Land Use Policy 75 (2018) 340–351

Contents lists available at ScienceDirect

Land Use Policy

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

Land-use trade-offs in the Kapuas peat forest, Central Kalimantan, Indonesia

Aritta Suwarno[a,*], Lars Hein[a], Hans-Peter Weikard[b], Meine van Noordwijk[c,e], Bayu Nugroho[d]

[a] Environmental Systems Analysis Group, Wageningen University, The Netherlands
[b] Environmental Economics and Natural Resources Group, Wageningen University, The Netherlands
[c] World Agroforestry Centre (ICRAF), South East Asia Program, Bogor, Indonesia
[d] Kapuas Protected Forest Management Unit, Indonesia
[e] Plant Production Systems, Wageningen University, The Netherlands

ARTICLE INFO

Keywords:
Ecosystem services
Land-use
Ecosystem management
Peat forest ecosystems
Forest management unit
Central Kalimantan

ABSTRACT

Forest ecosystems provide benefits to people locally and globally. Sustainable management of forest resources is required to ensure continued supply of these benefits, but complex social-ecological processes are often a constraint to the design of such forest management strategies. In this study, we developed a model of adaptive forest zonation to facilitate forest ecosystem management. We employed the ecosystem services concept and a land-use change model to identify potential areas for conservation and for economic use in the Kapuas Protected Forest Management Unit in Indonesia. Local people actively participated in this study to jointly define management zones and stakeholders' associated rights and responsibilities. Our results show that a stakeholder agreement facilitated the reduction of threats to forest ecosystems and increased local awareness of the need for forest ecosystem conservation. Compared to current forest zonation, we show that the availability of an economic development zone in adaptive forest zonation could potentially increase ecosystem benefits for local communities by about 40% through rattan and jelutong collection and agroforestry rubber and jelutong production. Although our results are specific for the Kapuas District, the methodology of adaptive forest zonation can be applied more generally. We recommend our methods be included in guidelines for zonation and management plans to help improve sustainable forest management practices of all forest management units in Indonesia.

1. Introduction

The Ecosystem Services (ES) concept has been used for framing the relationship between human well-being and ecosystems in the context of ecosystem management since the last few decades (Turner et al., 2003; Millenium Ecosystem Assessment, 2005; Balmford et al., 2010; UN et al., 2014). Integrating ecosystem services into ecosystem management requires consideration of the broader economic, social and political context. In this context, stakeholder participation is important in order to understand local and regional perceptions and interests in ecosystem management (Stringer et al., 2006; Reed, 2008; Seppelt et al., 2011; Luyet et al., 2012).

In order to effectively conserve forest ecosystems, sustainable forest management must secure local livelihoods for forest-dependent communities (Pagiola et al., 2002; Kroeger and Casey, 2007; LaRocco and Deal, 2011; Deal et al., 2012). The integration of the ES concept in sustainable forest management can thus be used to understand the benefits forest communities and other stakeholders receive under different forest management regimes (Deal et al., 2012; Quine et al., 2013). However, forest ecosystems generally provide a broad range of ES involving multiple stakeholders from local to global. The application of the ES concept for ecosystem management is challenging due to a lack of quantitative information on flows of ES and the value different stakeholders place on them (Hein et al., 2006, Deal et al., 2012; Quine et al., 2009).

The evolution of sustainable forest management practices in Indonesia has seen the introduction of Forest Management Units (FMUs) through Government Regulation No 6/2007. The concept of FMUs has its origins in the Forestry Law of 1967 but earlier attempts at achieving sustainable forest management through forest utilisation and conservation programmes failed (FORCLIME Forest and Climate Change Programme, 2011; Setyarso et al., 2014). The FMUs' task is to ensure that economic, environmental and social functions are sustainably implemented in forest management, as stipulated in Law No. 41/1999 on forestry, and Government Regulation No. 44/2004 on forest planning. The regulation governing the establishment of FMU areas was then strengthened through the Ministry of Forestry Regulation No. P.6/Menhut-II/2009. Meanwhile, the criteria, standards and procedures for

* Corresponding author at: Environmental System Analysis Group, Wageningen University, PO Box 47, 6700 AA, Wageningen, The Netherlands.
E-mail address: aritta.suwarno@wur.nl (A. Suwarno).

https://doi.org/10.1016/j.landusepol.2018.03.015
Received 3 February 2017; Received in revised form 2 February 2018; Accepted 6 March 2018
0264-8377/ © 2018 Elsevier Ltd. All rights reserved.

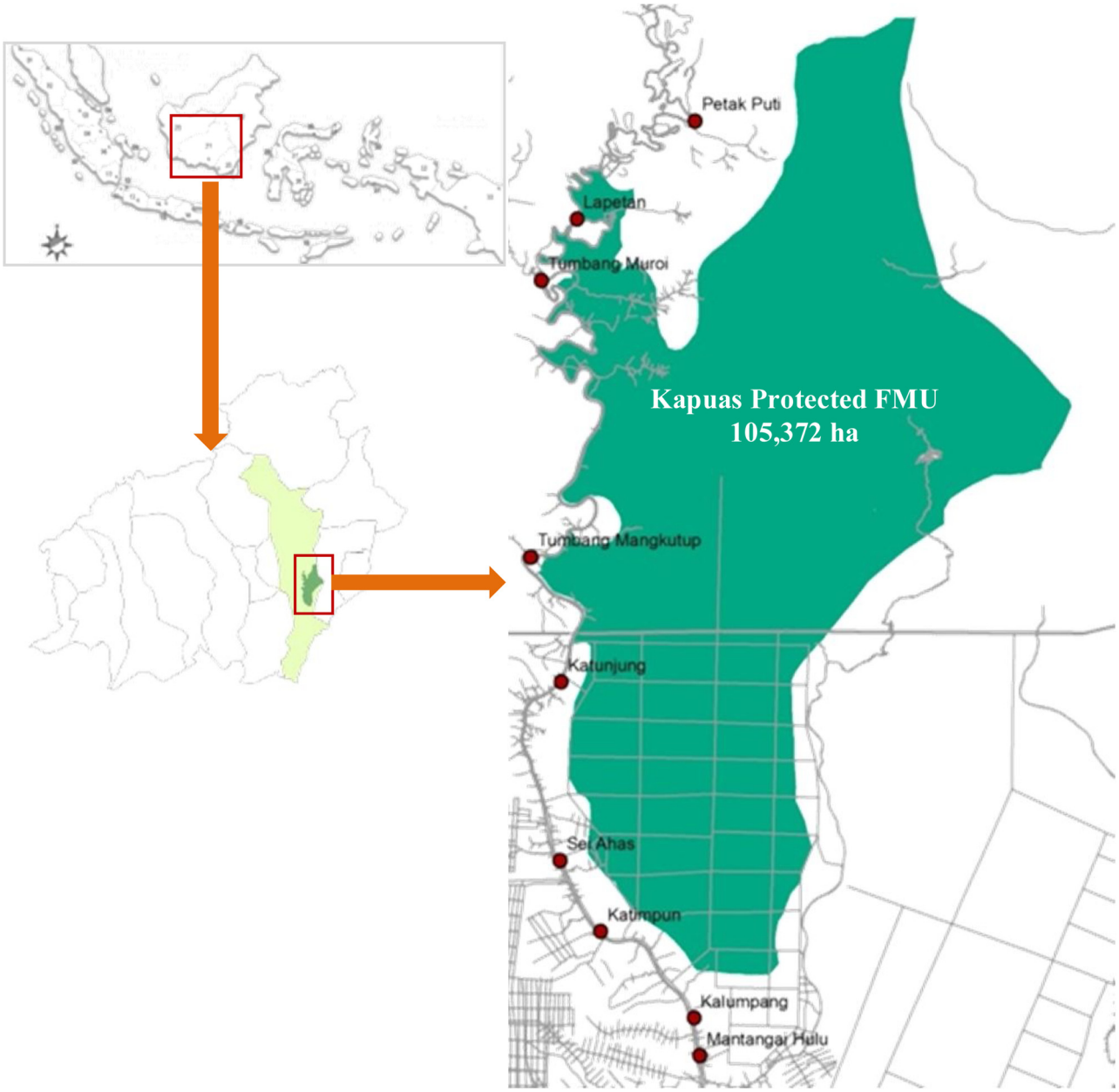


Fig. 1. The Kapuas Protected FMU area and neighbouring villages.
Source: Kapuas Protected FMU.

developing the management plans for FMUs are governed by the Ministry of Forestry Regulation No. P.6/Menhut-II/2010 and strengthened by the Ministry of Forestry Regulations No. P.47/Menhut-II/2013 and No. P.46/Menhut-II/2013. FMUs are required to develop FMUs as per the Ministry of Forestry Regulation No. 47/Menhut-II/2013 However, to date, FMUs have not explicitly considered ES in the formulation of forest management plans.

The objective of this study was to test how the ES framework in combination with land use modelling can be used to enhance forest management in an FMU, and develop a replicable method for doing so. In particular, we developed and analysed adaptive forest zonation, as the foundation of the forest management plan for Kapuas Protection FMU, in Kapuas District, Central Kalimantan. The FMU is for the largest part located in a peatland area. Reconciling local use and conservation is a challenge in peat forests where drainage-dependent land uses increase fire risk (Taufik et al., 2017). Adaptive forest zonation is a novel approach, which involves the identification of specific zones for different forest uses to meet the interests of different stakeholders. In our case study, these zones have been identified on the basis of both a quantitative analysis of ES flows under different types of management in combination with extensive stakeholder workshops with local forest users. We employed the LUCES model described in Suwarno and Suyamto (2014), Suwarno (2016) and Suwarno et al. (2016b) to identify potential future land-use change resulting from the current forest governance system. Next, potential areas to be allocated to conservation and economic development zones were identified and delineated based on a combination of potential land-use change and biophysical criteria in sustainable forest management. Subsequently, a participatory process was conducted to discuss the zonation draft with the local communities and revise it to meet the agreement between the communities and the management of Kapuas Protected FMU. Finally, to assess ES delivery of two management plans (scenarios) for this particular area, we calculated and analysed the potential benefits from ES that the communities and management of Kapuas Protected FMU would

دریافت فوری ← متن کامل مقاله

ISIArticles
مرجع مقالات تخصصی ایران

✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
✓ امکان دانلود نسخه ترجمه شده مقالات
✓ پذیرش سفارش ترجمه تخصصی
✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
✓ دانلود فوری مقاله پس از پرداخت آنلاین
✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات