nantu suffering from hunting, illegal logging and agricultural encroachment (Clayton et al., 1997; Clayton et al., 2000). Third, Nantu has an unusually well documented conservation intervention and investment history. Fourth, there are two other parks nearby, with similar habitat and protected area status, but which have either not benefitted from international funding (Panua Nature Reserve gazetted in 1984) or not to the same extent (Bogani-Nani Wartabone National Park gazetted in 1991); comparing them provides a quasi-experiment to reveal the effectiveness of the investment in Nantu. Fifth, diverse conservation interventions have been undertaken at Nantu enabling evaluation of the efficacy of each. Sixth, conservation success at Nantu provides a test case for evaluating the applicability of REDD to protected forests. Therefore, Nantu offers an unusual opportunity (a) to evaluate the effectiveness of forest protection, and various approaches to it (the topic of this paper) and (b) to set this evaluation in the context of payments for ecosystem services such as REDD (see sister paper, Collins et al., 2011).

Here, we investigate the conservation actions taken at Nantu, asking:

(a) Has Nantu been successful at providing additional forest conservation in comparison with two nearby protected areas?
(b) Which of the conservation interventions at Nantu contribute most to project success, in the eyes of local stakeholders?

In particular, we address two issues vital to the potential for REDD; how best to measure additionality regionally (that conservation actions have provided additional benefits compared to a business as usual scenario), and which local-level mechanisms most effectively promote forest conservation. This leads into our linked analysis of the institutional feasibility of operating a REDD scheme in Nantu (Collins et al., 2011).

1.1. *Study site*

Nantu is located in the Paguyaman forest of Gorontalo Province, northern Sulawesi (0°46′N 120°16′E) (Fig. 1). Sulawesi belongs to the Wallacea 'conservation hotspot'; 57% of mammal and 40% of bird species are endemic (CI, 2010). Nantu was gazetted as a 31,215 ha nature reserve in 1999 and expanded to 52,000 ha in 2004 by the Gorontalonese govern-

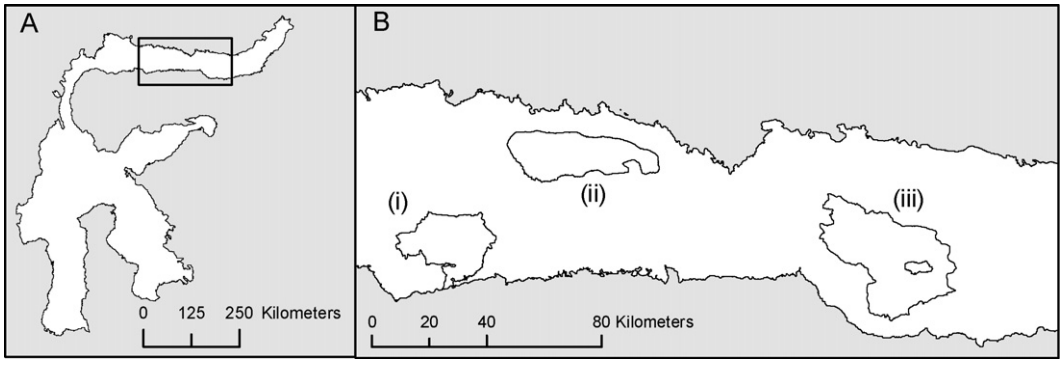

Fig. 1 – Map of the study area showing Sulawesi and the locations of the protected areas. The PAs are: (i) Panua Nature Reserve, (ii) Nantu Nature Reserve and (iii) Bogani Nani Wartabone National Park.