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# **Governance, Decentralisation and Deforestation: The Case of Central Kalimantan Province, Indonesia**

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## **Abstract**

The implementation of the decentralisation policies in Indonesia, which started in 2000, has fundamentally changed the country's forest governance framework. This study investigates how decentralisation has influenced forest governance, and links the forest governance to deforestation rates at the district level. We measure and compare the quality of forest governance in 11 districts in Central Kalimantan province in the periods 2000-2005 and 2005-2010 and relate forest governance to deforestation rate. This study shows that decentralisation has led to marked differences in forest governance between districts and that deforestation rates is strongly related to the change of forest governance. We recommend revisiting the Indonesian forest governance framework to ensure more checks and balances in decision making, better monitoring and increased transparency, with particular support for Forest Management Units as a new tool for forest management, and government support to facilitate the design and implementation of REDD+ projects.

**Keywords:** Indonesia, decentralisation, deforestation, forest governance

**JEL:** H110

## **1 Introduction**

Indonesian forests account for around 2.3% of global forest cover (FAO, 2010) and represent 44% of the Southeast Asian forested area (KOH et al., 2013). According to the Indonesian Ministry of Forestry (MOF, 2011), the total designated forest area in Indonesia was about 131 million ha. In 2009/2010, approximately 98 million ha of the designated forest area was still forested (MOF, 2011). Indonesia is experiencing the world's second highest rates of deforestation, due to pressure associated with socio-economic and political changes (FAO, 2001, 2006; HANSEN et al., 2008, 2009; MARGONO et al., 2012). Indonesian deforestation is of global concern, because of the

resulting carbon emissions, the associated loss of biodiversity as well as the impacts on local ecosystem services (BISHOP and LANDEN-MILLS, 2002; SUNDERLIN et al., 2005).

Central Kalimantan has suffered the second highest rate of deforestation in Indonesia in recent years. From 2000-2008 the province lost approximately 0.9 million ha of forest (BROICH et al., 2011). Deforestation in this province is driven by a range of economic, institutional, social, ecological and infrastructural factors. One of the key issues in this context is the effect of the decentralisation policy implemented in Indonesia since 2000. This policy has substantially changed the authority of different levels of government over natural and forest resource management and has been identified as one of the underlying causes of deforestation (CASSON, 2001; COLFER and CAPISTRANO, 2005; RIBOT et al., 2006; BÉNE and NEILAND, 2006; LARSON and SOTO, 2008).

Several studies describe how inclusive decision making in decentralised governance can increase the quality of public services (GOLDFRANK, 2002; ACKERMAN, 2004), improved responsiveness and accountability of local government (Blair, 2000; GOLDFRANK, 2002), and enhanced equitable access to services and productive assets (HARDEE et al., 2000). However, it has also been shown that a lack of institutional capacities, a lack of transparency and limited citizen participation can act as major constraints for effective decentralised decision-making (CROOK and MANOR, 1998; DE MELLO, 2000). The studies note significant regional, national and sub-national variation in the effects of decentralisation (LARSON, 2002; ANDERSSON, 2003), and many of the aforementioned studies do not use sub-national data to examine the specific, local effects of decentralisation.

Given the far-reaching consequences of deforestation in Indonesia, both in terms of local impacts on livelihoods and global impacts on biodiversity and carbon emissions, there is a need to come to a better understanding of the relationship between decentralisation and deforestation in this country. This study analyses how deforestation rate can be linked to the recent decentralisation policy in Indonesia. The study covers 11 districts in Central Kalimantan province. The main innovation of this paper is to provide both a descriptive analysis of the institutional changes that have taken place in Indonesia and an empirical analysis of the relationship between institutional change and deforestation at the district level. To enhance and address the problem of decentralisation, we employed a three-pronged approach. First, we framed the description of the decentralisation process from a new institutionalised perspective, as presented in section 2. Second, in section 3, we utilised comparable and time-series observations on deforestation as the environmental outcome. We used land cover maps from the Indonesian Ministry of Forestry, for three different years (2000, 2005 and 2010). In this section, we also explore the variation of ten indicators of the quality of forest

governance, capturing four principles of good forest governance (accountability, equity, transparency and participation), for the periods 2000-2005 and 2005-2010. Third, we employed comparative analysis to examine the relationship between the quality of decentralised forest governance and deforestation rates at the district level. The key results from the comparative analysis are provided in section 4, followed by the discussion and conclusions in sections 5 and 6, respectively.

## 2 Decentralisation Reform and Forest Governance

The East Asian economic crisis in 1997/1998 was the impetus for decentralisation in Indonesia. The crisis put the Indonesian financial and administrative system into disarray. As part of the package offered by the International Monetary Fund (IMF), Indonesia was required to implement various reforms aimed at deregulating markets, privatising state sectors and imposing fiscal austerity. In addition to market reforms, a fundamental transformation in the governance system was a key condition of the package (ROBINSON et al., 2002). The conditional bail out of the country's economy by the IMF, the World Bank and other donors bankrolled market reforms along with a governance programme that included decentralisation reforms (MCCARTHY, 2004). The WORLD BANK (2001) argued that under appropriate conditions decentralisation would help alleviate the administrative bottlenecks in the decision making process, increase government efficiency and its responsiveness to local needs, enhance accountability of public institutions, improve service delivery, and allow greater political representation and participation of diverse groups in decision making at different levels.

The decentralisation reforms in Indonesia were guided by a range of specific laws. The initial legal frameworks were Law No. 22/1999 on Regional Governance and Law No. 25/1999 on the Balance of Funds. According to Law No. 25/1999, all districts now receive approximately 25% of the national budget in the form of block grants. The authority of the districts, in almost all sectors of government, also increased due to the implementation of Law No. 22/1999 (BURGESS et al., 2012). Decentralisation in the forestry sector in Indonesia was implemented based on Law No. 22/1999 and No. 25/1999. Law No. 22/1999 grants the authority over forest areas to the Ministry of Forestry and Law No. 25/1999 gives authority to the *Bupati* (head of the district) or *Walikota* (head of the municipality) to utilize forest resources in generating income for local development. To give effect to Law No. 22/1999, the Ministry of Forestry issued ministerial decrees No. 05.01/Kpts-II/2000 and No. 21/Kpts-II/2001 granting *Bupati* and *Walikota* the authority to issue small-scale timber concession licences to co-operatives, individuals, or corporations owned by Indonesian citizens for areas of up to 100 hectares within conversion forests and production forests slated for reclassification to other uses. Decentralisation also changed the distribution of public benefit from the forestry sector in favour of district, province and national government (Table 1).

**Table 1. Proportion of income from the forestry sector among national, province and district before and after decentralisation**

Source	Proportion before decentralisation (%)			Proportion after decentralisation (%)		
	National	Province	District	National	Province	District
Levy on forest concession rights	55 <sup>1</sup>	30 <sup>1</sup>	15 <sup>1</sup>	20 <sup>3</sup>	16 <sup>3</sup>	64 <sup>3</sup>
Resource royalty provision	55 <sup>1</sup>	30 <sup>1</sup>	15 <sup>1</sup>	20 <sup>3</sup>	16 <sup>3</sup>	32 <sup>3</sup>
Reforestation fund	100 <sup>1</sup>	0 <sup>1</sup>	0 <sup>1</sup>	60 <sup>2,3</sup>	0 <sup>2,3</sup>	40 <sup>2,3</sup>

Source: <sup>1</sup>President Decree No. 30/1999, <sup>2</sup>Law 25/1999, <sup>3</sup>Law No. 33/2004

Considering the environmental effect on deforestation and forest degradation, central government refined Law No. 22/1999 in Law No. 34/2002 to recall the authority of the district governments in issuing small-scale timber licences. Corresponding to this law, the Ministry of Forestry issued Ministerial decree No P.03/Menhut-II/2005. This regulation basically cancels the authority for issuing timber licences at the district and provincial levels, and provides new guidelines for verifying the licences that had been granted by districts or provinces during the initial decentralisation period.

The outcome of decentralisation reform in Indonesia was determined by the convergence of several national and local forces (MANOR, 1999; RIBOT, 2002). The economic crisis of 1997 indicated a crisis of legitimacy for state institutions. The inability of the centralised governance system to respond to the economic and political crisis raised serious questions regarding their effectiveness (RASYID, 2002). Increased autonomy in decision-making and distribution of resources in decentralisation was perceived as a crucial alternative to prevent national disintegration (VAN ZORGE, 1999).

Decentralised forest governance was expected to influence the social and environmental outcomes in six ways: (i) participation and efficiency for local priorities, (ii) empowerment and democratisation, (iii) equitable access to resources, (iv) greater accountability in local government, (v) tailoring resource management to the local context, and (vi) conflict resolutions (RIBOT et al., 2006; BÉNÉ and NEILAND, 2006; BERKES, 2010). Decentralised natural resource governance requires sufficient and adequate internal institutional capacity. In Indonesia, decentralised forest governance has shifted an important part of the forestry mandate from the central to the district government level. District forest officials received a mandate to enforce forest policies

and to control deforestation at the district level (BURGESS et al., 2012). In order to carry out the mandated functions, the district government needs to have a certain level of financial resources, qualified personnel and the ability to organize their internal affairs. The actual outcomes of the decentralised policies adopted in Indonesia, have been very mixed and do not conform to these six principles (Table 2), as examined in detail for Central Kalimantan in the following sections.

**Table 2. Intentions and outcomes of decentralised natural resource management**

Intention	Outcome
Participatory development and greater efficiency for local priorities <sup>1,2,3,4,5</sup>	Local jurisdiction did not receive sufficient power or resources <sup>1,2,3,4,5</sup>
Increased voice for local communities, empowerment and democratisation <sup>1,2,5</sup>	The elite captured resources, as the powerful locals took advantage of uncertainties <sup>1,2,5</sup>
Poverty reduction through equitable access to resources <sup>1,2,3,4,5</sup>	Extreme poor and disadvantaged groups were marginalised <sup>1,2,3,4,5</sup>
Greater accountability in local governments <sup>1,2,5</sup>	Lack of representativeness of decentralised body <sup>1,2,5</sup>
Tailor resource management objectives to local contexts <sup>1,5</sup>	Fragmented management responsibility for ecosystems <sup>1,5</sup>
Local conflict resolution and more sustainable resource management outcomes <sup>1,2,3,4,5</sup>	Created more local conflicts and social tensions, some leading to resource overuse <sup>1,2,3,4,5</sup>

Sources: <sup>1</sup>RIBOT et al. (2006), <sup>2</sup>BÉNÉ and NEILAND (2006), <sup>3</sup>LARSON and SOTO (2008), <sup>4</sup>COLFER and CAPISTRANO (2005), <sup>5</sup>BERKES (2010)

### 3 Methodology

#### 3.1 Study Area

Central Kalimantan is located in the southern part of Kalimantan, Indonesia between latitudes 0°45' North and 3°30' South, and longitudes 110°45'- 115°50' East (Figure 1). The province covers an area of approximately 15.4 million ha (BPS, 2010) of which 82% (12.7 million ha) is designated as forest area (MoF, 2011). Based on the land cover map of 2010, about 57% of the province is covered by forest, including plantation forests, in 2010. Substantial land use and land cover change has taken place in this province; about 1.3 million ha of forest cover has been deforested during the period 2000-2009 (MoF, 2010). The total population in this province in 2010 was 2.2 million, while agriculture and forestry (including timber and non-timber forest products) are the main sources of local GDP (BPS, 2010). Following decentralisation and decentralisation laws No. 22/1999 and No. 25/1999, the number of districts in

Central Kalimantan increased from 5 to 13. All of these new districts were founded in 2002 based on Law No. 5/2002.

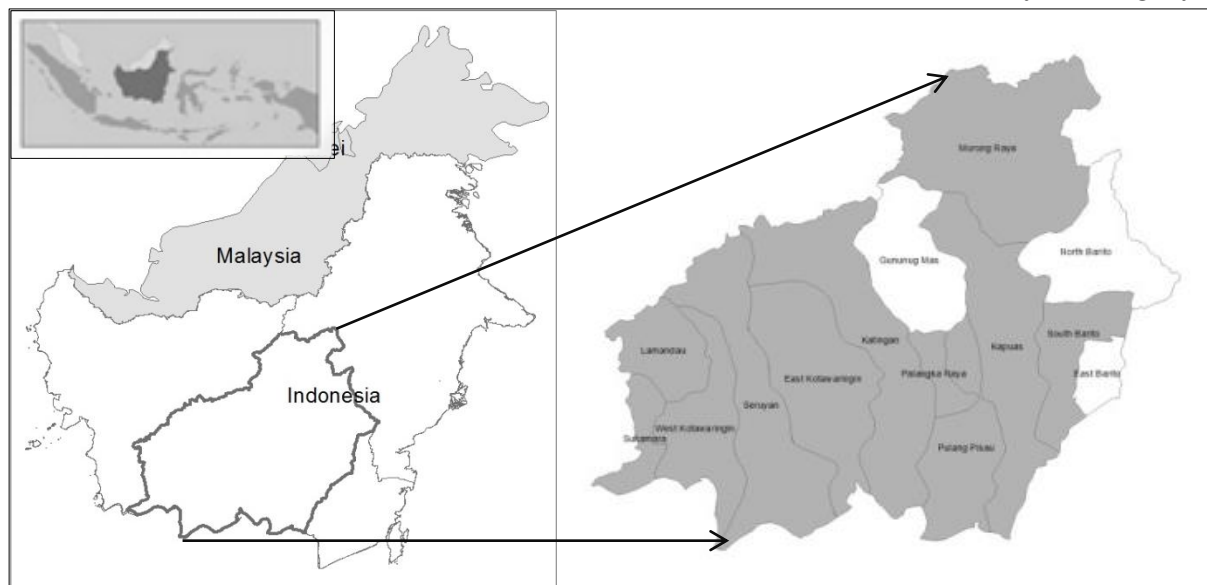
**Table 3. Districts in Central Kalimantan, before and after decentralisation**

Districts before decentralisation	Districts after decentralisation
Kotawaringin Barat	Kotawaringin Barat, Lamandau, Sukamara
Kotawaringin Timur	Kotawaringin Timur, Seruyan, Katingan
Barito Selatan	Barito Selatan, Barito Timur, Barito Utara
Kapuas	Kapuas, Murung Raya, Pulang Pisau, Gunung Mas
Kota Palangkaraya	Kota Palangkaraya

Source: BPS (2010)

This study covers 11 districts out of the 14 districts in this province. The districts included in the study are presented in Figure 1.

**Figure 1. Map of Indonesia (inset) showing the zoom out of the study area in Central Kalimantan Province; the districts covered in this study are in grey**



Source: BPS (2010)

### 3.2 Dynamics of Deforestation at the District Level

To analyse the dynamics of deforestation, we assessed land cover change and analysed various policies and legal aspects of deforestation in designated forest areas. We also compared the designated forest allocated for forest conversion by central government with the proposals from the provincial government. In this context, a “designated forest area” is any particular area designated and/or enacted by the government as permanent forest.

#### *3.2.1 Biophysical Analysis of Deforestation*

The analysis of deforestation in this paper was conducted for two different periods: 2000-2005 and 2005-2010. In this process, land cover maps of 2000, 2005 and 2010 (provided by Tropenbos International Indonesia Programme – TBI Indonesia) and the administrative map of Central Kalimantan were overlaid and analysed.

In the first step, the land cover maps were reclassified into two classes (forests and non-forests). Originally, the maps had 19 land cover classes. These maps were then reclassified by grouping primary dryland forest, secondary dryland forest, primary peat swamp forest, secondary peat swamp forest, primary mangrove forest, secondary mangrove forest, and plantation forest into forests, and the rests as non-forests.

In the second step, deforestation maps were generated for each period by overlying the land cover (forest and non-forest) maps of two different years. For example, we overlaid the land cover maps of 2000 and 2005 to identify the areas that were forested in 2000 but were not forested in 2005; these areas were then classified as deforested areas. The same procedure was applied for the period 2005-2010.

#### *3.2.2 Policy and Legal Analysis*

In order to improve our understanding of the legal aspects of the dynamics of the designated forest areas, we examined the policy and legal documents released by the central and provincial government. This analysis was conducted by comparing the percentage of designated forest areas allocated for forest conversion by the national government, based on the Ministry of Agriculture decree No. 759/KPTS/Um/10/1982, with the provincial government proposal which refers to provincial policies and legislation, as presented in Table 4.



**Table 4. Changing dynamics in designated forest areas in Central Kalimantan based on various legal documents released by national and provincial government**

Regulation	Designated Forest Area (ha)	Area allocated for conversion* (%)	National (N) or Province (P)
Forest land use by consensus (Ministry of Agriculture decree no. 759/KPTS/Um/10/1982)	15,320,100	28	N
Provincial legislation no 5/1993 supported by Letter of Ministry of Home Affairs No. 68/1994	15,356,400	27	P
Integrated and harmonised forest land use and consensus based on Governor decree no. 008/965/IV/BAPP in 1999	15,798,359	34	P
Provincial legislation no. 08/2003 on Spatial Planning of Central Kalimantan	15,356,700	31	P
Proposal for Spatial Planning of Central Kalimantan in 2007	15,410,482	44	P
Update of forest land use and consensus (2009/2010)	15,465,543	9	N
Ministry of Forestry Decree No. 529/Menhut-II/2012	15,263,242	17	N

Note: \*proportion of the designated forest area

Source: analysis of this study

### 3.3 Assessment of Forest Governance at the District Level

In order to understand decentralisation in forest governance, this study applied the basic theory of decentralised resource governance. This theory assumes and expects that local actors are willing to govern their natural resource effectively, and focus on the characteristics and performance of local institutions (RIBOT, 2002; ANDERSSON and OSTROM, 2008). Taking this theory into consideration, this study assessed forest governance, as the forest institution at the district level, in 11 districts in Central Kalimantan, for the period 2000-2005 and 2005-2010. Key variables used in this study cover the four principles of good forest governance (accountability, equity, transparency and participation) as explained under the framework of “good forest governance” developed by PROFOR-FAO (KISHOR and ROSENBAUM, 2012) and the framework of “governance quality” developed by the World Bank (HUTHER and SHAH, 1998), as presented in Table 5.

In this study we conducted field surveys and focus group discussions (FGD) for 11 districts in Central Kalimantan from July-October 2012. In each district we interviewed five different groups at the district level: (1) three forestry officers (head of the forest agency; head of planning, production, and conservation section; and head of forest management unit) from the forest institution which worked from 2000-2010; (2) community representatives; (3) NGOs which ran their activities during the period 2000-2010; (4) representatives of small to medium enterprises and companies; and (5) universities or higher education. Each face-to face interview took approximately 2-3 hours. The survey instrument (30 questions) was designed to elicit information regarding the four principles of good forest governance through 10 indicators of quality of the district forest governance. In addition, to strengthen and improve this survey data, we also conducted FGD at the district level. The FGD involved the representatives of the five groups.

**Table 5. Indicators of forest governance quality**

Pillars	Principle	Indicators
1. Policy, legal institutions, and regulatory frameworks 2. Planning and decision-making processes 3. Implementation, enforcement and compliance	1. Accountability	1. Existence of district policies on forest management. 2. Consistency and link between district and national policies on forest management. 3. Extension and implementation of a forestry mandate. 4. The independency of the forest district agency from political interference. 5. Capacity of forest agency staff.
	2. Equity	6. Equity in access to forest resources 7. Law enforcement.
	3. Transparency	8. Access to public data and information. 9. Public hearing and consultation during policy making.
	4. Participation	10. Stakeholder inputs and participation in land management policies.

Source: adopted from KISHOR and RESENBAUM (2012), HUTHER and SHAH (1998)

The 10 indicators of forest governance quality were elicited, agreed and scored based on the results of the interviews. These scores were on the scale of 1 to 4 (where 1 represents the worst condition and 4 represents the best). Further, we used the scores of these 10 indicators as independent variables for the empirical analysis.

### **3.4 Analysis of how Decentralisation Relates to Deforestation**

Previous studies on decentralisation described how inclusive decision making in decentralised governance may increase the quality of public services (GOLDFRANK, 2002; ACKERMAN, 2004), improves responsiveness and accountability of local government (BLAIR, 2000; GOLDFRANK, 2002; WHEELER et al., 2013), and enhance equitable access to services and productive assets (HARDEE et al., 2000). Considering the basic theory of decentralisation and findings from the previous studies above, this study examined the 10 indicators of the quality of forest governance in the period 2000-2005 and 2005-2010 and linked to the deforestation rates for the same time periods (2000-2005 and 2005-2010). We specify deforestation as the percentage of forest cover lost in the forested areas of each district.

The main hypothesis formulated in this paper is that deforestation will be inversely related to the score of each indicator as well as each principle of forest governance. High scores for the quality of forest governance would equate to a better accountability, equitability, transparency and participation in forest governance and lower deforestation. (c.f. BLAIR, 2000; HARDEE et al., 2000; GOLDFRANK, 2002; ACKERMAN, 2004; WHEELER et al., 2013)

## **4 Results**

### **4.1 Dynamics of Deforestation at District Level**

The analysis of land cover maps for the years 2000-2005 and 2005-2010 shows negative changes in forest cover in almost all districts. In the period 2000-2005, some districts such as Murung Raya and Kota Palangkaraya managed to maintain their forests and experienced no annual change in their forest cover. However, in the period 2005-2010, negative changes in forest cover were experienced in all districts. Table 6 shows that deforestation has accelerated in all districts, except for Seruyan, in the period 2005-2010.

### **4.2 Quality of Forest Governance at the District Level**

In the first period of decentralisation (2000-2005), the forest governance quality of most of districts remained relatively stable. In this period the new districts had just been established and they received additional support from the central government and/or from the old districts. Changes in quality of forest governance in the districts began in the period 2005-2010, when most districts experienced negative trends. However, some districts managed to improve their quality as measured with some of the indicators. These improvements were mostly related to their commitment to sustainable forest management practises through the planning and establishment of the

Forest Management Unit (FMU), in Kapuas and Barito Selatan, and the provision of an area to release orangutan in Murung Raya (BOSF, 2012). This condition supports the findings of previous studies that decentralisation efforts do not uniformly lead to better or worse local governance (GIBSON and LEHOUCQ, 2003; SMOKE, 2003; WHEELER et al., 2013). Forest governance quality in 11 sample districts in the period of 2000-2005 and 2005-2010 is presented in Figure 2.

**Table 6. Annual changes in forest cover at the district level**  
(expressed as a percentage of the total forest cover in the district)

District	Annual change of forest cover (% of forested area)	
	2000-2005	2005-2010
Kotawaringin Barat	-0.8	-2.3
Lamandau	-0.4	-3.0
Sukamara	-4.9	-6.6
Kotawaringin Timur	-4.4	-5.1
Seruyan	-1.9	-1.1
Katingan	-0.1	-1.3
Barito Selatan	-1.6	-1.9
Barito Timur*	-2.3	-5.3
Kapuas	-0.7	-1.3
Murung Raya	-0.0	-0.3
Pulang Pisau	-0.3	-2.6
Gunung Mas*	-0.1	-0.9
Kota Palangkaraya	-0.0	-1.5
Barito Utara*	-1.2	-1.9
Provincial average	-0.9	-1.7

\*not captured in the study

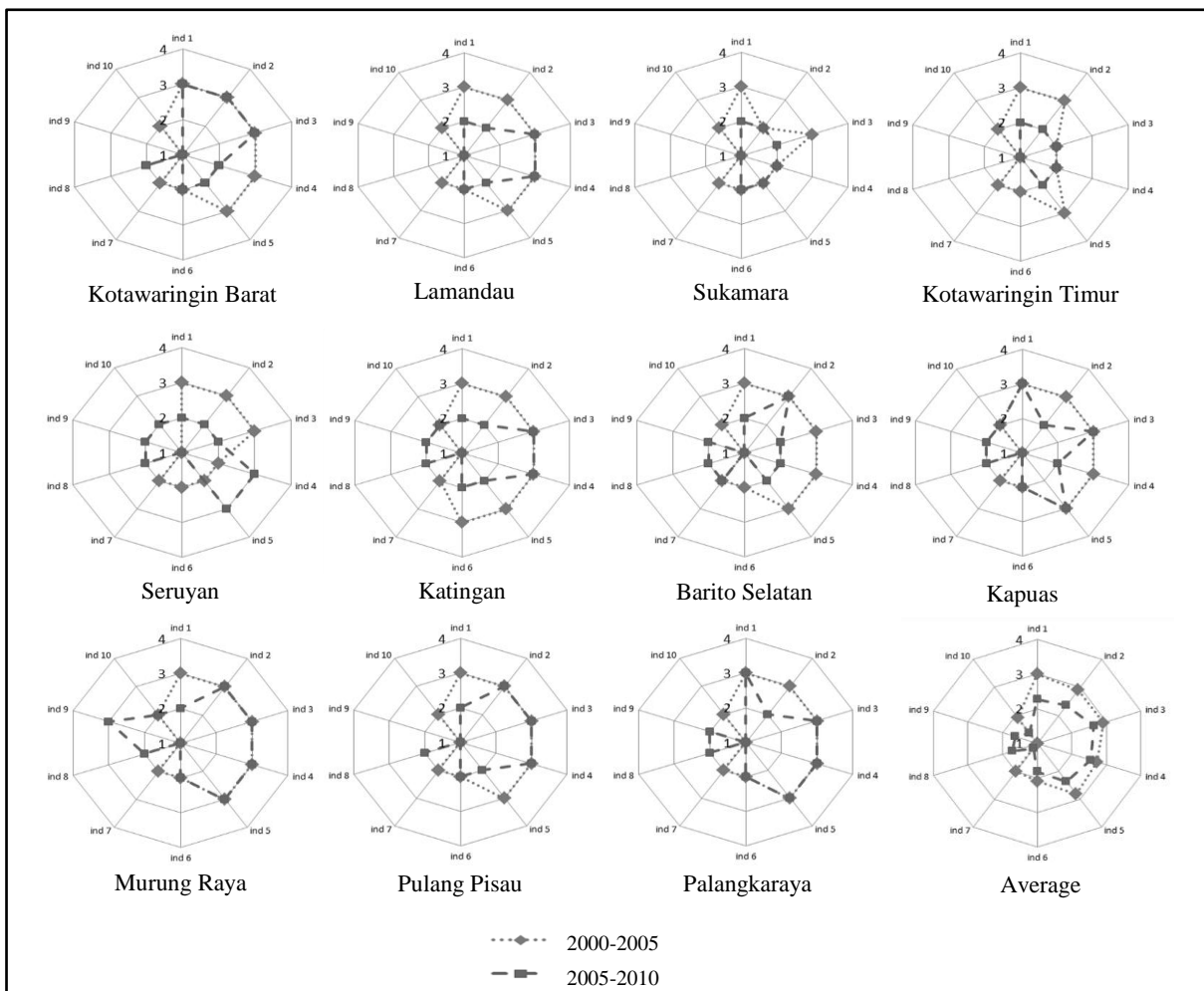
Source: land cover map 2000, 2005 and 2010

### 4.3 The Impacts of Decentralisation on Deforestation

The dynamics of the institutional arrangements under decentralised forest governance has changed the interest of the district heads, as well as the dominant political party, and changed the quality of forest governance. The results of our comparative analysis show that most districts experienced a decrease in the total score for forest governance in 2005-2010 compared with those in 2000-2005 (except for Kapuas district). In addition, the deforestation rate for most districts in 2005-2010 had increased compared

with those in 2000-2005 (except for Seruyan district that witnessed a reduction in the pace of deforestation). The scores for forest governance and changes therein, and the deforestation rates are shown in Table 7.

**Figure 2. Trends in forest governance quality in 11 sample districts in Central Kalimantan Province**



Source: analysis in this study

Our analysis shows that the change in score for accountability (indicators 1, 2, 3, 4 and 5) has a weak relationship with the change of deforestation rate (see Table 7 and Appendix 1 and 2). There is no obvious correlation between (changes in) the forest governance score and (changes in) the deforestation rate. These results support the findings of previous studies that indicate that accountability is not necessarily a main aspect in explaining deforestation (ANDERSSON and OSTROM, 2008; MCCARTHY, 2004; CASSON, 2001).

We also found that the change in score for equity (indicator 6 and 7) has a weak correlation with the change of deforestation rates (Appendix 1 and 2). Districts with a higher score for indicator 6 and 7 still experience fast deforestation, while some districts with a lower score have a low deforestation rate. In terms of indicator 6, which measures the equitable access to forest resources, our interviews with communities who live around the forest area show that even in the case of a degraded forest they generally still have sufficient access to the forest to collect NTFPs for their livelihoods. As for law enforcement (indicator 7) our interviews with staff of forestry agencies and NGOs shows that the police often gives low priority to arresting illegal logging, which may be related to the involvement of well-connected people in illegal logging (cf MCCARTHY, 2001a; MCCARTHY, 2001b; PALMER, 2000). Since the decentralisation did not manage to significantly improve law enforcement, indicator 7 also has a weak correlation with deforestation.

**Table 7. Scores for forest governance and the deforestation rates in two periods**

District	Deforestation per year (% of forest area in the district)		Governance (total score of 10 indicators)		Change (2010-2005)-(2000-2005)	
	2000-2005	2005-2010	2000-2005	2005-2010	Deforestation	Governance
Kotawaringin Barat	-0.8	-2.3	23	20	1.5	-3
Lamandau	-0.4	-3	23	18	2.6	-5
Sukamara	-4.9	-6.6	20	16	1.7	-4
Kotawaringin Timur	-4.4	-5.1	21	18	0.7	-3
Seruyan	-1.9	-1.1	20	19	-0.8	-1
Katingan	-0.1	-1.3	24	21	1.2	-3
Barito Selatan	-1.6	-1.9	20	19	0.3	-1
Kapuas	-0.7	-1.3	23	23	0.6	0
Murung Raya	0	-0.3	23	22	0.3	-1
Pulang Pisau	-0.3	-2.6	23	20	2.3	-3
Kota Palangkaraya	0	-1.5	23	21	1.5	-2

Source: analysis in this study

The principle of transparency is captured in indicators 8 and 9, while the principle of participation is captured in indicator 10. Our analysis shows that districts with an increase in transparency and participation tend to have a lower increase of the deforestation rate (Appendix 1 and 2). Access to public data and information is captured in Law No. 14/2008 and Provincial Regulation No. 59/2008 concerning the

procedures for research and data collection involving government institutions. This regulation requires all agencies at the district and provincial levels to share data and information with researchers, including students, university staff and scientists, conditional on them having a research permit. In return, this regulation also requires the researcher to report and share their research results with the district(s) and province(s). Our study shows that the districts with a lower increase in deforestation rates were more supportive to research, although it is not clear if the research led to the improvement in managing forest conditions or if better governed districts were more open to work with researchers. Our analysis also shows a significant correlation between the change in score for indicator 9 and deforestation rates (see Appendix 1 and 2). Districts in which public hearings and consultations were conducted in higher numbers tend to have a low deforestation rate. This suggests that public hearings and consultations are important in the policy-making process in order to capture public interest and opinions, as was confirmed by our interviews of stakeholders in NGOs and the forest sector. Our correlation analysis also indicates that the participation of stakeholders (indicator 10) is important in promoting better forest governance, confirming the work of BAE et al., 2014, in West Nusa Tenggara Province. A Pearson test shows that the correlation between deforestation and indicator 8, 9 and 10 was significant at  $\alpha = 0.01$ ,  $\alpha = 0.05$ , and  $\alpha = 0.01$ , respectively (Appendix 2). Even though our sample size was too small for a comprehensive correlation analysis, the combination of interview results and our limited statistical test indicates the importance of transparency as a main factor driving deforestation rates at the local level.

## **5 Discussion**

### **5.1 Key Variables Determining Deforestation in Central Kalimantan**

The results of our study show that the implementation of the decentralisation policy has changed the institutional arrangement of forest governance at the district level, both in the old and new districts. Most districts experienced lower scores for forest governance in 2005-2010 compared to the score in 2000-2005 (only Kapuas district could maintain the score at the same level). Hence, contrary to the objective of the decentralisation policies, our study shows that an improvement in forest governance at the district level in the period after the decentralisation could not be observed.

Law enforcement and consistency between the district and national forest policy have been identified as a significant driver for illegal deforestation in Indonesia (PALMER, 2000; COLFER et al., 2005). However, our analysis did not show a strong correlation between law enforcement and deforestation in the districts we sampled. This can either point to the lack of importance of law enforcement or, perhaps more probable given

persistent reports of illegal logging in Central Kalimantan (CASSON and OBIDZINSKI, 2002) to the option that illegal logging takes place in all districts and is not strongly influenced by the differences in governance that are observable between districts in this province. Our interviews showed that there may be a general lack of transparency across the province in terms of the process followed by district forest officers to issue logging permits or stop illegal logging, even though differences between sites occur for example due to NGO or local citizens' activities (CASSON and OBIDZINSKI, 2002).

The notion that the dynamics of institutional arrangements for forest governance is a key underlying cause of deforestation is also captured in changes of forest policy and regulations in designated forest areas. Based on policy analysis of various legal documents released by the national government, we found changes in the designated forest areas, as well as designated areas for conversion forest in Central Kalimantan. An important finding from our policy analysis is that the provincial government is keen to promote the conversion of forest area to other land uses to support their development programme. The provincial government started with allocating approximately 27% of forests for conversion in 1993 (Provincial legislation No 5/1993 supported by the Letter of Ministry of Home Affairs No. 68/1994) and increased this to approximately 44% in the spatial planning proposal of 2007 (Table 3).

Our study has only analysed the quality of decentralised forest governance as an underlying cause of deforestation, and does not include other drivers of deforestation. Several studies show that the expansion of oil palm plantation is a major driver of deforestation in Indonesia (BUTLER et al, 2009; BOER et al., 2012). Oil palm expansion and governance are of course related, since the local government is one of the actors that issues permits for new plantations (CASSON, 2001; MCCARTHY, 2004).

## **5.2 Deforestation Impact and Policy Implications**

Forests provide a range of valuable commodities (timber and non-timber) and other ecosystem services such as watershed protection, recreation, landscape beauty, climate stabilizer, carbon sequestration and genetic information storage (TEEB, 2010). Deforestation will lead to a reduction in the capacity of forest ecosystems to provide such services with associated impacts at local to global scales (BISHOP and LANDEN-MILLS, 2002; SUNDERLIN et al., 2005; LAMB, 2011).

Deforestation in Central Kalimantan induces an additional environmental concern due to the wide occurrence of peatland forest. Peatland forest has a high capacity for storing carbon and maintaining hydrological functions. A very deep peat layer is able to store carbon up to 7,700 ton C/ha while converting peatland forest followed by drainage leads to high carbon emission up to 23 ton C/ha/year (HOOIJER et al., 2010).



In addition, the drainage of peatland will lead to soil subsidence of about 3 to 5 cm per year depending on drainage level and contributes to high risk of fires and flooding (HOOIJER et al., 2010).

Considering the social and environmental consequences of deforestation, there is a need to examine how policies can be strengthened to enhance the quality of forest governance at the district level and ensure the implementation of better forest management practices. In order to meet these needs, we propose the following policy recommendations:

### *1. Revisit the Decentralisation Policy Framework*

The decentralisation policy plays a crucial role in forest and land management in Indonesia. The disconnection between theory and practice of decentralised forest governance is exemplified when dealing with land use management, based on Law No. 22/1999. The practical lack of congruence between this procedure and actual practice of granting permits has, in many districts, led to a lack of local participation and transparency in forest resource utilization. Hence, as also illustrated by our regression analysis, there is a need to enhance and enforce the requirements for stakeholder consultation and public hearings in forest management planning, with due consideration for the limitations of public hearings as an environmental management tool (SOMA and VATN, 2014). In addition, there is a need for establishing better procedures for public litigation. Litigation is an important tool in combating environmental degradation, particularly where state monitoring is suboptimal (ARNOLD, 2008). In particular, procedures for litigation should be established in forestry law as well as decentralisation laws. Finally, there is a need to carefully consider and streamline the responsibilities of the different government agencies in managing forests, in order to ensure that sufficient checks and balances are in place and that there are no overlapping mandates.

### *2. Support for Forest Management Units – FMUs (Kesatuan Pengelolaan Hutan – KPH)*

The FMUs were initiated by the national government based on Ministry of Forestry regulations No. 6/2007 and No. 3/2008 on the establishment of forest systems, and the preparation of the forest management plan and forest utilisation (KARTODIHARDJO et al., 2011). The development of FMUs is meant 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. Hence, the FMU is a promising instrument that could help to improve forest governance. However, central government needs to facilitate and improve the integration and coordination between existing forest agencies at the district and provincial level and FMU (BAE et al., 2004). The budget and technical capacity of the FMUs also

need to be improved. Our interviews, supported by the survey conducted by BAE et al. (2014), show that currently most FMUs operate under severe budget constraints (e.g. a lack of funds for transport, monitoring and enforcement). The technical staff also require training, for instance in community engagement. Sustainable funding from the district, province and national government needs to be safeguarded to ensure the continuity of the FMUs, and the cost of developing participatory management plans and their implementation should be covered by the district or province (in line with Government Regulation No. 6/2007 and Head of Forestry Planning Decree No. SK. 80/VII-PW/2006).

### *3. Facilitation of the Development of New REDD+ Projects*

The implementation of REDD+ provides economic incentives based on forest carbon credits that could make a significant contribution to reduce deforestation and forest degradation. REDD+ could also provide innovative and stable forms of finance for local development programs, assist benefit distribution for community development through national and local government policies, and support the monitoring of forest cover and condition (DANIELSEN et al., 2010; HOANG et al., 2013). In order to make REDD+ work, the enabling conditions need to be improved by establishing and implementing regulations for the Environmental Management and Protection Law, which are not yet in place. These laws include transparent permit procedures and regulations to avoid uncertainty for REDD+ projects or programmes. Further, these laws could be used as the guideline to define the roles and mandates of local and central government, particularly in terms of clarifying the rights and responsibilities related to REDD+. For investors, a key element will be to ensure that multi-stakeholder processes play a central role in REDD+ design and implementation, and that sufficient time is allocated to stakeholders' involvement.

### *4. Better Monitoring and Sharing Information on Forest Condition at the District Level*

Monitoring is a key aspect of sustainable forest management. Transparency in forest governance requires a long-term national forest monitoring system to achieve sustainable forest management, and reduction of deforestation and forest degradation (FULLER, 2006). The national forest monitoring system in Indonesia is being developed based on monitoring, reporting and verification (MRV) requirements of the REDD+ scheme. The system would provide real time data and information on forest cover, generated from high resolution satellite images in combination with field measurements. The information in this monitoring system should be made available not only to technical officers in the district and provincial government but also to other stakeholders (community organisation, NGOs, companies) in order to enhance transparency which we believe is a key factor in improving forest governance in Indonesia.

## 6 Conclusion

Deforestation is a function of complex interactions between natural, socio-economic and institutional processes. We examined the relationship between ten indicators of forest governance and district-level deforestation in Central Kalimantan, Indonesia. Our study in 11 districts indicates that local governance quality influences deforestation rates. A key factor appears to transparency of local procedures, as expressed by the number of public hearings and consultations the district organises in support of forest policy formulation and implementation. Furthermore, our study shows that decentralisation of Indonesian forest policies has, in the case of Central Kalimantan, led to a decrease in local governance quality and an increase in deforestation, over the period 2000-2010. In 10 out of 11 examined districts (the exception being Seruyan district), deforestation rates increased in the period 2005-2010 compared to the period 2000-2005. We recommend revisiting the Indonesian forest governance framework in order to ensure more checks and balances in decision making, better monitoring and increased transparency, with particular support for Forest Management Units as a new tool for forest management as well as for existing and new REDD+ projects.

## References

- ACKERMAN, J. (2004): Co-governance for accountability: Beyond 'Exit' and 'Voice'. In: *World Development* (32): 447-463.
- ANDERSSON, K.P. and E. OSTROM (2008): Analysing decentralised resource regimes from a polycentric perspective. In: *Policy science* (41): 71-93. Doi: 10.1007/s11077-007-9055-6.
- ANDERSON, K. (2003): What motives municipal governments? Uncovering the institutional incentives for municipal governance of forest resource in Bolivia. In: *Journal of Environment and Development* (12): 5-27.
- ARNOLD, L.L. (2008): Deforestation in decentralised Indonesia: What's law got to do with it? In: *Law, environment and development journal* 4/2.
- BADAN PUSAN STATISTIK (2010): *Statistic of Central Kalimantan Province*. Indonesian Statistic Bureau. Jakarta, Indonesia.
- BAE, J.S., Y.-S. KIM, L. FISHER, M. MOELIONO and J. DESHAZO (2014): Promises and Perils of Decentralized Forest Governance: The Case of Indonesia's Forest Management Units in Reducing Emission from Deforestation and Forest Degradation (REDD+). In: *Society & Natural Resources* 27 (12): 1-9. Doi: 10.1080/08941920.2014.945061.
- BÉNÉ, C. and A.E. NEILAND (2006): From participation to governance: A critical review of the concepts of governance, co-management and participation, and their implementation in small-scale inland fisheries in developing countries. *WorldFish center studies and reviews* 29. The WorldFish Center, Penang, Malaysia and the CGIAR challenge program on water and food, Colombo, Sri Lanka.

- BERKES, F. (2010): Devolution of Environment and Resource Governance: Trends and Future. In: *Environmental Conservation* 37 (4): 489-500. Doi:10.1017/S037689291000072X.
- BISHOP, J. and N. LANDELL-MILLS (2002): Forest environmental services: An Overview. Selling forest environmental services: market-based mechanisms for conservation and development. Earthscan. UK.
- BLAIR, H. (2000): Participation and accountability at the periphery: Democratic local governance in six countries. In: *World Development* (28): 21-39.
- BPS (National Statistical Bureau) (2010): Central Kalimantan in figure 2010. Jakarta. Indonesia.
- BOER, R., D.R. NURROCHMAT, M. ARDIANSYAH, HARIYADI, H. PURWAWANGSA and G. GINTING (2012): Reducing agriculture expansion into forest in Central Kalimantan: analysis of implementation and financial gaps. Centre for Climate and Opportunity Management, Bogor Agricultural University, Indonesia.
- BOSF (Borneo orangutan survival foundation) (2012): Signing of a joint workplan between BOSF and Murung Raya regency. URL: <http://orangutan.or.id/the-signing-of-a-joint-work-plan-between-bosf-murung-raya-regency/>.
- BURGESS, R., M. HANSEN, B.A. OLKEN, P. POTAPOV and S. SIEBER (2012): The Political Economy of Deforestation in the Tropics\*. In: *The Quarterly Journal of Economics* 127 (2012): 1707-1754. Doi: 10.1093/qje/qjs034.
- BUTLER, R.A., L.P. KOH and J. GHAZOUL (2009): REDD in the red: palm oil could undermine carbon payments schemes. In: *Conservation letters* (2): 67-73. Doi: 10.1111/j.1755263X.2009.00047.x.
- BROICH, M., M. HANSEN, F. STOLLE, P. POTAPOV, B.A. MARGONO and B. ADUSEI (2011): Remotely sensed forest cover loss shows high spatial and temporal variation across Sumatera and Kalimantan, Indonesia 2000–2008. In: *Environmental Research Letters* 6 (014010). Doi:10.1088/1748-9326/6/1/014010.
- CASSON, A. (2001): Decentralisation of policies affecting forest estate crops in Kotawaringin Timur district, Central Kalimantan. Case studies on decentralisation and forests in Indonesia. Case Study No. 5. CIFOR. Bogor, Indonesia.
- CASSON, A. and K. OBIDZINSKI (2002): From New Order to Regional Autonomy: Shifting Dynamics of “Illegal” Logging in Kalimantan, Indonesia. In: *World Development* 30 (12): 2133-2151. Doi: 10.1016/S0305-750X(02)00125-0.
- COLFER, C.J.P. and D. Capistrano (2005): The Politics of Decentralisation. Forest, People and Power. Earthscan, London, United Kingdom.
- CROOK, R. and J. MANOR (1998): Democracy and decentralisation in South East Asia and West Africa. Cambridge University Press, Cambridge, UK.
- DANIELSEN, F., M. SKUTSCH, N.D. BURGESS, P.M. JENSEN, H. ANDRIANANDRASANA, B. KARKY, R. LEWIS, J.C. LOVETT, J. MASSAO, Y. NGAGA, P. PHARTIYAL, M.K. POULSEN, S.P. SINGH, M. SØRENSEN, A. TEWARI, R. YOUNG and E. ZAHABU (2010): At the heart of REDD+: a role for local people in monitoring forests? In: *Conservation Letters* 2010 (4): 158-167. Doi: 10.1111/j.1755-263X.2010.00159.x.
- DE MELLO, L.R. (2000): Fiscal decentralisation and intergovernmental fiscal relations: A cross country analysis. In: *World Development* (28): 365-380.

- FAO (2001): Global Forest Resources Assessment 2000. FAO Forestry Paper No. 140. Rome, Italy.
- (2006): Global Forest Resource Assessment 2005. FAO Forestry Paper No. 147. Rome, Italy.
- (2010): Global Forest Resource Assessment 2010. Country Report Indonesia Forest Resource Assessment (FRA). Report no. 2010095. Rome, Italy.
- FULLER, D.O. (2006): Tropical forest monitoring and remote sensing: A new era of transparency in forest governance? In: Singapore Journal of Tropical Geography 27 (2006): 15-29. Doi:10.1111/j.1467-9493.2006.00237.x.
- GIBSON, C. and F. LEHOUCG (2003): The local politics of decentralised environmental policy in Guatemala. In: Journal of Environment and Development (12): 28-49.
- GOLDFRANK, B. (2002): The fragile flower and local democracy: A case study of decentralisation and participation in Montevideo. In: Politics and Society (30): 51-83.
- HANSEN, M.C., S.V. STEHMAN, P.V. POTAPF, K.W. PITTMAN, B. ARUNAWATI and F. STOLLE (2009): Quantifying changes in the rates of forest clearing in Indonesia from 1990 to 2005 using remotely sensed data sets. In: Environmental Research Letters 4 (034001). Doi: 10.1088/1748-9326/4/3/034001.
- HANSEN, M.C., S.V. STEHMAN, P.V. POTAPOV, T.R. LOVELAND, J.R.G. TOWNSHEND, R.S. DEFRIES, K.W. PITTMAN, B. MARGONO, F. STOLLE, M.K. STEININGER, M. CARROLL and C. DiMICELI (2008): Humid tropical forest clearing from 2000 to 2005 quantified by using multitemporal and multiresolution remotely sensed data. Proceeding of the National Academic Science (PNAS) 105: 9439-9444. Doi: 10.1073/pnas.0804042105.
- HARDEE, K., M. BRONFMAN, T. VALENZUELA and W. MCGREEVEY (2000): Promoting partnership and participation in the context of decentralisation. Policy project paper. USAID, Washington, D.C.
- HOANG, M.H., T.H. DO, M.T. PHAM, M. VAN NOORDWIJK and P.A. MINANG (2013): Benefit distribution across scales to reduce emissions from deforestation and forest degradation (REDD+) in Vietnam. In: Land Use Policy (31): 48-60. Doi: 10.1016/j.landusepol.2011.09.013.
- HOOIJER, A., S. PAGE, J.G. CANADEL, M. SILVIUS, J. KWADIJK, H. WÖSTEN and J. JAUHIAINEN (2010): Current and future CO<sub>2</sub> emissions from drained peatlands in Southeast Asia. In: Biogeosciences (7): 1505-1514. Doi: 10.5194/bg-7-1505-2010.
- HUTHER, J. and A. SHAH (1998): Applying a simple measure of good governance to the debate on fiscal decentralisation. Policy research working paper no. 1894. The World Bank, Washington, D.C.
- KARTODIHARDJO, H., N. NUGROHO and H.R. PUTRO (2011): Forest management unit development. Concept, legislation and implementation. Ministry of Forestry Indonesia and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Jakarta, Indonesia.
- KISHOR, N. and K. ROSENBAUM (2012): Assessing and monitoring forest governance: a user's guide to a diagnostic tool. Program on Forests (PROFOR). PROFOR, Washington, D.C.
- KOH, L.P., C.J. KETTLE, D. SHEIL, T.M. LEE, X. GIAM, L. GIBSON and G.R. CLEMENTS (2013): Biodiversity state and trends in Southeast Asia. In: Levin, S. (ed.): Encyclopedia of

- Biodiversity, 1. Elsevier, Amsterdam: 509-527. Doi: 10.1016/B978-0-12-384719-5.00357-9.
- LAMB, D. (2011): Regreening the bare hills. Tropical forest restoration in the Asia Pacific region. World Forest VIII. Springer, Heidelberg, London, New York.
- LARSON, A.M. (2002): Natural resources and decentralisation in Nicaragua: Are local governments up to the job? In: World Development (30): 17-31.
- LARSON, A.M. and F. SOTO (2008): Decentralisation of Natural Resource Governance Regimes. In: Annual Review of Environment and Resources (33): 213-39. Doi: 10.1146/annurev.enviro.33.020607.095522.
- MANOR, J. (1999): The political economy of decentralisation. The World Bank, Washington, D.C.
- MARGONO, B.A., S. TURUBANOVA, I. ZHURAVLEVA, P. POTAPOV, A. TYUKAVINA, A. BACCINI, S. GOETZ and M.C. HANSEN (2012): Mapping and monitoring deforestation and forest degradation in Sumatra (Indonesia) using Landsat time series data sets from 1990 to 2010. In: Environmental Research Letters 7 (3). Doi: 10.1088/1748-9326/7/3/034010.
- MCCARTHY, J. (2004): Changing to gray: Decentralisation and the emergence of volatile socio-legal configurations in Central Kalimantan, Indonesia. In: World Development 32 (7): 1199-1223. Doi: 10.1016/j.worlddev.2004.02.002.
- (2001a): Decentralisation, local communities and forest management in Barito Selatan District, Central Kalimantan. Center for International Forestry Research, Bogor, Indonesia.
- (2001b): Decentralisation and forest management in Kapuas District, Central Kalimantan. Center for International Forestry Research, Bogor, Indonesia.
- MoF (Ministry of Forestry) (2011): Indonesian forest statistic 2010. Indonesian Ministry of Forestry, Jakarta, Indonesia.
- PALMER, C.E. (2000): The Extent and Causes of Illegal Logging: An Analysis of A Major Cause of Tropical Deforestation In Indonesia. CSERGE Working Paper. Centre for Social and Economic Research on the Global Environment, London, England.
- RASYID, R.M. (2002): The policy of decentralisation in Indonesia. Paper prepared for the GSU conference 'Can decentralisation help re-build Indonesia?'. Atlanta, GA, USA, 1-3 May 2002.
- RIBOT, J. (2002): Democratic decentralisation of natural resources: Institutionalising popular participation. World Forest Institute, Washington, D.C.
- (2006): Choose democracy: environmentalists' socio-political responsibility. In: Global environmental change (16): 115-119. Doi: 10.1016/j.gloenvcha.2006.01.004.
- RIBOT, J.C., A. AGRAWAL and A.M. LARSON (2006): Recentralising while decentralising: How national governments re-appropriate forest resources. In: World Development (34): 1864-1886. Doi: 10.1016/j.worlddev.2005.11.020.
- ROBINSON, R., G. RODAN and K. HEWISON (2002): Transplanting the regulatory state in Southeast Asia: A pathology of rejection. Working paper no. 33. Southeast Asia Research Centre, City University of Hong Kong, Hong Kong.
- SHEIL, D., A. CASSON, E. MEIJAARD, M. VAN NORDWIJK, J. GASKELL, J. SUNDERLAND-GROVES, K. WERTZ and M. KANNINEN (2009): The impacts and opportunities of oil

- palm in Southeast Asia: What do we know and what do we need to know? Occasional paper no. 51. CIFOR, Bogor, Indonesia.
- SMOKE, P. and B.D. LEWIS (1996): Fiscal decentralisation in Indonesia: A new approach to an old idea. In: *World Development* (24): 1281-1299.
- SMOKE, P. (2003): Decentralisation in Africa – Goals, dimensions, myths and challenges. In: *Public Administration and Development* (23): 7-16. Doi: 10.1002/pad.255.
- SOMA, K. and A. VATN (2014): Representing the common goods – Stakeholders vs. citizens. In: *Land Use Policy* 41 (2014): 325-333. Doi: 10.1016/j.landusepol.2014.06.015.
- SUNDERLIN, W.D., A. AGELSEN, B. BELCHER, P. BURGERS, R. NASI, L.A. SANTOSO and S. WUNDER (2005): Livelihoods, forest and conservation in developing countries: an overview. In: *World Development* 33 (9): 1383-1402. Doi: 10.1016/j.worlddev.2004.10.004.
- TEEB (The Economics of Ecosystems and Biodiversity) (2010): *The Economics of Ecosystem and Biodiversity: ecological and economic foundation*. Earthscan, London and Washington, D.C.
- WHEELER, D., D. HAMMER, R. KRAFT, S. DASGUPTA and B. BLANKESPOOR (2013): Economic dynamics and forest clearing: A spatial econometric analysis for Indonesia. In: *Ecological Economics* (85): 85-96. Doi: 10.1016/j.ecolon.2012.11.005.
- WORLD BANK (2001): What is decentralization? URL: <http://www1.worldbank.org/publicsector/decentralization/what.htm>.
- VAN ZORGE REPORT (1999): *Implementing reform: decentralising amid regional dissent*. Report no. 27 (29 November 1999): 4-13. Van Zorge, Hefferman & Associates, Jakarta, Indonesia.

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## Appendix 1. Scores from ten indicators of the forest governance quality in the districts

District	Period	ind 1	ind 2	ind 3	ind 4	ind 5	ind 6	ind 7	ind 8	ind 9	ind 10	Total Score	Deforestation per year (% to forest area in the district)
Kotawaringin Barat	2000-2005	3	3	3	3	3	2	2	1	1	2	23	-0.8
	2005-2010	3	3	3	2	2	2	1	2	1	1	20	-2.3
Lamandau	2000-2005	3	3	3	3	3	2	2	1	1	2	23	-0.4
	2005-2010	2	2	3	3	2	2	1	1	1	1	18	-3
Sukamara	2000-2005	3	2	3	2	2	2	2	1	1	2	20	-4.9
	2005-2010	2	2	2	2	2	2	1	1	1	1	16	-6.6
Kotawaringin Timur	2000-2005	3	3	2	2	3	2	2	1	1	2	21	-4.4
	2005-2010	2	2	2	2	2	2	2	1	1	1	17	-5.1
Seruyan	2000-2005	3	3	3	2	2	2	2	1	1	1	20	-1.9
	2005-2010	2	2	2	3	3	1	1	2	2	2	20	-1.1
Katingan	2000-2005	3	3	3	3	3	3	2	1	1	2	24	-0.1
	2005-2010	2	2	3	3	2	2	1	2	2	2	21	-1.3
Barito Selatan	2000-2005	3	3	3	3	3	2	2	1	1	2	23	-1.6
	2005-2010	2	3	2	2	2	1	2	2	2	1	19	-2.2
Kapuas	2000-2005	3	3	3	3	3	2	2	1	1	2	23	-0.7
	2005-2010	3	2	3	2	3	2	1	2	2	2	22	-1.3
Murung Raya	2000-2005	3	3	3	3	3	2	2	1	1	2	23	0
	2005-2010	2	3	3	3	3	2	1	2	3	2	24	-0.3
Pulang Pisau	2000-2005	3	3	3	3	3	2	2	1	1	2	23	-0.3
	2005-2010	2	3	3	3	2	2	1	2	1	1	20	-2.6
Kota Palangkaraya	2000-2005	3	3	3	3	3	2	2	1	1	2	23	0
	2005-2010	3	2	3	3	3	2	1	2	2	1	22	-1.5

Ind 1 = Existence of district policies on forest management

Ind 2 = Consistency and link between district and national policies on forest management

Ind 3 = Extension and implementation of forestry mandate

Ind 4 = The independency of forest district agency from political interference

Ind 5 = Capacity of forest agency staff

Ind 6 = Equity in access to forest resources

Ind 7 = Law enforcement

Ind 8 = Access to public data and information

Ind 9 = Public hearing and consultation during policy making

Ind 10 = Stakeholder inputs and participation in land management policies

Source: analysis in this study



## Appendix 2. Pearson's correlation coefficients of the change on forest governance quality on the change of deforestation rate at the district level

Variable a , Variable b	Correlation coefficient (r)	P value
Indicator 1, Deforestation rate	0.08	0.82
Indicator 2, Deforestation rate	-0.11	0.76
Indicator 3, Deforestation rate	0.45	0.17
Indicator 4, Deforestation rate	0.33	0.32
Indicator 5, Deforestation rate	-0.59	0.6
Indicator 6, Deforestation rate	0.55	0.08
Indicator 7, Deforestation rate	-0.29	0.38
Indicator 8, Deforestation rate	-0.76	0.007**
Indicator 9, Deforestation rate	-0.68	0.02*
Indicator 10, Deforestation rate	-0.74	0.009**
<b>Total Indicators, Deforestation rate</b>	<b>-0.78</b>	<b>0.004**</b>

\* significant at  $\alpha$  0.05 / \*\* significant at  $\alpha$  0.01

Source: analysis in this study