



Identifying key factors for mobilising under-utilised low carbon land resources: A case study on Kalimantan

Chun Sheng Goh^{a,*}, Martin Junginger^a, Lesley Potter^b, André Faaij^c, Birka Wicke^a

^a Copernicus Institute of Sustainable Development, Utrecht University, Heidelberglaan 2, 3854 CS, Utrecht, The Netherlands

^b Australian National University, Canberra, Australia

^c Energy Academy Europe, University of Groningen, Blauwborgje 6, P.O. Box 9700 AE Groningen, The Netherlands



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ABSTRACT

Mobilising under-utilised low carbon (ULC) land for future agricultural expansion helps minimising further carbon stock loss. This study examined the regency cases in Kalimantan, a carbon loss hotspot, to understand the key factors for mobilising ULC land via narrative interviews with a range of land-use actors and complementary desktop analyses. The factors were broadly categorised into economic, agro-ecological, institutional and cultural factors, which were perceived as opportunities and/or barriers by different land-uses and stakeholders (with different business models), and can vary across regencies. Generally, oil palm was regarded by most interviewees as an economic opportunity, reflecting that there were no other more attractive options. However, oil palm may also be limited by various factors. For example, labour availability may greatly limit the actual amount of land that can be mobilised in many regencies due to low population density. These economic factors were interlinked with the agro-ecological factors, such as soil quality, which was often regarded as the reason of low economic attractiveness. The other two categories, institutional and cultural factors, are more subtle and complex, involving socio-political elements across the hierarchy of authorities. Understanding these factors requires understanding the relationships between different stakeholders and their histories. Past analyses on ULC land largely focus on a single crop or end-use. This study shows that mobilisation of ULC land has to depart from analysing the specific conditions within individual regencies, especially considering the views of multiple land-use actors on different land-use options and business models. Future research is recommended to assess available land-use options and business models by investigating how they are affected by each of the factors identified here and accounting for the policy targets set by individual regencies (e.g. economic development or food security) and the preference and capability of local actors.

1. Introduction

Rapid land-use change (LUC), particularly deforestation and conversion of peatland, in Kalimantan (Indonesia) has led to many environmental problems in the past decades (see e.g. Moore et al., 2013; Tacconi et al., 2008). One of the most serious problems is the substantial loss of carbon stock from deforestation as well as peat degradation, drainage and burning which have significantly contributed to global greenhouse gas emissions and climate change, and led to health-threatening transboundary haze. Annual carbon stock loss in Kalimantan contributed to roughly 30% of the total carbon stock loss of Indonesia, ranging from 0.3 to 0.6 billion tonne CO₂ per year (Abood et al., 2015). Agricultural expansion due to increasing demand, especially for export-oriented oil palm plantation, is recognised as one of the major culprits (Agus et al., 2013; Austin et al., 2015; Wicke et al.,

2011). In 2011, the total area planted with oil palm in Kalimantan increased to about 3 Mha, and half of this area involved direct conversion of upland forest and wetland (Gunarso et al., 2013). Since then, the oil palm area has increased to 3.5 Mha in 2014 (DG Estate Crops Indonesia, 2013).

As global demand for palm oil is expected to grow further in the future (FAOSTAT, 2016; OECD/FAO, 2016), it is necessary to ensure that future agricultural production, especially palm oil, does not cause further carbon stock loss. Overall, these aims can be translated into two basic criteria when searching for potential land resources for future agricultural activities: (i) the current agricultural productivity of the land is insignificant or low compared to its optimal potential (i.e. there is significant room for more production per unit land); and (ii) the level of carbon stock is low so that land utilisation is unlikely to incur additional carbon stock loss and negative ecological impacts (e.g. forest

* Corresponding author at: Copernicus Institute of Sustainable Development, Utrecht University, Heidelberglaan 2, 3854 CS, Utrecht, The Netherlands.
E-mail addresses: c.s.goh@uu.nl, gohchunsheng@hotmail.com (C.S. Goh).

and wetland must be excluded). Such land may be broadly regarded as under-utilised¹ low carbon (ULC) land.²

Various studies have tried to quantify the physical area of ULC land using environmental criteria (especially in terms of carbon stocks) and agro-ecological criteria (in terms of land suitability for certain crops) at national, regional or provincial level (e.g. *Hadian et al., 2014; Gingold et al., 2012*). The analyses were performed for a specific crop (particularly oil palm, e.g. *Gingold et al., 2012*) or a specific end-use (particularly bioenergy, e.g. *Hadian et al., 2014*), but rarely linked this to the agrarian transformation in socio-economic aspect that involves different crops and actors across multiple sectors. Recent work by *van der Laan et al. (2016)* has demonstrated an integrated approach that also accounts for yield and supply chain improvements to assess the technical land potential for future agricultural production covering a range of crops. However, this study did not connect physical land availability and suitability to socio-economic conditions. But in reality, a wide range of socio-economic factors, e.g. labour availability and local preferences (*Baumann et al., 2011*), largely define whether ULC land can actually be mobilised³ for additional agricultural production or not. For example, the study by *Pirker et al. (2016)* represents state-of-the-art quantitative analysis of potential future oil palm expansion, yet socio-economic factors are not incorporated.

The various socio-economic factors influencing the availability of ULC land may be perceived as either opportunities or barriers to mobilising ULC land depending on the actor (e.g. private company, farmers, local communities, government officials), their land-use preferences (e.g. mixed crop farming or monoculture oil palm) and business models (e.g. small-scale farming or industrial plantation). The viewpoints may also change from global, national to local level. For example, local land-users may see local labour shortage as a major barrier for intensification, while large-scale players may see it as an advantage in obtaining land-use permit with less land conflicts with local communities (*Byerlee and Rueda, 2015*). Many qualitative and narrative studies have investigated the relationship between land-use and socio-economic transformation in Kalimantan and Indonesia, e.g. *Casson (2006); Potter (2011)* and *McCarthy (2013)*. However, they are not explicitly designed to identify ULC land, and evidence only exists either in the form of individual case studies (e.g. *Tomich et al., 1997*) or at a more aggregated level with a broader scope beyond ULC land (e.g. *Shantiko et al., 2013; Gatto et al., 2015*).

Our previous work assessed ULC land resources by reconciling information available from different sources, but have not specifically examined the individual factors that affect the mobilisation of these land resources (*Goh et al., 2017*). Based on these shortcomings, this study aims to identify the actual factors for mobilising ULC land resources, including not only agro-ecological factors, but also economic, institutional and cultural factors. To achieve the aim of the study, information and opinions were collected from actors involved in land-use and assessed for differences and similarities in what factors were seen as opportunities and barriers by the different actors. This is especially crucial to be performed within a relevant administrative level, i.e. the regency level, at which the authorities are the most influential in the actual implementation of land-use policies in Kalimantan. The detailed research sites were selected in Central Kalimantan, covering four regencies with distinctive characteristics. In addition, an important factor identified through the narrative interviews, i.e. labour availability, was further quantitatively investigated. This part was applied to all the

regencies in Kalimantan. Extra attention was given to oil palm as a predominant land-use that has experienced rapid expansion in the past decades in Kalimantan, but other land-use options such as paddy and other permanent crops are also discussed.

2. Materials and methods

2.1. Obtaining viewpoints from land-use actors through narrative interviews

Narrative interviews were conducted to obtain positions and perspectives from different land-use actors on two research questions: (a) what are the key factors in mobilising ULC land from local and industrial perspectives, and (b) how do these affect the mobilisation of ULC land. Four regencies (names in *italic*) with distinctive characteristics were selected as case studies (*Fig. 1*), which broadly represent the following cases:

- (i) Subsistence farming with alternative income sources – *Gunung Mas*. The regency is mainly occupied by subsistence farmers who did not undergo agricultural modernisation but have developed alternative income sources, i.e. small-scale (illegal) mining activities.
- (ii) Integration with international market – *Kotawaringin Timur*. The regency, which has access to ports, has been rapidly developing intensive export-oriented agricultural activities, particularly industrial-scale oil palm plantations.
- (iii) Urbanisation – *Palangka Raya*. The capital of Central Kalimantan is a suitable example to assess the impact of urbanisation on surrounding land-use.⁴
- (iv) Unsuitable agro-ecological conditions – *Pulang Pisau*. The regency has a limited area suitable for agricultural activities due to unfavourable agro-ecological conditions (it is largely covered with swamp and peatlands). Nevertheless, its land-use patterns have been greatly influenced by policy intervention – it is the former site of the Mega Rice Project (MRP)⁵ with a large influx of transmigrants.⁶

The field study was conducted by the first author, with the help of a small local team, between November 2014 and January 2015 in these four regencies. The potential sites (those with potentially low carbon land covers and likely under-utilised, like dry-field grass and shrub land) were screened based on the publicly available land cover maps (*MoF, 2015*). Then, the data collection started with short surveys with the local communities to identify places to visit and people to meet. Decisions were also made with consideration of logistical constraints. The targeted groups for interviews and discussions were local communities in the four regencies (*Table S1*). In addition, industrial perspectives were also examined through interviews with key industrial informants who have experience with oil palm establishment in Kalimantan (*Table S2*). Government officers, experts and scientists were also consulted for their views on land-use issues in relation to ULC land in the four regencies. A few key questions were formulated (see *Table 1*) to kick-start the discussion, but the interviews (mostly in the form of group discussions) were conducted in a flexible way to avoid preconception and allow unexpected hypotheses to emerge. The team was

¹ 'Under-utilised' is a normative notion that can be interpreted in different ways depending on e.g. socio-cultural values, economic values or legal perspectives. In this paper, it only refers to agricultural productivity to reflect criterion (i).

² We avoid the use of the term 'agriculture land' because it can be defined differently. For example, low carbon grass land within the forest concession is not legally considered as 'agriculture land'.

³ 'Mobilisation' means actions of preparing and putting into active service, making it available, improving and coordinating its uses.

⁴ Municipalities are usually small in area. Palangka Raya is considered a special case as a municipality with a relatively large area allocated. This situation allows the examination of how urbanisation affects LUC based on the LUC statistics at municipal level. For municipalities with much smaller areas, the urbanisation effect spreads across neighbouring regencies and difficult to trace with aggregated data.

⁵ The Mega Rice Project was a failed programme initiated by the Indonesian Government to develop one million hectares of degraded peatland for food crop production in 1996.

⁶ The transmigration programme is a population-relocation programme that moves landless people mainly from the densely populated Java Island to less populous islands of the country, e.g. Kalimantan. See e.g. *Potter (2012)*.

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