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## **The evolving role of tropical forests for local livelihoods in Indonesia**

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**Abstract:** The authors studied how the role and perceptions of natural forests have changed in seven villages along the Malinau River, East Kalimantan (Indonesian Borneo). Local people consider development projects, logging and mining activities, and floods as having the greatest influence on their livelihoods and use of forests. Access to and availability of valued forest products is perceived to have decreased and thus, while still of considerable importance, the overall role of forests has declined. New sources of income,

farming opportunities, clinics and access to schools, as well as the village infrastructure, are the main positive changes in local livelihoods. While village life is improving, in general, villagers are concerned about the declining quality of their forests and the environment. The present study findings indicate that forest communities, often living in remote areas, support both development and conservation efforts. Giving greater control to local people in the management of tropical forests offers both environmental and development benefits.

**Keywords:** forests; tropical; reliance; people; perceptions; trends/events; local livelihoods; change; sustainable development; environment; Indonesia.

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## 1 Introduction

Forests goods and services are important for millions of people across the tropics (Byron and Arnold, 1999; World Bank, 2008). The role of forests in people's lives is increasingly recognised and understood (Arnold, 2001; FAO, 2003; Tieguhong and Zwolinski, 2009; Kainer et al., 2009). However, there is less clarity on how the role of forests can change over time. What is the influence of shifting aspirations, changing cultural preferences, fluctuation in product prices, access to new knowledge and

technologies, and the ever changing external opportunities, demands and pressures of an increasingly information rich world? While inevitably complex, researchers can ask local views to highlight and characterise positive and negative trends and events and their implications.

In much of the tropics, externally driven development activities have brought fundamental change to the relationship between people and forests. Some policies, including many conservation interventions, deny forest-dwellers rights and aspirations, and alienate them from their ancestral territories (Sheil et al., 2006; Lele et al., 2010). On the other hand, development projects often seek to maintain forest ecosystems, and to secure local livelihoods, e.g., sustainable and collaborative forest management. However, overall impacts are often unclear and large numbers of people living in forested areas remain poor (Scherr et al., 2003; Dudley et al., 2008; Sunderlin et al., 2008).

For forest dependent people in Malinau, East Kalimantan (Indonesian Borneo), the last decade was a time of considerable change and uncertainty. The monetary crisis of 1997, and the increase in the export value of palm oil and other commodities, have encouraged prospecting by private investors (Sheil et al., 2006; Sandker et al., 2007; Dudley et al., 2008). Moreover, decentralisation had a dramatic effect on local rather than central government, increasing local authority over timber and plantation concessions (Barr et al., 2006; Moeliono, 2006; Wollenberg, 2006; Colfer et al., 2008; Wunder et al., 2008; Moeliono et al., 2009).

Having worked with seven communities in forested areas of Malinau district in 1999 and 2000 (henceforth the '1999 survey') to explore their needs, perceptions and priorities concerning forests (Sheil et al., 2003), the authors have been able to assess changes in the subsequent decade, with the specific follow-up surveys reported here conducted in 2007 and 2008 (henceforth '2008 survey'). The authors found these communities had a strong relationship with the tropical forests. Forests and forest lands are important to these people for various reasons (see for example Basuki and Sheil, 2005; Sheil and Liswanti, 2006; Sheil et al., 2006). The authors concluded from the initial survey that information on how people view and value their natural environment can help improve forest conservation planning, address the needs of local people, and advance the management of tropical forestlands (Sheil et al., 2006; Padmanaba and Sheil, 2007). The research's aim here is to identify and explore key changes in local livelihoods and the role of forests by identifying important trends/events as perceived by the people themselves. The authors examine and discuss what these changing perceptions imply for development and the environment.

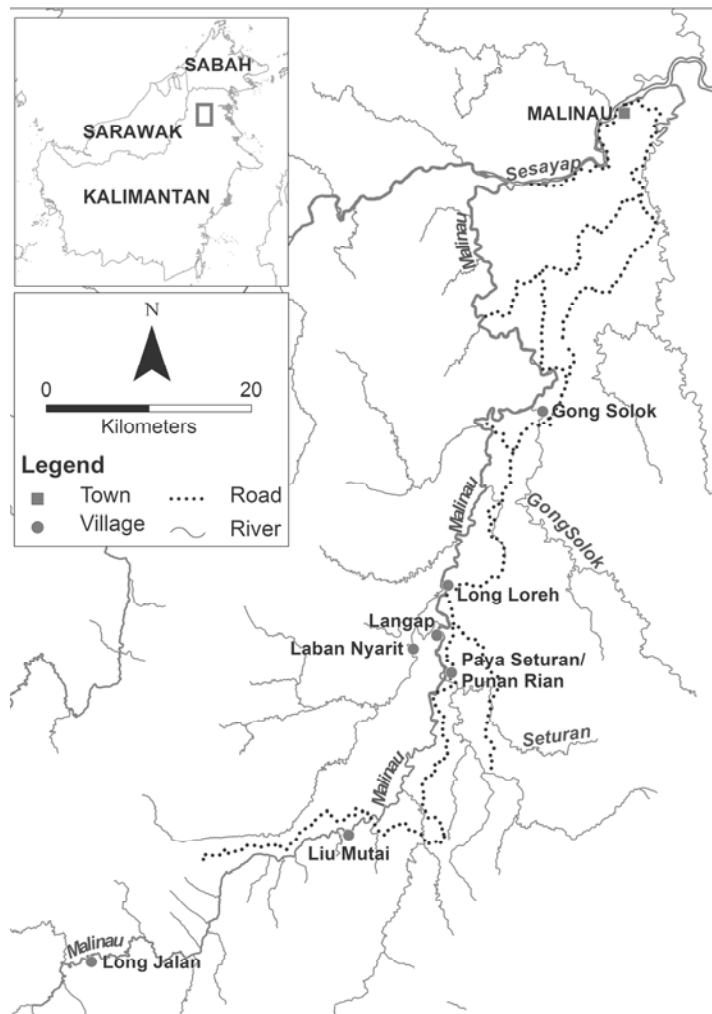
## **2 Study area**

Malinau is rich in biodiversity and contains valuable timber and mineral resources (Meijaard et al., 2005; Sheil et al., 2006). The district covering 39,800 km<sup>2</sup>, is sparsely populated and dominated by steep mountainous topography (Basuki and Sheil, 2005; Meteorology and Geophysical Board Tarakan in BPS Kaltim, 2009). Over 90% of Malinau district remains forested (tropical rain forest) of which 19,000 km<sup>2</sup> is production forests. The landscape is divided by traditional claims, but most of the region was allocated to logging and mining concessions more than a decade ago. Local communities were not consulted when these concessions were granted (Lynch and Harwell, 2002). These concessions are still actively extracting the resources, especially coal mining

operations, which are also expanding their operational areas. Both timber and coal production have been increasing in recent years (BPS Kabupaten Malinau, 2010).

Traditional livelihoods were typically a mixture of swidden cultivation, fruit gardens, hunting, fishing and collecting valued forest products. The collection of eaglewood and bird's nests have long been important in encouraging some men to specialise in the collection of these highly valued resources which are traded for rice, money and good (Sellato, 2001). The eaglewood is known locally as 'gaharu' that is the scented resinous wood of fungal infected *Aquilaria* spp. The resin is used for making incense and has been traded for centuries (Eghenter, 2001; Donovan and Puri, 2004).

**Figure 1** Map of villages along the Malinau River and the road that connects them to the Malinau town, the district's capital



In the five-year period from 2004 to 2009, Malinau District's economic growth accelerated from 1.24% to 8.96%. In this period, the economic sectors such as mining, agriculture (including forestry), services, construction, and trade dominated (96% equal

to USD 176 Million) the distribution of the gross regional domestic product (GRDP) of Malinau. The remaining 4% of the GRDP came from other sectors such as transportation, finance, the processing industry and energy. The population of the district also increased from 56,155 to 84,429 people between 2005 and 2010. The infrastructure and services for health (hospital, doctors, paramedics, insurance and medicine) and education (school buildings, teachers) sectors have also improved (BPS Kabupaten Malinau, 2010). These changes are most evident in and around Malinau Town and other larger settlements – some remote communities still lack access to schools and clinics.

All seven of the study villages, selected from the 1999 survey, were located on the banks of the Malinau River (Figure 1). They represent two long established ethnic groups, Merap and Punan (Kaskija, 2002). Villagers living upstream and downstream of the Malinau River rely differently on forests (Sheil et al., 2006); villages were therefore grouped accordingly. They also have distinct culture, livelihood characteristics and access to public facilities. Downstream (Langap/LG, Gong Solok/GS, Laban Nyarit/LN, Paya Seturan/PS, and Punan Rian/PR) villagers often interacted with the government, logging and mining companies, and spent more time in agriculture than forest-based activities. Upstream (Liu Mutai/LM and Long Jalan/LJ) villagers relied more on forest and had limited access to markets, services or development opportunities including schools and medical clinics.

### **3 Methods**

The initial survey provided baseline data on the biophysical characteristics of the landscape and people's perceptions of various landscape features. The research also built trust between the villagers and research team, by involving the villagers in various activities. Between 1999 and 2008 the authors visited each village for more than two months (Sheil et al., 2003; Basuki and Sheil, 2005; Sheil and Liswanti, 2006; Lynam et al., 2006; Padmanaba and Sheil, 2007). The authors used data from the past surveys to assess changes. The more recent survey included a different range of activities, as described in the following sections.

#### *3.1 Measuring change in importance of forest among local land types*

The authors used scoring exercises to weigh the relative importance of local land types including forests. In group discussions, the authors asked villagers to distribute 100 counters among various land types (these were based on a discussion and agreement of locally recognised types: agriculture, forests, garden, old fallow, young fallow, old village, river, settlement/village, and swamp), and then asked them to explain the reason for their choice (see method details in Sheil et al., 2003; Sheil and Liswanti, 2006). Scores and ranks from the 1999 survey from the same villages were shown and explained to the 2008 survey groups at the beginning of the exercise for their consideration. Changes in importance and significance of forest by time and among other land types were analysed by comparing its percentage score and rank between 1999 and 2008.

In each village, villagers were represented by four groups of seven to ten people, divided by gender and age (i.e., four groups). When Merap and Punan existed in one village, i.e., LN, the authors formed four groups of men and women for each ethnic group, without age division. In a very small village, i.e., PR, villagers were only

represented by two groups of men and women, without age division. In total, there were 26 groups.

### *3.2 Examining trends/events affecting local livelihoods and forest resources*

The authors asked the village representatives about local trends/events that took place between 1999 and 2008 and influenced their livelihoods and relationship with forest. These were explored using spider-grams exercises (see details in Lynam, 1999; Evans et al., 2006).

As in the scoring exercises, the authors worked with representative groups of villagers in each village. There were seven men and seven women's groups which consisted of seven to ten people.

As per the methods developed by Lynam (1999), the authors asked the villagers to make a list of the most important trends/events and to put one counter on the least important trend/event. This worked well as the communities found the idea easy to grasp. There was no upper limit on the scores given. When each score was completed the authors then asked for an account and explanation of how each trend/event had influenced their livelihoods and forest roles. The authors continued by asking villagers to put counters on all impacts of each trend/event, as they did with the trends/events' importance. The authors recorded the groups' perceptions in the form of a percentage score, based on the sum of all the scores, for all trends/events and impacts.

The authors listed and ranked overall trends/events from all villages and groups based on their average score. The authors explored the top five trends/events further to understand their impacts on livelihoods and forests resources in one or more villages, downstream and upstream of the Malinau River.

### *3.3 Collecting information regarding change in local livelihoods and forests*

The authors used a semi-structured questionnaire as a guideline to obtain detailed information relevant to the condition of each village and the research context. The questionnaire covered various themes such as main trends/events affecting livelihoods and forest roles, impacts and changes because of the trends/events, and how the villagers adapted to the change in the forest role. The authors also collected additional information such as the study villages' general characteristics through literature reviews. This information was used to crosscheck the results of the group discussions.

The respondents consisted of key informants and ordinary villagers. Key informants were selected from each village based on their respected role: head of village, teacher, traditional leader, and elder. The authors interviewed 83 people comprising 52 men and 31 women, which varied from 8–14 people in each village.

### *3.4 Exploring the correlation between perception of forest, trends/events and local livelihoods*

SPSS 9.0 was used for statistical analysis, to explore the correlation (Spearman-rho) between perception of forest importance, trends/events importance, and village characteristics.

## 4 Results

### 4.1 Importance of forest among local land types

Most of the villagers, as in 1999, still considered *forest* as the most important land type (Table 1). However, LJ and PS villagers had different perceptions.

**Table 1** Change in importance of forest and other land types [mean for four groups (old women, young women, old men, young men), % of land type importance] by village and time (see online version for colours)

Village	Year	<i>Forest</i>	<i>Garden</i>	<i>Old fallow</i>	<i>Old village</i>	<i>Rice field</i>	<i>River</i>	<i>Swamp</i>	<i>Village</i>	<i>Young fallow</i>	Total
Long Jalan	1999	23.25	8.50	6.50	7.25	8.50	14.75	6.50	19.00	5.75	100
	2008	15.25	11.00	11.50	6.00	12.00	16.50	5.50	15.75	6.50	100
Gong Solok	1999	19.50	15.00	6.75	5.25	17.75	12.00	4.75	12.00	7.00	100
	2008	17.75	11.50	8.50	2.75	15.25	15.25	10.00	12.25	6.75	100
Liu Mutai	1999	22.25	15.00	7.50	5.75	15.50	12.50	3.00	12.00	6.50	100
	2008	17.50	11.75	10.00	4.50	16.25	9.75	4.25	17.00	9.00	100
Paya Seturan	1999	19.25	12.75	6.75	3.75	15.25	16.50	12.25	8.50	5.00	100
	2008	14.25	10.00	8.50	6.25	14.25	12.25	6.75	22.75	5.00	100
Laban Nyarit <sup>+</sup>	1999	22.00	9.75	11.50	5.75	11.50	12.00	9.00	11.25	7.25	100
	2008	15.75	13.25	10.25	6.50	13.50	11.00	6.75	14.75	8.25	100
Langap	1999	25.50	9.00	10.75	5.75	12.25	9.00	9.25	12.25	6.25	100
	2008	20.00	12.00	8.25	5.00	13.75	12.50	8.25	11.50	8.75	100
Punan Rian	1999	16.00	10.00	6.00	7.50	14.00	17.00	7.00	14.00	8.50	100
	2008	19.50	10.00	10.00	3.50	16.00	14.00	7.50	12.00	7.50	100

Notes: Italic numbers are the land types with the highest 'importance' on each line

<sup>+</sup>Only two groups as the community is very small (see methods)

The young women in LJ viewed forest as less important than river and village. They explained that the forest no longer provided plentiful eaglewood as it had been overharvested by outsiders. Even though other groups agreed about the decreasing eaglewood, they still believed that forest remains very important due to other forest products. The present study's discussion with the larger communities (both Punan and Merap) and observations showed that a lot of locally useful products cannot be substituted locally, e.g., wild fruits, bush meat, timber, etc.

In PS, *village* is now more important than *forest* because forest products have decreased and access to the forest is limited due to companies' activities. *Village* has become more important since the local government provided them with better road access, new settlements, piped clean water, school and customary buildings.

Nonetheless, the significance of *forest* in the 2008 survey compared to the 1999 survey showed a decline for all communities, except for PR villagers. The authors' observations showed that villagers spent more time working in their village area in agriculture and cash earning activities such as working for development projects and/or companies. But for the people in PR who moved back to their ancestral lands, upstream of the Seturan River in 2003, access to forests and forest products in their new settlement had increased. Previously, they had limited agricultural lands and the forest was about six hours walk from the village.





**Table 3** List of main trends/events, with their corresponding impacts on local livelihoods identified by 14 discussion groups

<i>Trends/events</i>	<i>Impact on local livelihoods</i>									
	<i>Income</i>	<i>Facilities</i>	<i>Education</i>	<i>Health</i>	<i>Agriculture</i>	<i>Forest products</i>	<i>River quality</i>	<i>Demonstration</i>	<i>Food crisis</i>	<i>Resettlement</i>
Development projects	+	+	+	+	+	-				+
Companies' activities	+/-		+	-	-	-	-	-		
Floods	-	-	-	-	-	-	-		-	-
Decreasing rice yield	-			-	-	-			-	
Decreasing eaglewood	-				+	-				

Notes: +positive impact perceived by all groups; - negative impact perceived by all groups; +/- positive and/or negative impact perceived by all groups

#### 4.2 Trends/events affecting local livelihoods and forests

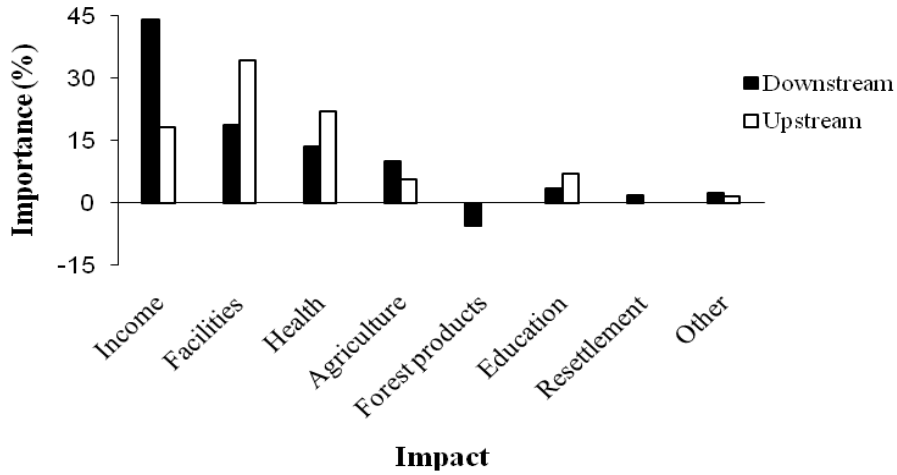
The five most important trends/events (by mean score of all villages and gender) based on the group discussions are shown in Table 2 and their corresponding impacts on local livelihoods are presented in Table 3. All trends/events influenced villagers' incomes, agriculture production and forest resources. In addition, less important trends/events included "resettlement, endemic human diseases, the monetary crisis of 1998, new democratic process, shifts in the seasons, conflicts over boundaries, electric fishing, erosion, and communication facilities".

##### 4.2.1 Development projects

In 2005 the central government developed three projects in the study villages, which the villagers found significant. These included projects to provide piped clean water from sources such as waterfalls and streams to settlements in all study villages, except LG where the source of water was too far, i.e., more than three kilometres; subsidised/cheap rice and healthcare services (all villages); and financial aid (cash) for poor families in downstream villages. In 2006 the district government provided grants for village development to build houses, bridges, cement foot paths, schools, and to develop agriculture by providing all villages with seedlings (coffee, cocoa, vegetable, etc.) and livestock (chickens, ducks and cattle).

In all villages, people felt the projects had helped to increase their *income* and wellbeing (Figure 2). Those who lived downstream argued that these development projects had the greatest benefits on improving their *income* (+44% a positive impact importance), especially through financial aid for poor families and wage opportunities in project activities, e.g., collecting and transporting timber, or building houses. Villagers upstream reported that having *facilities* like new houses, community halls, piped clean water, and schools were the most important (+34%) followed by *health* (+22%).

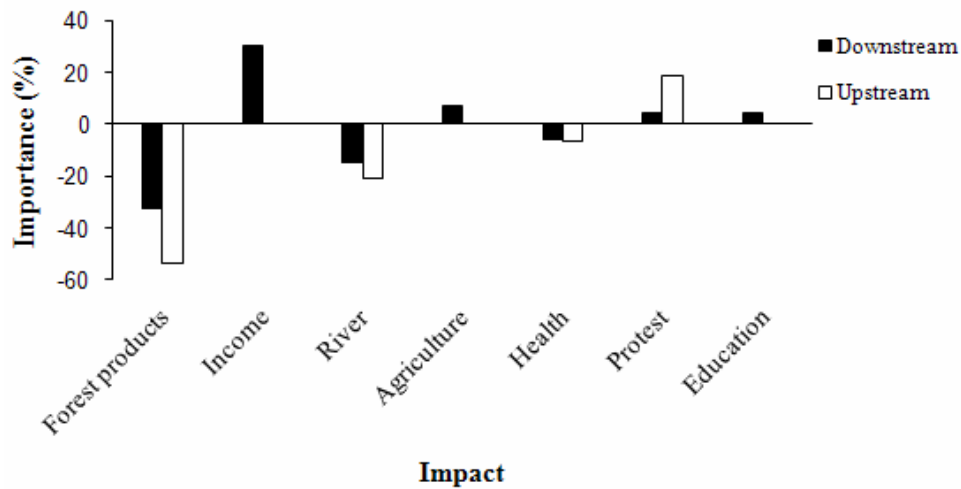
**Figure 2** The average importance value (%) given (by men’s and women’s groups) for changes in local livelihoods *influenced by development projects*, from two villages upstream (LJ, LM) and five villages downstream (GS, LG, LN, PS, PR) of the Malinau River (avg. % for 14 groups of two and five villages)



While the development projects improved village facilities, villagers perceived that this was at the expense of forest resources, such as timber, although not as much as the commercial activities (see Figure 3).

Community health had been improved through the clean water program in all villages except LG. In addition, the respondents informed us that healthcare services for all villagers were provided by the local government. Villagers can go to the hospitals in Long Loreh sub-District and Malinau town for free treatment and medicine, though upstream villagers have to travel a day to reach either hospital.

**Figure 3** The average importance values given (by men’s and women’s groups) for the changes in local livelihoods *influenced by companies’ activities* from two villages upstream (LJ, LM) and five villages downstream (GS, LG, LN, PS, PR) of the Malinau River (avg. % for 11 groups of two and five villages)



#### 4.2.2 *Logging and mining activities*

Logging and coal mining companies are both state and private owned. These companies log timber, transport logs, slash the under storey, maintain logging roads, dig for coal, discharge mining waste into rivers, and transport coal. These companies also create employment and trade opportunities for local villagers. Villagers reported that companies' activities had been increasing since 2000 as indicated by the presence of two new logging contractors in the area, and more recent surveying activities of a new coal mining company.

Villagers explained that the companies' activities brought tradeoffs between their own livelihoods and environmental degradation (Figure 3). Although villagers living downstream (GS, LG, LN, PS, PR) were concerned about the decline in forest products (−32% a negative impact importance), their income had increased (+30% a positive impact importance) through fees, employment, access to forest product markets, aid for electricity; their cultivation skills increased (+7%); and access to education facilities improved (+4%). Key informants in GS and LN informed the authors that villagers extracted approximately 5,000 m<sup>3</sup> timber (dbh > 70 cm) from their fallow land over a 12 month period (2006–2007) per village. This was then sold to a broker from Malinau town who sold the timber to the plywood factory on Tarakan Island (about four hours to the east of Malinau town by speedboat).

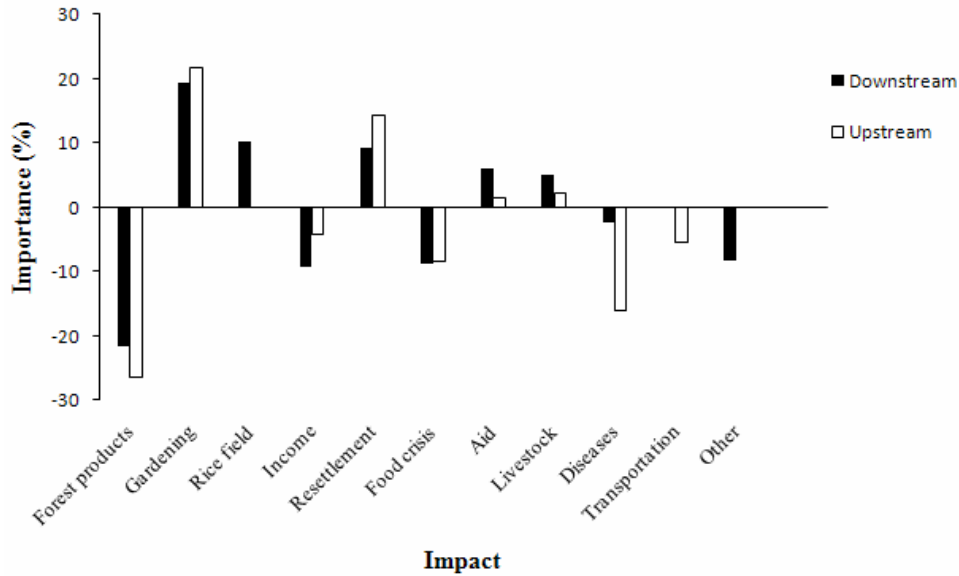
Villagers upstream (LJ, LM) indicated that logging and mining activities had negative impacts, e.g., reducing eaglewood – their main source of income – and timber, rattan, animals as well as access to forest (−53% of impact importance), lowering river water quality and fish populations (−21%), and creating conflict over land tenure (−19%). In addition, all villagers reported that logging and mining activities next to their settlements and agricultural areas had polluted the river (−21%) and air, leading to breathing and stomach problems (−6%).

#### 4.2.3 *Floods*

Floods were considered an important event during the last decade in Malinau. From interviews, this study found out/discovered that the two major floods in 1999 and 2006 increased local people's use of the forest for food and construction materials. The 1999 flood affected all study villages except LN, and the 2006 flood affected PS, PR, LG and GS. The 2006 flood damaged crops, houses, boats, food stocks, domestic animals and village facilities leading to: a food crisis, human disease, need for resettlement, and an accumulation of debris in the river.

During the spider-grams exercises, all villagers (upstream and downstream) reported that the most important impacts during and after the flood were increased reliance on forest products (−24% a negative impact importance) as well as planting and harvesting food in gardens (−20%; Figure 4). Other less important coping strategies in times of disasters were finding alternative income, moving the settlement to a safer place, raising livestock, and rebuilding damaged houses, rice stores and household facilities. For those living downstream, another strategy was planting new rice fields on higher ground. The district government provided basic foods and financial aid for a few days after the flood.

**Figure 4** The average importance values given (by men's and women's groups) for the changes in local livelihoods *influenced by floods* from two villages upstream (LJ, LM) and four villages downstream (GS, LG, PS, PR) of the Malinau River (avg. % for 12 groups of two and four villages)

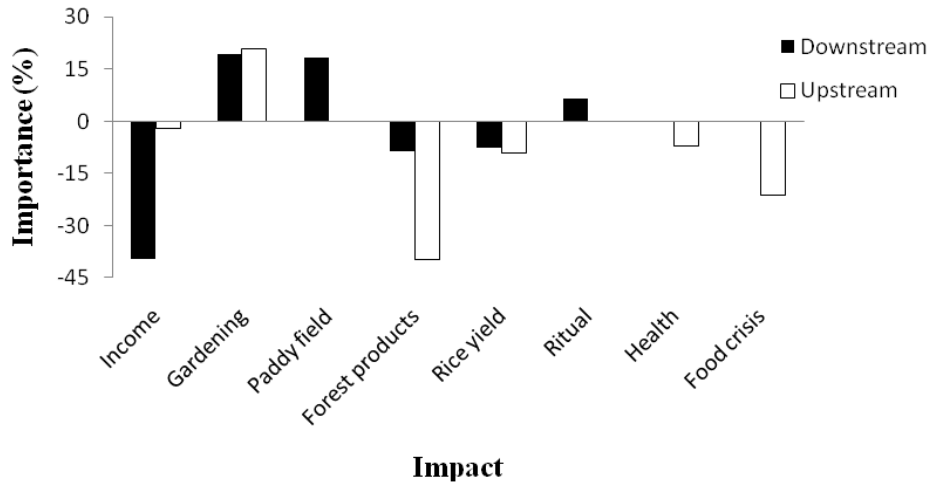


Villagers upstream considered human disease as a more important impact caused by flood (–16%) than those living downstream (–2%). They explained that a few people had died after the flood in 1999 because the village had no health facilities.

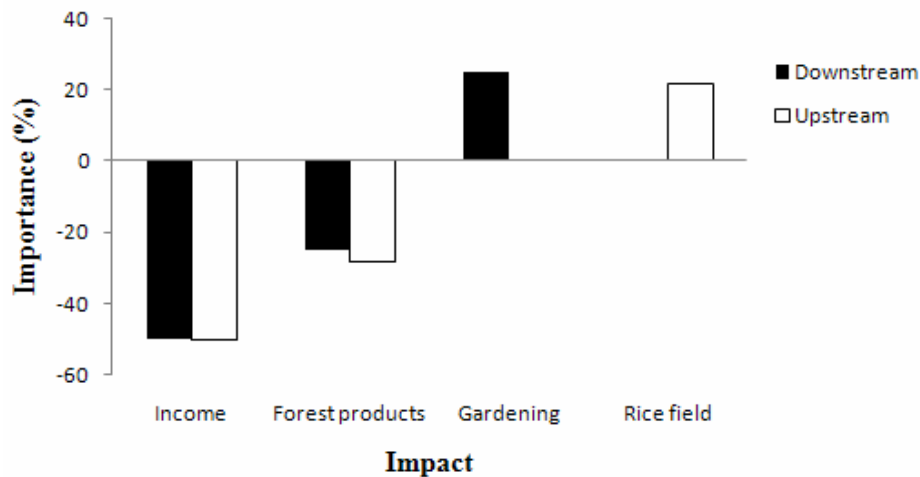
#### 4.2.4 Decreasing rice yield

Plant pests and diseases significantly affect crops. The production of the villagers' staple food, rice, is a special concern. Wild pigs, monkeys and insects were considered the main pests. In addition plant disease, possibly root rot, resulted in rice wilting and empty panicles. Although, these plant pests and diseases are not new, local people believe they have increased since 2005 and perceive a declining yield of rice from their land. In consequence villagers downstream said that they were forced to find money to buy rice (–39% a negative impact importance), plant more food crops in their garden (–19%), establish more (wet) paddy fields (–18%), which they believed to be more resistant to plant diseases than (dry) upland rice, and to find food from the forest (–8%; Figure 5). But in the upstream villages, people explained that the declining rice yield had forced them to gather more wild food and collect more eagle wood (to trade for food) from the forest (–39%), they reported that they had suffered from hunger (–21%), and had to plant more food crops in their gardens (–20%). These villagers said they lacked access to any pesticides to deal with the plant pests and diseases, and no means with which to plant cash crops. In PS, they cultivated 'wet' rice varieties in irrigated paddy fields, which are locally free of plant pests and diseases and so they do not consider these as a problem.

**Figure 5** The average importance values given (by men’s and women’s groups) for the changes in local livelihoods *influenced by rice pests and diseases* from two villages upstream (LJ, LM) and four villages downstream (GS, LG, LN, PR) of the Malinau River (avg. % for nine groups of two and four villages)



**Figure 6** The average importance values given (by men’s and women’s groups) for the changes in local livelihoods *influenced by decreasing eaglewood* from two villages upstream (LJ, LM) and one village downstream (PR) of the Malinau River (avg. % for three groups of two and one villages)



#### 4.2.5 Decreasing eaglewood

A decline in the availability of eaglewood was an important trend (50%) in three of the research villages: LJ, LM and PR. According to these villagers (Figure 6), their yields of eaglewood have been decreasing since 2006 leading to a significant decrease in their income. Collectors from other regions (including from the islands of Java and Lombok) had reduced the plants in the forest by practicing random cutting without identifying the

presence of eaglewood mould. Local collectors were also judged to increasingly over-harvest eaglewood.

Upstream villagers tried to compensate for their decreasing income by selling other forest products, such as rattan (basketry), wild pig and deer meat, to other villages downstream. They also planted crops like cassava and eggplant (aubergine) in addition to rice, to increase overall food yields and reduce cash expenditure on food. Villagers in PR (downstream) sought additional income by planting more vegetables in their gardens for sale to other villages or companies.

#### *4.2.6 Other trends/events*

Other trends/events that were noted, but were stated to have had a minor impact on livelihoods and forest resources, included plant disease such as root rot (GS, LG, LJ, LM, PS), resettlement of some villagers who moved to higher ground (GS, LG, LN, LJ, PR), monetary crisis 1997 (GS, LN, PS), decentralisation (LN, LJ, PR, ongoing since 2000), conflict over village boundaries (GS and PS, ongoing since 1986), and road construction connecting Tanjung Nanga and LJ villages in 2003.

Human diseases, such as malaria and dysentery, which were among the main concerns in most villages in 2000 were significantly reduced by the availability of healthcare services and were no longer mentioned. Resettlement was considered in five villages (GS, LG, PR, LN, LJ) as having both positive and negative impacts, e.g., safer from flood but further to the river. The monetary crisis in 1997 raised the prices of some valued goods, e.g., salt, kerosene and house materials, but villagers informed us that they had adapted by reducing consumption and finding substitutes from the forests such as the resin of *Agathis* trees for kerosene in lamps. Decentralisation brought new experiences for local people particularly the elections for village, district, and national level leaders.

Conflict over village boundaries had occurred since 2002. Each village competed for land in response to a decree at the district level that divided Malinau into four sub-districts. Traditionally, villagers could claim ownership of land they had cleared (Wollenberg et al., 2007; Appell, 2008). The villagers started clearing land quickly in the belief that this new decree would work the same way providing legal tenure for the land they had cleared. Thus, forest is often cleared by competing villagers simply to obtain and secure tenure. People in GS and PS explained that this situation had reduced their land for cultivation as the land had been occupied by neighbouring villages.

Villagers explained that when the road from Tanjung Nanga to LJ was constructed, the district government granted harvesting rights to the contractors to clear a kilometre of land on each side of the road (Moeliono, 2006). According to the villagers in LM, the project to connect the towns of Malinau and Bahau (in Bulungan District) not only failed, due to extreme topography, but also caused a reduction in valued forest products (including timber and rattan) and polluted the Malinau River.

### *4.3 Correlation between forest importance, trends/events and local livelihoods*

The authors explored the potential correlation between perceptions of trends in the importance of forests (stable vs. decline, compared to other land types), and main trends/events as well as the characteristics of the study villages. The importance of forests was perceived as being in decline in two of the study villages (LJ and PS), as shown above. The present study examined the data to see if the decline had any relationship with

village characteristics (i.e., number of household, percentage of farmers, distance to Malinau town, distance to school, and distance to hospital) and the main trends/events affecting local livelihoods. The results show that the percentage of villagers who work as farmers may be negatively correlated with the perception of the importance of forests (Spearman's rho,  $p$ -value .09,  $N = 7$ ). In villages with more farming households, less eaglewood collectors and less employees of the companies, the perception is that the role of forests is declining.

## **5 Discussion**

### *5.1 The decline in the importance of forest over the last decade*

The present study highlights positive and negative aspects of local development trajectories on the Malinau. There was a perception that various trends/events that occurred in the study area, particularly timber and mining activities as well as eaglewood overharvesting, had reduced access to forests and forest products. New roads and other development projects were seen as having threatened and reduced forest resources and services. However, it was acknowledged that these projects also brought opportunities, including development benefits and new jobs. Nonetheless, some, such as plantations and intensive agriculture, occur at the expense of forest cover. The importance of forests, though still high, looks likely to continue its decline.

In Malinau, the villagers in LJ and PS suggested that the importance of forests was decreasing with respect to other land types, i.e., village and river. These two villages had the fewest capital assets (Sheil and Liswanti, 2006) and the least access to agricultural land and valuable forest products like eaglewood, the least livelihood options, and were most impacted by flood. They have also been impacted by logging concessions in the surrounding forests for decades. Despite the many positive trends most informants feel that they have lost more than they have gained from these developments. Much of the negative impacts stem from damage to the forest undergrowth – especially due to log extraction and undergrowth slashing that is required under Indonesian regulations. This slashing is known to reduce the availability of numerous forest products including a negative impact on hunted wildlife (Sheil et al., 2003). The other five villages still perceive forests as the most important land types, and are similarly affected by logging concessions, but they have other livelihood options, in part, due to better access to less degraded forests, agricultural lands and also markets. With degradation, depletion of valued products and reduced access, as well as the shift to other livelihood options, the role of forest to local people may evolve from providing direct products such as food, construction materials and medicines, to providing indirect benefits, e.g., clean water and financial compensation from companies.

### *5.2 Changes in local livelihoods*

Key informants noted various beneficial trends over the last decade. These included new opportunities for improved income from employment, trade and new agricultural options, better village facilities including better access to (free) healthcare services and schools. But challenges remain.

Respondents were concerned about decreasing forest, river and agriculture products as well as river and land quality. Local people were especially concerned about the environmental impact of the various concessions in the area. Although recognising that timber and mining companies provided them with cash income, from timber and coal fees, paid work and aid, these villagers thought the negative impacts outweighed the benefits (see also Yasmi, 2003; Padmanaba and Sheil, 2007). Some authors have highlighted how Malinau's villagers welcome new projects (e.g. Boedhihartono et al., 2007). While this remains true the present study's data show that caution, even scepticism, is increasing. While local people are not anti-development they are increasingly concerned about environmental impacts and long term consequences (Levang et al., 2007; Padmanaba and Sheil, 2007).

Some trends/events, e.g., the monetary crisis in 1997, had fewer impacts on the study villagers' livelihoods compared to other regions (Sunderlin et al., 2001; Shimizu, 2006). The villagers' lifestyle and ready access to forest resources contributed to their resilience; a similar finding also reported by Colfer and Dudley (1993) from a neighbouring area in East Kalimantan. They reduced consumption of bought goods and relied on forest products many of which can also be traded to generate income. As access to forest products has diminished such forest-based resilience has subsequently decreased (see also Colfer and Soedjito, 2003).

Villagers living upstream and downstream of the Malinau River rely differently on forests (Sheil et al., 2003), and the present study implies that this reliance also changes in response to trends/ events. Downstream villagers compensate for decreasing forest resources and access by diversifying their income generation with new opportunities, e.g., wages from companies, government financial aid, planting fruit trees, raising livestock and selling forest products. But many of these are insecure sources of income considering the short-term contract system of employment in logging and mining companies, and the limited timeframe of government projects. The development of plantations and livestock in villages are also still in their infancy, slowly implemented, and involve many irregular practises, according to the villagers, such as unfair selection of households that receive free seeds etc., and money for management costs. The upstream villagers are more vulnerable to decreasing access to forest and forest products because they lack easy access to alternative sources of income, healthcare and government facilities. Reduced access to quality forests will affect the ability of villagers, upstream and downstream, to cope with adverse trends/events in the future.

### *5.3 Towards future livelihood options and forest management*

From the present study's findings, the authors think local people in LJ and PS may have no choice but to continue to use the degraded forest for their livelihoods. In contrast, livelihoods in GS, LG, LN, LM and PR, with better access to facilities and livelihood options, may evolve towards agricultural and service-based sectors. But, the current alternative sources of income still cannot substitute most forest products for local livelihoods, e.g., food, materials for houses and boats, recreation, rituals etc. Should these areas become devoid of forests, in a more global context, humanity may also lose cultural diversity. This study's results suggest local people will give more support to development projects that respect and maintain their access to forest products.



While the development projects can provide other livelihood options, often only short term, they can also increase pressure on the forest. The projects' use of forest resources and the building of infrastructure that facilitates easy access to forests may provide outsiders, rather than local people, with increased access to benefits from forest. Equally, work in plantations and mines are limited to low income, unskilled labour, due to the villagers' lack of relevant skills. Efforts to provide suitable education and training at the village or sub-district level, could help local people access new livelihood options. Other alternative incomes may ultimately include options like payment for environmental services (PES, Wunder et al., 2008), reducing emission from deforestation and forest degradation (REDD+), ecotourism (Purwanto, 2009) and production of charcoal and crafts (Iskandar et al., 2007). The authors argue that these alternative livelihood options are not as crucial as is improving the role of villagers in forest management.

A greater formal role in forest management would provide opportunities for the villagers to use their forest resources for their own development (Sheil et al., 2006). The way in which the local people participated in the present research and voiced their concerns about the degradation of their environment and their livelihoods, reflected their willingness to participate in resource management. Their ability to monitor their environment and its resources is also clear from the research's data. Unfortunately, villagers' participation in resource management has been neglected by decision makers because of their remoteness, their lack of formal education and their lack of political influence (Wollenberg et al., 2007).

The lack of villagers' involvement in forest management has, however, contributed to various problems and conflicts, e.g., villagers protesting and trying to stop mining and logging activities and social tension on village boundaries (see also Resosudarmo et al., 2009). The villagers believed this has resulted in degraded forests and a negative impact on local livelihoods – a pattern also observed elsewhere in East Kalimantan (Colfer et al., 2008) and Indonesia (Ribot et al., 2006). The limited role of local people in the management of the Malinau forest areas (Sheil et al., 2006) leaves them with fewer benefits and little, if any, control in various development activities.

What can be done to improve outcomes for people and forests? Over the last decade it appears that new livelihood opportunities have decreased access to forest goods and services, but such trade-offs can be reduced and, if carefully orchestrated, could become synergies, e.g., REDD+, PES, ecotourism etc. The local government needs to exercise more control over companies to protect forests and water; and to create the conditions to which villagers aspire and which are required by the UN 'Agenda 21' on achieving sustainable development as well as by Indonesian Environmental law No. 32/2009 (UU32/2009). Another case, from Eastern Borneo, suggests that all stakeholders in forest management should be willing to make some sacrifices in order to sustain their natural resources (Limberg et al., 2010). At the very least the authors recommend that villagers are better involved in planning and guiding any activities that impact their environment.

So what does this mean for the future of the forest? At first glance the trends are not good: the extent and quality of forests are declining and local people, though concerned, have not been able to prevent this. But this is an incomplete picture, especially when the authors remember that Indonesia, as well as some other tropical developing countries, is a

young democracy in which governance and power are in a state of flux. Already, we see that some communities in the remote region have been able to define and implement protected forests of their own (Boedhihartono et al., 2007; Adnan et al., 2008). The fact that this has happened and been applauded suggests that with suitable encouragement this could become a more general trend – especially if the funds and skills are available. Loss of forest benefits combined with REDD+ payments provide increasing incentives for forest protection, not necessarily everywhere, but in a planned manner across the landscape. There is a need to see forest-cover as a desirable and valued part of the long-term land-use plan for the region not merely as an opportunity for timber and conversion, but also in respect of the needs and aspirations of local people. The present study also highlight how local knowledge, culture and livelihoods can be beneficially integrated with forest management to produce more sustainable, less damaging, outcomes that benefit livelihoods without unduly damaging the environment.

## **6 Conclusions**

Local people perceive forests and forest resources as becoming less significant. The present study suggests that this relates to the declining ability of forests to provide goods and services. Forest loss and degradation and problems of access lie behind these declines. While their importance has decreased, forests still remain the most important source of goods and services for local livelihood.

Livelihoods for most villagers have improved. It is unclear how sustainable these gains will be. Villagers are concerned about the ongoing degradation of forests and the environment. But with existing preference for local forest conservation, decentralisation of forest governance and global support for REDD+, decision makers still have opportunities to optimise the trade-off between development and conservation to secure their forests, the environment and local livelihoods.

Local perspectives on how main trends/events change livelihoods and forest value offer a basis for more sustainable development alternatives and improved forest management. Strategies thus informed or better still controlled and guided, by local people's values can reduce conflict and better secure the environment and local livelihoods in the longer term. While dependence on forests is declining all the villagers profess a strong desire to maintain a good productive environment in perpetuity. The authors recommend that decision makers increase the role of local people in the control and management of forests including in both logging and mining concessions.

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