

ANALYSIS

# Economic valuation of the Leuser National Park on Sumatra, Indonesia

Pieter J.H. van Beukering<sup>a,\*</sup>, Herman S.J. Cesar<sup>a</sup>, Marco A. Janssen<sup>b</sup>

<sup>a</sup> *Institute for Environmental Studies, Vrije Universiteit, Boelelaan 1115, Amsterdam 1081 HV, The Netherlands*

<sup>b</sup> *Center for the Study of Institutions, Population and Environmental Change, Indiana University, 408 N. Indiana, Bloomington, IN 47408, USA*

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## Abstract

The Leuser Ecosystem in Northern Sumatra is officially protected by its status as an Indonesian national park. Nevertheless, it remains under severe threat of deforestation. Rainforest destruction has already caused a decline in ecological functions and services. Besides, it is affecting numerous economic activities in and around the Leuser National Park. The objectives of this study are twofold: firstly, to determine the total economic value (TEV) of the Leuser Ecosystem through a systems dynamic model. And secondly, to evaluate the economic consequences of deforestation versus conservation, disaggregating the economic value for the main stakeholders and regions involved. Using a dynamic simulation model, economic valuation is applied to evaluate the TEV of the Leuser National Park over the period 2000–2030. Three scenarios are considered: ‘conservation’, ‘deforestation’ and ‘selective use’. The results are presented in terms of (1) the type of benefits, (2) the allocation of these benefits among stakeholders, and (3) the regional distribution of benefits. The economic benefits considered include: water supply, fisheries, flood and drought prevention, agriculture and plantations, hydro-electricity, tourism, biodiversity, carbon sequestration, fire prevention, non-timber forest products, and timber. The stakeholders include: local community members, the local government, the logging and plantation industry, the national government, and the international community. The regions considered cover the 11 districts involved in the management of the Leuser Ecosystem. With a 4% discount rate, the accumulated TEV for the ecosystem over the 30-year period is: US \$7.0 billion under the ‘deforestation scenario’, US \$9.5 billion under the ‘conservation scenario’ and US \$9.1 billion under the ‘selective utilisation scenario’. The main contributors in the conservation and selective use scenarios are water supply, flood prevention, tourism and agriculture. Timber revenues play an important role in the deforestation scenario. Compared to deforestation, conservation of the Leuser Ecosystem benefits all categories of stakeholders, except for the elite logging and plantation industry.

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## 1. Introduction

The Leuser Ecosystem in Northern Sumatra (Indonesia) covers 25,000 km<sup>2</sup> and consists of a

\* Corresponding author. Tel.: +31-20-4449-524; fax: +31-20-4449-553.

E-mail address: [beukering@ivm.vu.nl](mailto:beukering@ivm.vu.nl) (P.J.H. van Beukering).



Fig. 1. The boundaries of the pilot analysis.

national park and a buffer zone (Fig. 1). Deforestation in this ecosystem is widespread, despite its formally protected status (van Schaik et al., 2001). This is believed to have severe ecological consequences, such as the probable local extinction of the Sumatran orangutan, rhinoceros, tiger and elephant. In addition, the local economy could become structurally damaged as crucial ecological functions of the rainforest decline. Consequent damage caused by floods, erosion and loss of water supply can greatly exceed the revenues derived from timber extraction and land conversion.

The objectives of this study are to determine the total economic value (TEV) of the Leuser Ecosystem and evaluate the consequences of deforestation. A dynamic simulation model is applied to

evaluate the TEV of the Park over the period 2000–2030. The originality of this study lies in the dynamic link exposed between ecological functions and their related economic values. In addition this study provides a breakdown of impacts on different stakeholder groups and geographic units.<sup>1</sup>

To determine both the complex systems dynamics of tropical rainforests and the stakeholder elements, the authors have closely collaborated with social and ecological experts working in

<sup>1</sup> Pet-Soede et al. (1999) presents one of the few economic valuation studies per stakeholder for blast fishing in Indonesia based on a much simpler systems model. Bockstael et al. (1995) present an economic valuation of ecosystems using a sophisticated systems dynamics but they did not consider stakeholder aspects.

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