



*Strengthening local capacity
in the economic analysis
of environmental issues*

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries (i.e., Cambodia, China, Indonesia, Lao PDR, Malaysia, Myanmar, Papua New Guinea, the Philippines, Thailand, and Vietnam.) It aims to strengthen local capacity for the economic analysis of environmental issues so that researchers can provide sound advice to policy makers.

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Valuing the Benefits of Forest Conservation: A Study from Southern Thailand

Like many developing countries, Thailand faces the challenge of deforestation and the loss of biodiversity that this brings. One of the driving forces behind deforestation is the fact that forests are often seen as providing free benefits to society; hence, they are often overlooked in the decision-making process and so become susceptible to development pressures.

To help overcome this challenge, an EEPSEA study looked at the economic and social values of the threatened Kho Hong Hill (KHH) forest area, which is close to Hat Yai City in southern Thailand. It also assessed the economic benefits of three different forest management options for the KHH forest.

The research is the work of a team led by Saowalak Roongtawanreongsri from Prince of Songkhla University (PSU). This team found that forest management through reforestation could yield higher social and economic benefits than simply preserving KHH's existing forest areas, although this would inevitably involve higher management costs than the straight preservation option. The study therefore recommends a number of legislative steps and incentive programs that should be put in place to drive reforestation in KHH.



A summary of EEPSEA Research Report No. 2014-RR11: 'Economic Benefits of Management Options for Kho Hong Hill, South Thailand' by Saowalak Roongtawanreongsri, Prakart Sawangchote, Sara Bumrungsri and Chaisri Suksaroj. Comments should be sent to Saowalak Roongtawanreongsri, Environmental Economics Research Unit, Faculty of Environmental Management, Prince of Songkla University, Thailand. Tel: +66 81 9590879, 66 74 286845. Email: saowalakroong@hotmail.com

Kho Hong Hill forest area

KHH is the last standing forest close to Hat Yai City, the famous urbanized area on the east coast of lower south Thailand. It provides ecosystem services to the 157,682 residents of Hat Yai Municipality and to the 67,892 people who live within 3 km of the forest’s border. Previous studies have shown that the KHH forest is still fertile and that its primary forest areas are still intact.

However, almost 40% of the KHH forest is lost. Its degradation is due to population increase, deforestation, illegal encroachment, the conversion of forest into rubber farms or agricultural lands, and the construction of buildings. Because of this, the ecosystem services that the forest provides are compromised. The impacts of deforestation in KHH include loss of landscape value, desertification, floods, drought, loss of wildlife, and landslides. This makes deforestation in KHH a critical concern.

The benefits and services that are provided by KHH’s ecosystem are recognized amongst PSU biologists. The intact forest serves as a provider of oxygen. It also sequesters carbon dioxide, and serves as a source of water for downstream communities. Moreover, the forest is home to many wild animals and plants—some of which are endangered (such as the Slow Loris). It is also a temporary home for other important species such as the plain-pouched Hornbill.

Recognizing the importance of the forest and the gravity of the deforestation problem it faces, the PSU academic community initiated the “Help Conserve Kho Hong Hill” initiative to protect and conserve KHH forest areas. This project highlights the fact that, since KHH is one of the last intact urban forests in Songkhla province, it must be conserved and restored to



Deforested site at Kho Hong Hill

preserve its ecological integrity and to promote the well-being of the people in Hat Yai City and in nearby communities.

Valuing the KHH forest’s ecosystem services

To help drive this conservation process, this study set out to determine the value of KHH’s ecosystem services and to compare the net economic benefits of three management options for the KHH forest. Six ecosystem services were selected for evaluation, namely: a) the provision of timber, b) carbon dioxide sequestration, c) oxygen generation, d) water supply, e) flood control, and f) biodiversity.

A variety of valuation techniques were used to estimate the ecosystem services provided by the KHH forest. Specifically, market valuation was used to estimate the forest’s value as a water supply source as well as its value in providing timber, sequestering carbon dioxide, generating oxygen, and controlling flood. The values for water supply and flood control were calculated through simulation models; costs from floods included the value of damaged properties and household items, foregone income, the cost of illnesses and the cost of rehabilitation after the

floods. Finally, the value transfer approach was used to determine the value of the biodiversity in the KHH forest.

Where possible, primary data collected from field studies was used to do these valuations. Secondary data (collected from government documents, research reports, journal articles, statistical data and case studies, among others) was used to provide context to the relevant environmental variables used in the study. For example, timber value was estimated using the data from a previous study. In this earlier study, the volume of timber produced by the forest was measured by tallying all the trees located within a sample plot. Information on timber prices was obtained from the Department of Forestry. With this data, the value of timber was calculated by multiplying the volume of timber by its prevailing price. To get the net benefit of this service, the cost of harvesting was then deducted from the value of the timber.

The economic value of the KHH forest

Based on 2011 figures, the ecosystem services provided by the KHH forest supply the

following benefits per hectare per annum: timber with a value of THB 632,974 (USD 23,089), carbon dioxide sequestration with a value of THB 12,618 (USD 406), oxygen generation with a value of THB 108,518 (USD 3,496) and biodiversity with a value of THB 163,836 (USD 5,277) (see table below).

The values for the water supply and flood protection services provided by the KHH forest could not be reported on a yearly basis as the figures varied year by year. However, the values of these two ecosystem services were higher than the values calculated for the other services.

Once the values of the ecosystem services provided by the KHH forest had been established, they were used to assess the economic costs and benefits of three potential forest management strategies. These strategies were developed using the information derived from interviews and discussions with relevant KHH stakeholders. For example, the research team conducted eight focus group discussions in various locations around KHH.

The chosen management scenarios were as follows: a) Scenario I or the base case scenario, in which no intervention is introduced and the forest continues to be converted into rubber plantations; b) Scenario II, which involves the establishment of protected areas (PAs) to preserve the remaining forest areas in KHH; and c) Scenario III, in which forest restoration/rehabilitation initiatives are implemented to increase the forest areas in KHH.

Scenarios II and III

At the time of the study, the work set out under Scenario II (the establishment of PAs) was already being considered and explored by the Thai government. If this scenario was adopted, then the KHH forest would be included as part of the Greater Songkhla Lake Basin Protected Area. Under this option, all current land use activities in KHH would have to stop; thus, the forest area could no longer be converted for other land uses. Over 666 ha of the remaining forest and over 469 ha of existing rubber farms would be maintained.

Management costs for Scenario II would include the cost of establishing the PAs. They would also include a budget for the maintenance, operations and the operating costs of the government agencies that would manage and monitor the forest once it had been declared as a PA.

The work set out under Scenario III would involve introducing and promoting a management scheme that would convert rubber plantations back into native forest. Under this scenario, the whole of KHH would eventually return to its natural condition as a 100% forest area. The scenario would aim to achieve a 10% rate of reforestation (of the total area of rubber plantations) per year.

According to the Help Conserve KHH Project, Scenario III may be the most effective option for the management of the KHH forest. Thus, the Project has made a commitment to inform and educate people about the benefits of restoring the KHH, as well as supporting and monitoring the conservation efforts that are being implemented in the area.

Scenario III could be implemented in two ways: through farmers’ voluntary actions, or by raising funds to buy back rubber plantations from their present owners and then rehabilitating them as conservation areas. The forest could be restored in different ways. It could be left alone to naturally regenerate, native species could be replanted, the local communities could switch to agro-forestry, or any of these methods could be combined together. Projections show that replanting trees would yield a faster forest regeneration rate than natural regeneration.

Rehabilitation costs for Scenario III would include the costs of building and maintaining seedling nurseries and the costs of replanting, labor, and transportation, among others.

Summary of all ecosystem service values of Kho Hong Hill

Ecosystem services	Value at current stage (THB/ha/year)	Notes
From intact forest		
Timber	632,974	Entered into CBA only when the forest is cleared
CO ₂ sequestration	12,618	Annual benefit
CO ₂ storage	47,983	Entered into CBA only when the forest is cleared
O ₂ generation	108,518	Annual benefit
Water absorption by forest	118,954,045	Value presented is for the first year only
Flood prevention	-	Different in each year for each scenario
Biodiversity	163,836	Annual benefit
From rubber plantation		
CO ₂ sequestration	3,738	Annual benefit
O ₂ generation	31,181	Annual benefit

Note: Rubber farms do not generate significant volume of water or biodiversity, and thus were not estimated.

Cost-benefit analysis of the forest management scenarios

A cost-benefit analysis (CBA) was carried out to see which of the three management scenarios developed would be most economically feasible. The CBA was performed for all of the management scenarios for a 25-year period. Results showed that under the base case scenario, the annual benefits from the ecosystem services from KHH would turn negative from Year 15 onwards. Meanwhile, both Scenario II (i.e., the establishment of PAs) and Scenario III (i.e., implementing forest rehabilitation programs) would yield positive net present values (NPV) (see figure below).

These CBA results imply that further deforestation of KHH will result in social losses in the long run. Thus, stakeholders must work to improve the condition of KHH as soon as possible—while the benefits of doing so can still be secured. The study shows that by just preserving the existing forest

areas in KHH (i.e., preventing further deforestation) positive benefits can still be achieved over a 25-year period. However, it also shows that forest management through reforestation can yield higher benefits than simply preserving the existing forest areas, although this will inevitably involve higher management costs.

Policy implications

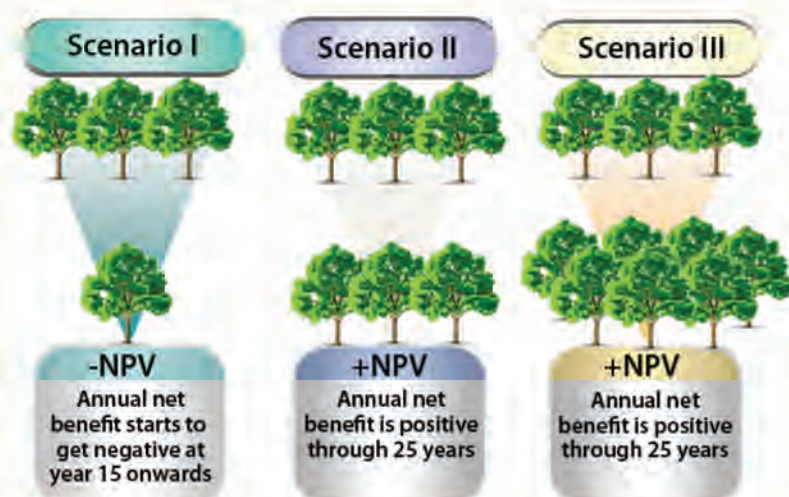
In light of these findings, the study's recommendations, in order of priority, are as follows:

- 1) The remaining forest areas in KHH should be protected to prevent further deforestation. This can be done through strict law enforcement and by establishing PAs in KHH.
- 2) Intermediate plans should be put in place to encourage rubber farmers to re-convert their rubber plantations into forest areas. Implementing a payment for ecosystem services (PES) mechanism

should be investigated as a way to motivate rubber farmers to reforest.

Long-term plans for the management of KHH should include defining what constitutes the sustainable use of forest products, formulating public policy and regulations to guarantee sustainable forest use, determining and implementing a systematic monitoring strategy, and promoting the conservation of local species for the next generation. These recommendations are consistent with the objectives of the Help Protect KHH forest conservation movement.

Overall, the results of this study should help decision makers in their environmental management initiatives, particularly if forest restoration programs are to be developed and implemented to complement the rubber farming activities and other changing land uses in the area.



Summary of the cost-benefit analysis of the three scenarios

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