

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/319501418>

Indonesia's One Map Policy: A Critical Look at the Social Implications of a 'Mess'

Thesis · April 2017

DOI: 10.13140/RG.2.2.25247.87209

CITATIONS

3

READS

2,017

1 author:



Kaitlyn Bretz

Pennsylvania State University

4 PUBLICATIONS 5 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Social Implications of Indonesia's One Map Policy [View project](#)

INDONESIA'S ONE MAP POLICY:
A CRITICAL LOOK AT THE SOCIAL IMPLICATIONS OF A 'MESS'

By

Kaitlyn Justine Bretz

Submitted in Partial Fulfillment
of the Requirements for
Graduation with Honors from the
South Carolina Honors College

May, 2017

Approved:

David Kneas, Professor
Director of Thesis

Jennifer Pournelle, Professor
Second Reader

Steve Lynn, Dean
For South Carolina Honors College

Contents

Abbreviations & Acronyms	3
Thesis Summary.....	4
Abstract.....	5
Introduction.....	6
Background.....	7
<i>The Problem</i>	7
<i>Land Use Conflicts</i>	8
<i>Historical and Modern Policies of Land Use</i>	12
One Map Policy	18
<i>REDD+ Moratorium Map</i>	18
<i>One Map Policy Objectives 2010-2014</i>	21
<i>One Map Policy Objectives 2014 - Present</i>	24
Participatory Mapping	27
<i>Critiques of Historical Surveys and GIS</i>	28
<i>PT Serasi Kelola Alam (SEKALA)</i>	30
<i>World Resources Institute</i>	31
<i>Considerations for Applying GIS in Community Mapping</i>	32
The “Mess”	33
<i>Who Benefits?</i>	33
<i>Addressing Land Conflicts:</i>	35
Conclusion	36
References.....	38
Appendix A: Examples of Inconsistent Spatial Data.....	43
Appendix B: Profiles of Organizations Interviewed.....	45

Abbreviations & Acronyms

BAPPEDA	District/Province Development Planning Agency (<i>Badan Perencanaan Pembangunan Daerah</i>)
BAPPENAS	National Development Planning Agency (<i>Badan Perencanaan Pembangunan Nasional</i>)
BIG	Geospatial Information Agency (<i>Badan Informasi Geospasial</i>)
BPN	National Land Bureau (<i>Badan Pertanahan Nasional</i>)
COP	Conference of the Parties
DNPI	National Council on Climate Change (<i>Dewan Nasional Perubahan Iklim</i>)
GIS	Geographic Information Systems
GHG	Greenhouse Gas
IMM	Indicative Moratorium Map
JKPP	Participatory Mapping Network (<i>Jaringan Kerja Pemetaan Partisipatif</i>)
KKN	Corruption, Collusion, and Nepotism (<i>Korupsi, Kolusi, Nepotism</i>)
KPK	Corruption Eradication Commission (<i>Komisi Pemberantasan Korupsi</i>)
KPA	Agrarian Reform Consortium (<i>Konsorsium Pembaruan Agraria</i>)
NGO	Nongovernmental Organization
OBG	Oxford Business Group
OMI	One Map Initiative (see OMP, One Map Policy)
OMP	One Map Policy
REDD+	Reducing Emissions from Deforestation and Forest Degradation, conservation of forest carbon stock, sustainable management of forests, and enhancement of forest carbon stocks
RePPPProt	Regional Physical Planning Project for Transmigration
RTRW	Regional Spatial Land Use Planning (<i>Rencana Tata Ruang Wilayah</i>)
SEKALA	PT. Serasi Kelola Alam
SIG	Spatial Informatics Group
SIT	School for International Training
TGHK	Agreed Map on Forest Functions, or Forest Land Use Consensus (<i>Tata Guna Hutan Kesepakatan</i>)
WRI	World Resources Institute
UKP4	Presidential Delivery Unit for Development Monitoring and Oversight (<i>Unit Kerja Presiden Bidang Pengawasan dan Pengendalian Pembangunan</i>)
UNFCCC	United Nations Framework Convention on Climate change

Thesis Summary

The science of cartography and the organization of spatial data is intrinsically political and can not only allow states to control their population and borders, but can also empower local communities to stake claims to their land. The imbalance of power between different stakeholders, primarily state officials and village communities, can instigate land use conflicts a growing problem in developing countries. Indonesia, an archipelago comprised of over 17,000 islands, has some of the highest rates of land-related conflicts. Rights for economic development, agricultural production, environmental conservation, and indigenous land claims actively compete amongst one another and have caused several hundred conflicts across the nation. Starting in the 1990s geographic information systems, otherwise known as GIS, were used in land use planning across the globe. Governments and nongovernmental organizations attempt to use this software to level the power relations between community members and government officials.

After spending over three months living in Indonesia, I realized that GIS is not used nearly as often as it is in the United States. The more fieldwork and interviews I conducted, the more I realized that Indonesia has struggled with mapping technologies for decades, particularly when dealing with the cycle of centralization to decentralization of power. Policies changed with each administration, beginning with the Netherland's centralizing colonial powers, to Sukarno's dictatorship immediately after Indonesia's independence, to Suharto's claim to power and promotion of globalization, and most recently to a democratic republic. In an attempt to unify spatial data across Indonesia, President Yudhoyono created Presidential Decree No. 4/2011, otherwise known as the One Map Policy (OMP). By taking a critical look at the OMP and collecting interview data from outside experts, I critically analyzed the social implications surrounding the OMP in Indonesia.

The OMP is intended to standardize and consolidate spatial data across Indonesia, create a base map for all state agencies to use, and upload free spatial data to a portal readily accessible to Indonesian citizens. In various reports and presentations, government officials have promoted this policy and praised it as innovative and a progressive move for Indonesia. Community members have also taken mapping into their own hands. Through nongovernmental organizations, citizens are learning how to collect spatial data and are submitting their own maps for approval by Indonesia's national geospatial agency

Despite the enthusiastic expectations for the OMP, if you look deeper, it may not be as progressive as it seems. Land use conflicts were high prior to Presidential Decree 4/2011 and have increased since then. Historical land use policies in Indonesia were convoluted prior to the One Map Policy and one administrative decree won't reverse decades of contradictory laws. The incorporation of community-drawn maps is also unclear, especially since communities must rely on nongovernmental organizations to create maps to the government's standards. After six years of mapping, the OMP has encountered many delays and has only recently been promoted by the current president. The mapping process is still ongoing and is set to be completed in 2019, so the actual success of the One Map Policy has yet to be seen.

Abstract

In December 2010, a cabinet meeting between the Indonesian President and REDD+ agency led to the realization that spatial data does not match between government agencies. The comparison of two forestry maps catalyzed the publication of Presidential Decree No. 4/2011, better known as the One Map Policy. This policy is aimed at standardizing and unifying spatial data across the Indonesian archipelago, creating a base map for all agencies to use, and making spatial data free and readily accessible for Indonesian citizens. The One Map Policy is a direct move to centralize national power and give the state more control over its borders, and by extension its citizens. The push for transparency in the mapping process is a promising move by the government officials and opens up opportunities for local communities to submit their own land claims. The problem is that many communities do not have the capacity to map their own land and must rely on nongovernmental organizations, who in turn are limited by their donations. This work delves into how the historical and current ‘mess’ of spatial planning policies affects Indonesia’s social order. With the current implementation of the One Map Policy, government officials have the upper hand on spatial planning and many communities are left without access to mapping tools. Indonesia has a turbulent history with spatial planning and a single, centralizing policy is unlikely to solve land use conflicts over the long-term and future administrations have the potential to withdraw their promises for transparency, continuing the pattern of ‘messy’ policies.

Introduction

Mapping is an intrinsically political act that allows state powers to outline their borders and control their citizens through the approval of land claims and restrictions on the use and extraction of resources. Paper maps and surveyor sketches have been replaced by satellite imagery and mathematic algorithms. Since the 1990s, geographic information systems have been the main source of spatial analyses and cartographic software.

Geographic information systems, referred to as GIS, are commonly defined as computerized systems for the capture, storage, querying, analysis, and display of geospatial data (Chang, 2011 cited in Hodgson, 2015a). Geospatial data can be collected a variety of ways. Primary data capture is done by recording a geographic position and its attributes from a native source (i.e., surveying or remote sensing). Data conversion involves the digitization and georectification of existing maps. Today, most data collection is done via remote sensing. Remote sensing is a method of measuring environmental processes, such as change in land cover, from a distance by digitally managing aerial photography and satellite imagery (Robbins, 2003). Spatial analyses work by using a base map outlining a region's boundaries, to which you add attribute features as data layers (Figure 1). The data's sources, formatting, and degree of error need to be taken into account before, during, and after any spatial analyses. (Hodgson, 2015b)

Today, GIS is an integral part of mapping land claims in Indonesia. Proper land use policies and development plans require a complete knowledge of an area's spatial organization, especially when multiple stakeholders are invested. This requirement is particularly important because environmental groups, local communities, and growing businesses are constantly vying for a voice in land-use planning. Indonesia has one of the highest rates of land use conflicts in the world, but there has been little progress in resolving them.

Since the start of the Reformation period in 1998, nongovernmental organizations (NGOs) have been able to work more freely across Indonesia and many have made land use planning and mapping a priority. International coalitions have also been able to pressure the Indonesian government to change its policies, with one group in particular, United Nations' Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (commonly referred to as REDD+ Programme) actively making deals with Indonesia to reduce its carbon emissions. REDD+ also had a hand in promoting the concept of the One Map Policy. In this study I will (1) describe the current "messy" state of mapping policies in Indonesia, (2) outline the goals of the One Map Policy, (3) identify the network of actors involved in the creation and

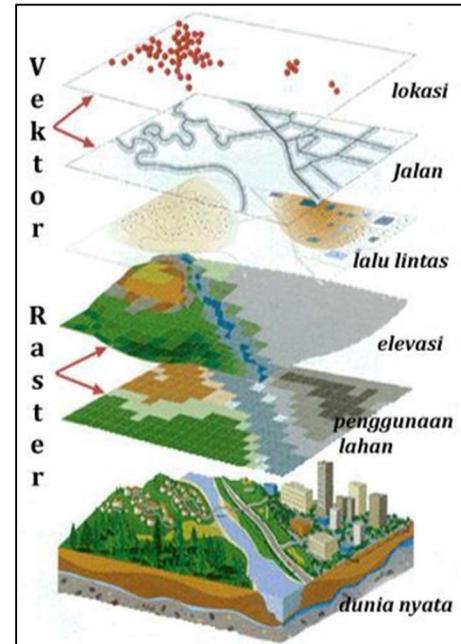


Figure 1. Generalized process of using geospatial data in GIS. By placing attribute data on top of a base later map, you can create a representation of the real world. [vektor raster (raster vectors), lokasi (location), jalan (roads), lalu lintas (traffic), elevasi (elevation), penggunaan lahan (land use), duni nyata (real world)]

Source: SEKALA (2014)

implementation of the One Map Policy and (4) discuss power shifts within the ongoing process of implementing the One Map Policy.

I spent over three months in Indonesia living in Bali and Java as part of a SIT Study Abroad program. The last month of the program was spent conducting fieldwork for an independent research project, during which I interviewed multiple NGOs about how they use GIS to promote environmental sustainability and conservation policies. All of my contacts were referred to me by former contacts (snowball sampling) or by cold-emailing researchers. The majority of my interviews were done in English, though some translation from Bahasa Indonesia was required. Any mistranslations are my own.

After returning to the United States I maintained correspondence with my interviewees and expanded my sources by reaching out to other academic researchers and re-interviewing previous contacts. In total, I spoke to nine individuals over the course of five months (Table 1).

<i>Contact Name</i>	<i>Position & Affiliation</i>	<i>Date</i>
<i>Franciska Widiastuti</i>	GIS Specialist (a), SEKALA	9 Nov 2016
<i>Awan Gede</i>	GIS Specialist (b), SEKALA	9 Nov 2016
<i>Olivier Pouillion</i>	Founder & CEO, Gringgo	15 Nov 2016
<i>I Made Suarnatha (Suar)</i>	Director, Wisnu Foundation	16 Nov 2016
<i>Yohanes I Ketut Deddy Muliastira (Ketut)</i>	Director, SEKALA	29 Nov 2016
<i>Anne Rosenbarger</i>	Southeast Asia Commodities Manager, Global Forest Watch, WRI	30 Nov 2016
<i>Nanang Indra Kurniawan</i>	Academic	7 Feb 2017
<i>Rini Astuti</i>	Academic	22 Feb 2017
<i>Gede Ngurah Surya Anaya</i>	Director, BaliFokus	3 Mar 2017

Table 1. Order of contacts interviewed during the SIT Study Abroad program and after returning to the United States

Background

The Problem

Since its independence in August 1945, Indonesia has struggled to clearly define its regional geographic boundaries and settle land claim disputes. Indonesia is plagued by land use conflicts and the number of incidents are only growing (KPA, 2016). Political reorganization and shifting administrative priorities only serve to promote these land disputes. Each political administration, from Sukarno to the current Reformation period, has left its mark in the form of policies and development strategies meant to organize Indonesian society and promote economic growth.

One consistent factor across each administration is the collection of agencies with overlapping authorities. Indonesia's numerous national ministries are infamous for creating their own thematic maps with few corresponding boundaries (Oxford Business Group (OBG), 2016;

Kurniawan, 2016). Pak Ketut Deddy, the director of an Indonesian environmental consulting company, has worked with communities that were mapped by the government without local inclusion. In Papua for instance, the community members and government officials realized that their respective names for several rivers did not match because the official names of certain rivers were unrecognized by locals, who continued to call them by locally-used names (Ketut, personal communication, 29 Nov 2016). As recently as 2015, national agencies were still using their own maps. The Minister of Planning Sofyan Djalil was quoted saying “forestry has a map, agriculture has a map, transmigration has a map, the local government has a map... [and] these maps are not consistent with each other” (Jannah, 2015). Many of my interviews about mapping in Indonesia had a recurring theme of overlapping and mismatched data. While there is a policy designed to fix this problem, the One Map Policy, it seems Indonesia has a long way to go before dissimilar boundaries aren't a contributing factor to land use conflicts.

Land Use Conflicts

A common theme in creating maps is the compilation and negotiation of spatial data by stakeholders, usually government officials, national agencies, and/or community members. While the inclusion of all potential land claims is important, it complicates the process of creating a uniform spatial database on the land's current conditions. Lubis and Langston (2015) studied landscape change via GIS in North Sulawesi. A central theme to their research was establishing how landscapes and land use patterns should be considered both physically and temporally:

“Understanding development and dynamics at a landscape scale has been seen as a bridge to accommodate and assist natural resource managers, policy makers, planners, and local communities to explore options for suitable development. Landscape dynamics refer to a process of landscape evolution that involves tracing the relationship between humankind and the natural environment (2015, p. 207)”.

Stakeholders, including natural resource managers, policy makers, and local communities often have dissimilar opinions on how to use their surrounding landscape. These stakeholders exert different amounts of power over each other; those with less power struggle to make their claims heard, lest they be ignored by groups with more authority. Together, similar resource claims and unequal access to power have the potential to create or increase socio-political tensions, which can escalate into land use conflicts. In order to reduce land use conflicts, it is important to establish a unified view of a landscape and have a clear designation of what the land is for by forming an agreement between stakeholders or initiating a governmental policy. Currently, formal agreements between stakeholders are rarely present, nor does the government (as a unified entity) control zoning policies or concession distribution.

Forest Watch Indonesia, an independent organization dedicated to monitoring forest conditions, found that in 2013, 14.7 million hectares had overlapping licenses for forest concessions, industrial forest plantations, and mining areas. Around 7 million hectares of natural

forest were located on land with conflicting licenses among development projects. This overlap predominately occurs when different agencies issue licenses for the same area but in separate jurisdictions, for instance protected areas, customary land, and resource extraction concessions. (Shahab, 2016; Forest Watch Indonesia, 2017)

The Konsorsium Pembaruan Agraria (KPA) is an organization based in Jakarta, Java that is dedicated to creating “a just agrarian system and [ensuring] equitable allocation of agrarian resources to all people of Indonesia; to guarantee ownership, control, and use of agrarian resources for farmers, fishermen, and indigenous people; and to improve the welfare of the poor” (KPA, 2017). KPA defines agrarian land use conflicts as “conflicts arising from policies created by public authorities that have caused widespread social, economic, and political problems” (KPA, 2015, p.3). This definition clearly blames public authorities for causing land use conflicts. This claim is not unjustified: the Indonesian government has reportedly instigated social conflict through the expropriation of land that local people have controlled for generations to promote agricultural plantations (Harwell 2000; Tagliarino 2016; Shahab 2016).

Land use conflicts have attracted the attention of large international NGOs who have begun campaigning for land sovereignty in the face of economic development in Indonesia. Larger NGOs tend to focus on bigger disputes that have amassed media coverage or social campaigns, such as conflicts involving indigenous land claims and palm oil plantations, while other disputes go unnoticed. KPA attempts to track any and all land disputes that occur within Indonesia. Their sources include reports from officials and citizens, or notices published in local media; any conflict that does not get reported is therefore missing from KPA’s annual reports, so the numbers reported are conservative estimates.

According to data collected by KPA, a number of trends regarding land use conflicts have risen since 2004¹. Over the past eleven years, the number of land-use conflicts has increased 1,300% (Figure 2), the area of disputed land grew exponentially (Figure 3), and the number of injuries and arrests increased 3,975% and 3,871%, respectively (Figure 4). When you classify land use conflicts (2004 through 2016) by industrial sector, plantation and infrastructure cause the most conflicts (43% and 31% respectively), followed by forestry (7.3%) and mining (6.2%) (Figure 5). For context, Indonesia’s national elections occurred in 2004, 2009, and 2014. There have been recent spikes in reported conflicts with a drop between 2014 and 2015; however, conflicts quickly rose back to 2014-levels in 2016.

¹ KPA cites the definition of land conflict used by BPN in Regulation of Head of BPN-RI No.3/2011 about Management, Study and Settlement of Land Case when talking about agrarian conflicts (KPA, 2013). BPN’s definition of land disputes ranges from demanding the return of land, encroachment of plantation lands, occupation of government assets, and problems arising from land acquisition activities (translated from Putra, 2015).

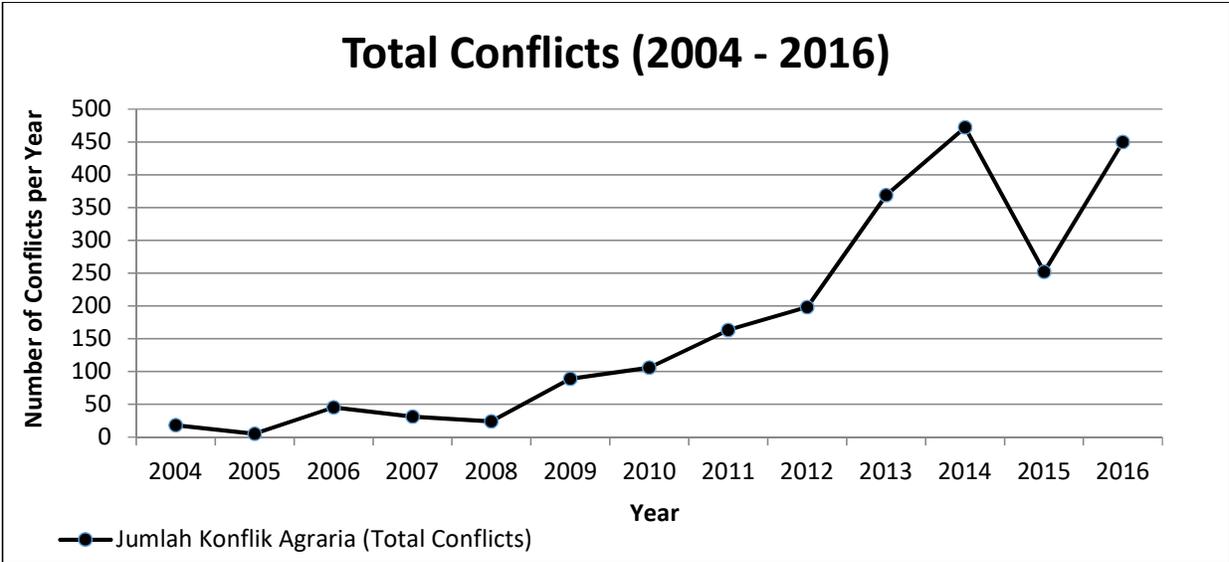


Figure 2. Total land conflicts in Indonesia from 2004 through 2016. Data shown here are conservative estimates due to the nature of the data: only conflicts reported to KPA directly or through media outlets are recorded, thus unreported conflicts are missing.

Sources: KPA, 2014; KPA, 2015; KPA, 2016

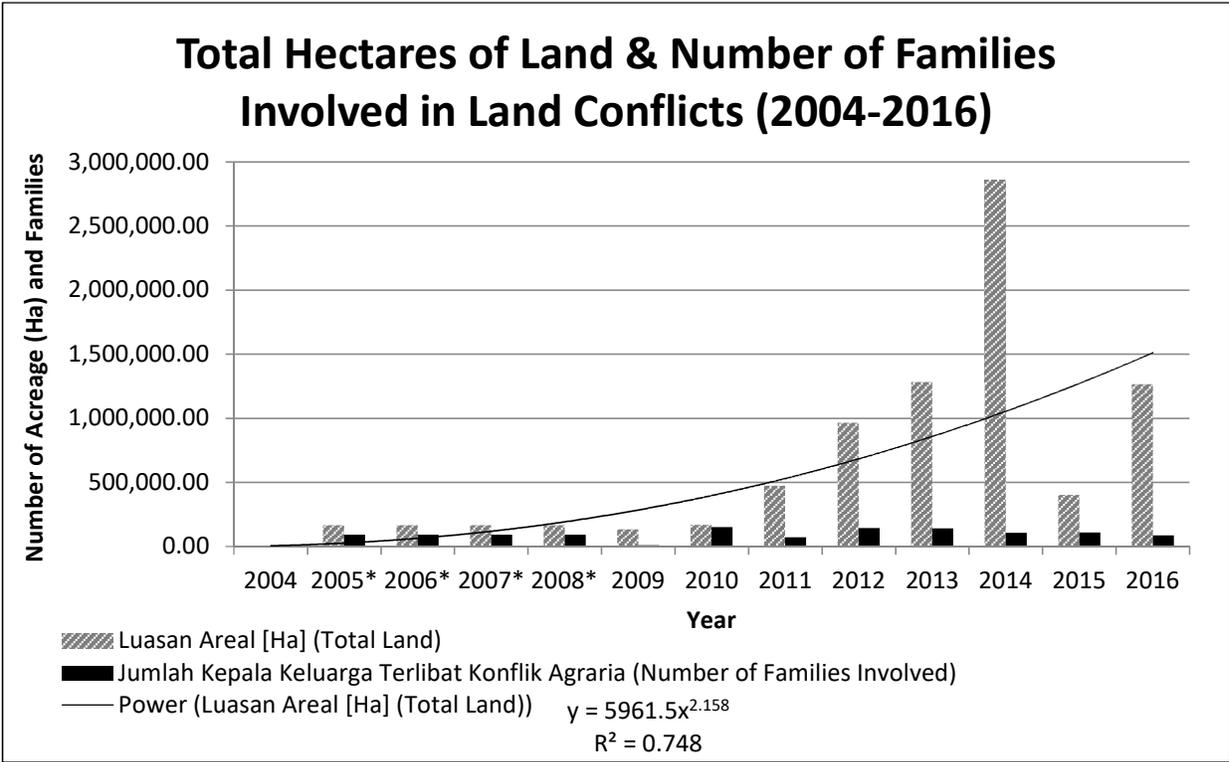


Figure 3. Total acreage of disputed land in Indonesia and the number of families involved in conflicts from 2004 through 2016. Data shown here are conservative estimates due to the nature of the data: only conflicts reported to KPA directly or through media outlets are recorded, thus unreported conflicts are missing. Note that the number of families involved remains relatively constant while the acres increase at an approximate power of 2 (trend line).

*denotes calculated averages of collected data. Data from 2005-2008 were published collectively, not by year
 Sources: KPA, 2014; KPA, 2015; KPA, 2016

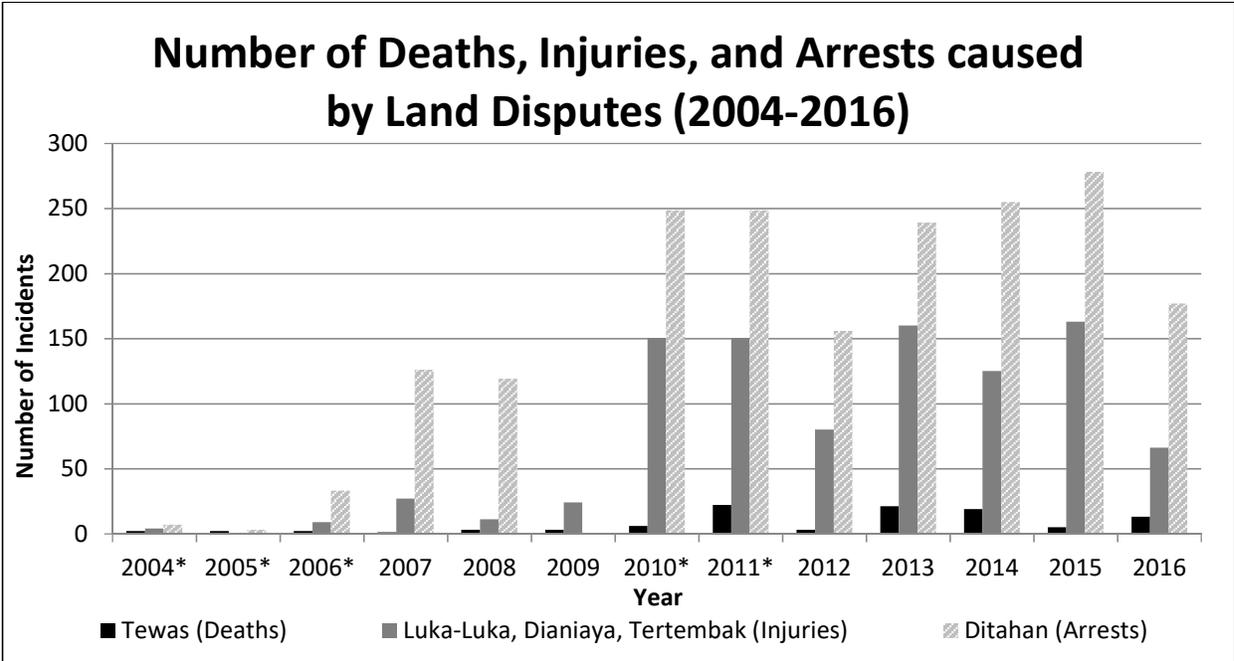


Figure 4. Total number of deaths, injuries, and arrests in Indonesia from 2004 through 2016. Data shown here are conservative estimates due to the nature of the data: only conflicts reported to KPA directly or through media outlets are recorded, thus unreported conflicts are missing.
 *denotes calculated averages of collected data. Data from 2010-2011 were published collectively, not by year
 Source: KPA, 2014; KPA, 2015; KPA, 2016

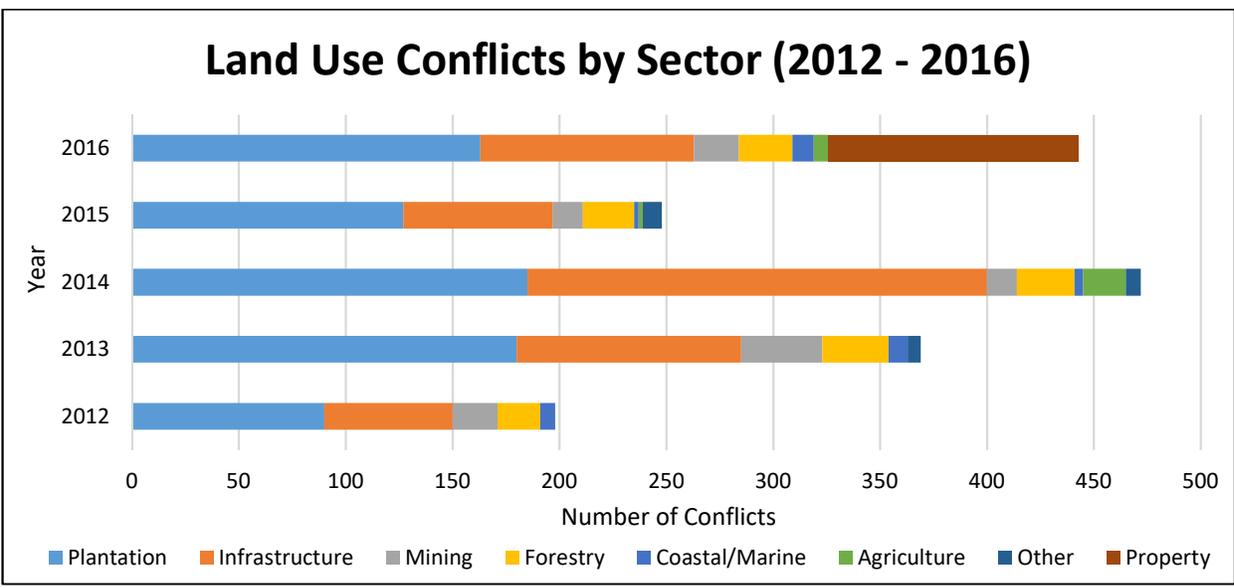


Figure 5. Distribution of land use conflicts across selected industries. Data shown here are conservative estimates due to the nature of the data: only conflicts reported to KPA directly or through media outlets are recorded, thus unreported conflicts are missing. Industries selected as categories vary between years: in 2015, coastal/marine and agriculture conflicts were reported together but are evenly split in the graph above; agriculture and oil/gas conflicts were reported together in 2016, but are only shown as agriculture above; data for 'property' and 'oil and gas' were not reported before 2016
 Source: KPA, 2014; KPA, 2015; KPA, 2016

Agrarian conflicts are only a small part of the picture. Further complicating the crisis of land disputes is the wide range of lands with competing claims besides agriculture, including religiously sacred lands, indigenous lands, and designated conservation areas. Sacred lands for instance, can be found in Bali and are predominately threatened by cultural tourism, the sect of the tourism industry that focuses on attractions offered by local communities such as cultural practices, rituals, religions, etc. (Picard, 1986; Lorenzen & Roth, 2015). The miscommunication of what is appropriate for tourists to visit and/or experience, and what is culturally important and/or sacred for a community has fueled conflicts for the past several decades and is only growing (Dalem, 2016; Strauß, 2015). It should be noted however, that not all of the above land use conflicts are caused directly by the creation/implementation of maps. Maps are used to justify a stakeholder's right to take an interest in an area, and some conflicts are not about land rights, including those caused by cultural tourism.

Two of the organizations I spoke with actively work in reducing land use conflicts in Indonesia. The World Resources Institute (WRI) is currently helping compile spatial data and reduce land disputes between Indonesian stakeholders, particularly community members and government officials. By launching a platform for discussion, WRI intends to facilitate multi-stakeholder meetings to improve communication and policy making (Rosenbarger, personal communication, 30 Nov 2016). PT Serasi Kelola Alam, hereafter called SEKALA, is a consulting company that works with communities and the Indonesian government to map out certain regions and determine their proper boundaries (Widiastuti, personal communication, 9 Nov 16). They are often tasked with collecting preliminary spatial data, identifying any overlapping boundaries, and then presenting it to the government, who has the final say in what boundaries are formally accepted.

Historical and Modern Policies of Land Use

Modern policies governing agriculture within Indonesia can be traced back to the Dutch Colonial era. The 1870 Agrarian law declared that all land without certified ownership was state property, promoting the idea that forest resources are public goods that the government has the right to exploit (Mulyani & Jepson, 2017).

After Indonesia's independence in 1945, Sukarno replaced the Dutch policy with the 1960 Basic Agrarian Law (Mulyani & Jepson, 2017). This law maintained state sovereignty of forest resources by declaring state law as superior to customary law (also known as *adat* law). This policy also introduced the right for the lower-class to settle, cultivate, and claim ownership of up to two hectares of forest land and gave district-level governments the authority to distribute land titles (Mulyani & Jepson, 2017). By introducing a new political power to forestry management, the Sukarno administration created tension between these district governments and the national government.

The Sukarno regime fell in 1965 and in its place rose the New Order governed by Suharto. In an attempt to distinguish itself as a 'New Order', the Suharto administration passed the Foreign Investment Act No. 1/1967, which ushered in foreign investment and capitalist development from

‘Western’ nations (primarily Europe, North America, and Australia). This represented a major reversal of economic and foreign policies from the Old Order. To solidify his power over forest rights, Suharto issued the 1967 Basic Forestry Law (No. 5/1967) that reasserted state control over the majority of Indonesia’s forest and gave the national government the authority to grant and manage forest concessions. Over 120 million hectares of land (62% of Indonesia) were designated as state forests without a proper acquisition process (Wibowo & Giessen, 2015).

Historically, mapping forest resources has been an intrinsically political act. States actively worked to draw maps that simplified regional diversity, effectively making some things legible while ignoring others (Scott, 1998). Forest maps are a tool that government officials can use to exclude or include people from these areas, to manage the valuable resources within the forests, to control sources of social unrest, and delineate state boundaries. After passing the Basic Forestry Law, Suharto’s administration awarded lucrative forest concessions to political supporters and began Indonesia’s historical affiliation with political cronyism and capital accumulation. Anecdotal evidence indicates that the maps created during the Suharto era revealed border conflicts, territories with multiple permits, and illegal entry of one concession owner into another’s concession (Peluso, 1995). A 1990 report published by the United Nation’s Food and Agriculture Administration found that 57.9 million hectares of forest had been allocated to forest industries for only 43.3 million hectares of actual production forest (Peluso, 1995).

Indonesia’s Geospatial Information Agency, Badan Informasi Geospasial (BIG), was created in 1969 to manage spatial data and mapping for the national government (Mulyani & Jepson, 2017). BIG is still heavily active in modern mapping policies and is an integral part of the One Map Policy. On their homepage (<http://www.big.go.id/>), the bolded header reads “*bersama menata Indonesia yang lebih baik*” (“Indonesia is organized better”). This phrase succinctly outlines the belief in the power of mapping: a government that knows how its lands are organized is more efficient and can exert control within its boundaries to the highest magnitude.

The first nationwide attempt at land use planning beyond simply forested areas began in 1981 with the Agreed Map on Forest Functions, also translated as Forest Land Use Consensus (Tata Guna Hutan Kesepakatan, TGHK) (Mulyani & Jepson, 2017; Rosenbarger, 2013b; Peluso, 1995). This map was created by combining spatial data from the Ministry of Forestry and other partner government agencies (Ministry of Agrarian Affairs, the Ministry of Internal Affairs, etc.) and was published in 1983 in a 1:500,000 scale (Mulyani & Jepson, 2017). TGHK was created without meaningful input from the district-level government or communities and did not take into account local people’s land claims or the existing vegetative cover (Mulyani & Jepson 2017; Peluso, 1995). A ‘Forest Estate’ was also created, which designated six categories of forests across Indonesia: protection forest, conservation forest, limited production forest, production forest, conversion forest, and unclassified lands.

It is important to note that the 1983 TGHK was effective largely due to the continuation and acceleration of the transmigration program during Suharto’s New Order. Initially used by the Dutch colonial administration in 1905, this program involved moving people from densely populated islands such as Java, Bali, Lombok, and Madura, to less populated islands such as

Sumatra, Kalimantan, Sulawesi, and West Papua (Mulyani & Jepson, 2017). TGHK was reportedly the map used by state officials to identify groups of migrants and relocate them to sparsely populated areas. The World Bank supported this program by issuing loans between 1976 and 1992 but it was heavily criticized for its lack of social and environmental safeguards. Despite these criticisms, the Land Resources Department of the United Kingdom's Overseas Development Administration funded a second mapping effort, called the Regional Physical Planning Project for Transmigration (also called RePPProt) (Mulyani & Jepson, 2017; Rosenbarger, 2013b; Peluso, 1995). RePPProt produced maps of land systems, land use, and land status that updated 1983 TGHK at a larger scale of 1:250,000 (Mulyani & Jepson, 2017). Literature on this topic remains uncertain about whether this second mapping effort was named the RePPProt maps or TGHK 1987².

Despite efforts by the TGHK to centralize land use planning in Indonesia, spatial data was poorly integrated between the multiple national ministries, who still controlled land use planning for their respective jurisdictions. Some agencies and local governments continued to use older maps instead of the TGHK, increasing tensions between the local and national government (Mulyani & Jepson, 2017). Additionally, both TGHK maps recommended development areas that were currently claimed by local rights, but the planning of them proceeded without considering these local populations (Peluso, 1995). Law No. 24 of 1992 was created in order to standardize the rules for spatial land use planning under Regional Spatial Land Use Planning (*Rencana Tata Ruang Wilayah*, RTRW) (Mulyani & Jepson, 2017). These standards were enforced by the National Development Planning Agency (*Badan Perencanaan Pembangunan Nasional*, BAPPENAS) and its provincial-level offices. Thus, the spatial planning process was decentralized and made available to the provincial and sometimes district level government offices. The maps created after Law 24 often overlapped and conflicted with the official TGHK map (Rosenbarger, 2013b). An attempt to integrate the TGHK and spatial plans created at the provincial and district level began in 1994 but had little success (Rosenbarger, 2013b).

The early- to mid-1990s was the time when GIS software began to be widely used across the globe. Kalimantan, Indonesia's side of Borneo, was one of the first places GIS was used to not only investigate the causes and impacts of an environmental disaster, but to also find evidence to bring companies to court (Harwell, 2000). The Indonesian fires of 1997-1998 burned a large amount of land across the islands of Borneo and Sumatra. Different stakeholders blamed different causes, including the natural cycle of El Niño, swidden (slash-and-burn) farming, and palm oil plantations. Historically, environmental conditions and swidden farming would catch the blame for starting the fires; however, with the advent of open-source spatial data and publically-available GIS programs, the door was opened to the NGO community who used this data to pressure the government into changing their policies. In August 1997, the Environment Minister issued

² Mulyani & Jepson (2017) and Rosenbarger (2013b) both call the RePPProt maps a second edition of the TGHK maps, whereas Peluso (1995) separates them into two distinctive mapping programs. Peluso (1995) even has a table comparing the two maps and showing different values for defined ecosystems. I write about these maps as if they were one because they both were used in transmigration program and were published around the same time. Further research is needed to determine the nature of these mapping policies.

warnings of prosecution for plantation owners who used fire to clear their land, and then attempted to make good on these threats the following October when he brought charges to the Forestry Minister against 179 companies. While the majority of charges were dropped within a few months, the fact that they were made at all indicates progress in disaster analysis (Harwell, 2000).

In 1998, Suharto's New Order regime fell. In response, a giant policy shift occurred that escalated the delegation of land use decisions to regional authorities rather than centralizing it under the national government. This new movement was sparked by the public (supported primarily by students and intellectual leaders) and demanded a new government free of corruption, collusion, or nepotism, or 'KKN' (*Korupsi, Kolusi, Nepotism*). This reformation period, called *Reformasi* in Indonesia, challenged the national government's history with forest industrialists. In response, the Habibie administration (1998-1999) passed Law No. 22/1999 that delegated regional autonomy for resource planning and gave decision-making authority to the district-level governments (Mulyani & Jepson, 2017). Additionally, a new Basic Forestry Law, No. 41/1999, further reduced management of all forested lands (except national parks and reserves) by giving regional governments control over the land. Standards for land management were set by the Ministry of Forestry, but the authority to provide land tenure rights remained with the National Land Bureau (BPN), creating tensions among national agencies (Mulyani & Jepson, 2017). For instance, Indonesian citizens who have lived on a plot of land for more than ten years can receive a license from the Agrarian Ministry and the BPN; however, those individuals that live on land gazetted for conservation cannot receive land permits because they are under the jurisdiction of the Ministry of Forestry (Astuti, personal communication, 22 Feb 2017). This issue is attempting to be addressed by the Corruption Eradication Commission, but requires the collaboration of more than three agencies. A new Basic Agrarian Law was also introduced (Law No. 41/1999) and granted individuals the rights to manage and use natural resources. This new Basic Agrarian Law replaced the older versions and is the foundation for other laws related to managing natural resources outside the forest estate (Rosenbarger, 2013b).

The Wahid (1999-2001), Megawati (2001-2004) and Yudhoyono (2004-2014) administrations struggled with rising tensions between government agencies. Several initiatives were implemented to improve forest data and integrate forest maps, most of which were supported by international donors such as the World Bank, the European Union, and the United Nations Framework Convention on Climate Change (UNFCCC) (Mulyani & Jepson, 2017). In 2004 there was an additional push to regulate the division of power between the district, provincial, and national levels of government (Law No. 32/2004) (Rosenbarger, 2013b). By delineating the authority granted to each level of the government, state officials hoped to reduce internal conflicts.

Law No. 26 of 2007 replaced the 1992 spatial planning law and updated Law No. 32/2004 by creating a national set of spatial plans that were coordinated between all levels of government, national through regional (Hasyim, Subagio & Darmawan, 2016). Each level was still permitted to create their own spatial plans; however, the national-level plans were required to be made first and to serve as a reference for provincial-level plans, which further served as reference for district-level plans. Other factors, including definitions and scale standards were clarified. These policies

for spatial planning were supposed to be implemented within three years, however there remain a number of lower-level governments who have not revised their spatial planning legislation (Hasyim et al., 2016). According to Hasyim et al. (2016), only 73.5% of provincial governments, 82.5% district governments, and 90.3% of city-level governments have completed their revisions (2016). This data is reported by a third party, Penataan Ruang, and any potential errors are not acknowledged. All of the spatial plans under Law No. 26 of 2007 are valid for 20 years and are supposed to be reviewed every five years (Rosenbarger, 2013b).

According to Riggs et al. (2016) Indonesia has 634 recorded overlapping agrarian regulations, including the 1960 Basic Agrarian Law and the 1999 Basic Forestry Law (Nuridin, 2014) (See Figure 6). NGOs remain frustrated with Indonesian land use policies. Anne Rosenbarger, a researcher for the World Resources Institute, described the Indonesian resource concession permitting process as “a mess and wholly inaccurate” (personal communication, 30 Nov 2016). In another interview, Olivier Pouillion, the CEO and director of Gringgo, a waste-oriented NGO in Bali, said that “[the] government is a small piece of the picture...and is clueless” (personal communication, 15 Nov 2016), reaffirming the lack of faith NGOs have regarding the government’s capacity to understand how its policies affect local populations.

Several scholars have delved into the disparity between formal government policies and the actual on-the-ground implementation. According to Mathews (2005), there exists two types of rhetoric: official (language within the policy) and vernacular (language used by civilians) (2005). He found evidence of a “separation between the world of the officials who designed these regulations and that of those who had to enforce them” (Mathews, 2005, p. 803). Thus, “people create zones of illegibility and ignorance” in order to operate appropriately on a day-to-day basis (Mathews, 2005, p. 804). James C. Scott makes a similar argument in his book, *Seeing Like a State* (1998): society would not be able to function without a ‘dark twin’. This ‘darker’ side of cities is made of informal agreements that people create when they interact on a daily basis. NGOs that operate in Indonesia appear to have their own policies they use to operate. Pak Ketut spoke specifically about his experience with other NGOs, World Wildlife Fund and WRI. In Indonesia, environmental organizations are in constant communication with each other and often work together during campaigns. During Suharto’s reign, NGOs were withheld from actively working with government officials, and instead turned to each other for support. In response to Indonesia’s constantly shifting authority, environmental organizations formed their own policies and agreements that allow them to work effectively. (Ketut, personal communication, 29 Nov 2016)

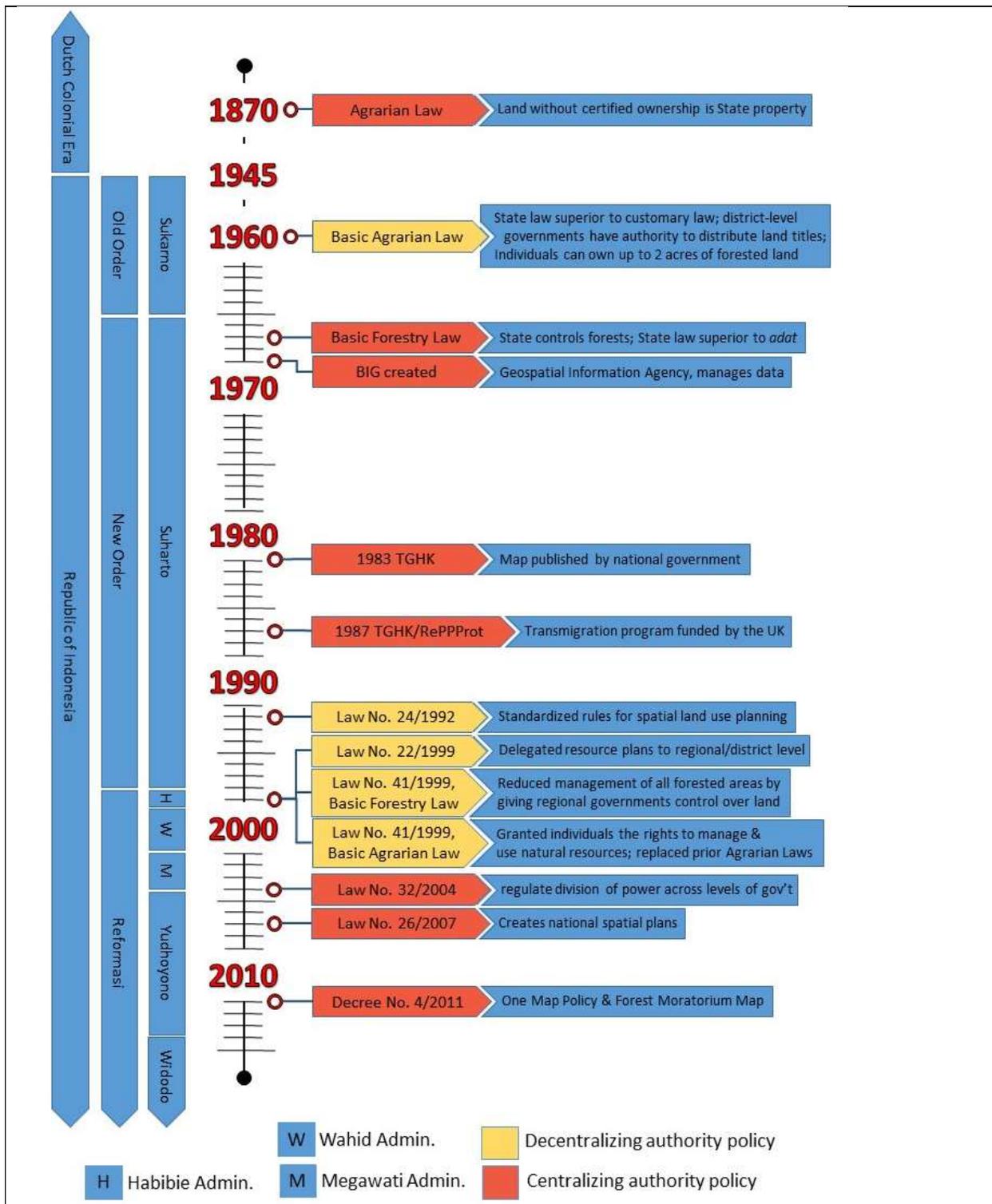


Figure 6. Timeline depicting select legislation related to land use and the contemporary political administration. From left to right, the timeline shows the official state of Indonesia pre- and post-independence, general political atmosphere, administrations led by key political figures, the name of the legislation, and a general description of the policy's impact. Note that the scale changes greatly from 1870 through 1960 and administration lengths are not to scale with one another.

Source: Mulyani & Jepson, 2017; Rosenbarger, 2013b; Hasyim et al., 2016

One Map Policy

REDD+ Moratorium Map

On December 16, 2010 President Susilo Bambang Yudhoyono held a cabinet meeting with REDD+ Programme and the Presidential Delivery Unit for Development Monitoring and Oversight (Wibowo & Giessen, 2015; Samadhi, 2013). Officially known as UKP4 (Unit Kerja Presiden Bidang Pengawasan dan Pengendalian Pembangunan), the Presidential Delivery Unit for Development Monitoring and Oversight was initially established in 2009 and worked closely with the Indonesia REDD+ actors to promote REDD+ infrastructure. During this cabinet meeting, two maps created by the Ministry of the Environment and the Ministry of Forestry were shown to President Yudhoyono to illustrate the problem with mapping discrepancies in the national government. Though they both claimed to quantify Indonesian forests, the maps' boundaries and forestry concessions were completely different (Figure 7) (OBG, 2016; Samadhi, 2013; Astuti³ & McGregor, 2015). Only 32.6 million hectares of forests matched between the two maps, with an overall error ranging from 10 to 30 million hectares. It was later discovered that each agency had different criteria for secondary and primary forests, different forest boundaries, and different mapping methodologies (Shahab, 2016; Astuti & McGregor, 2015).

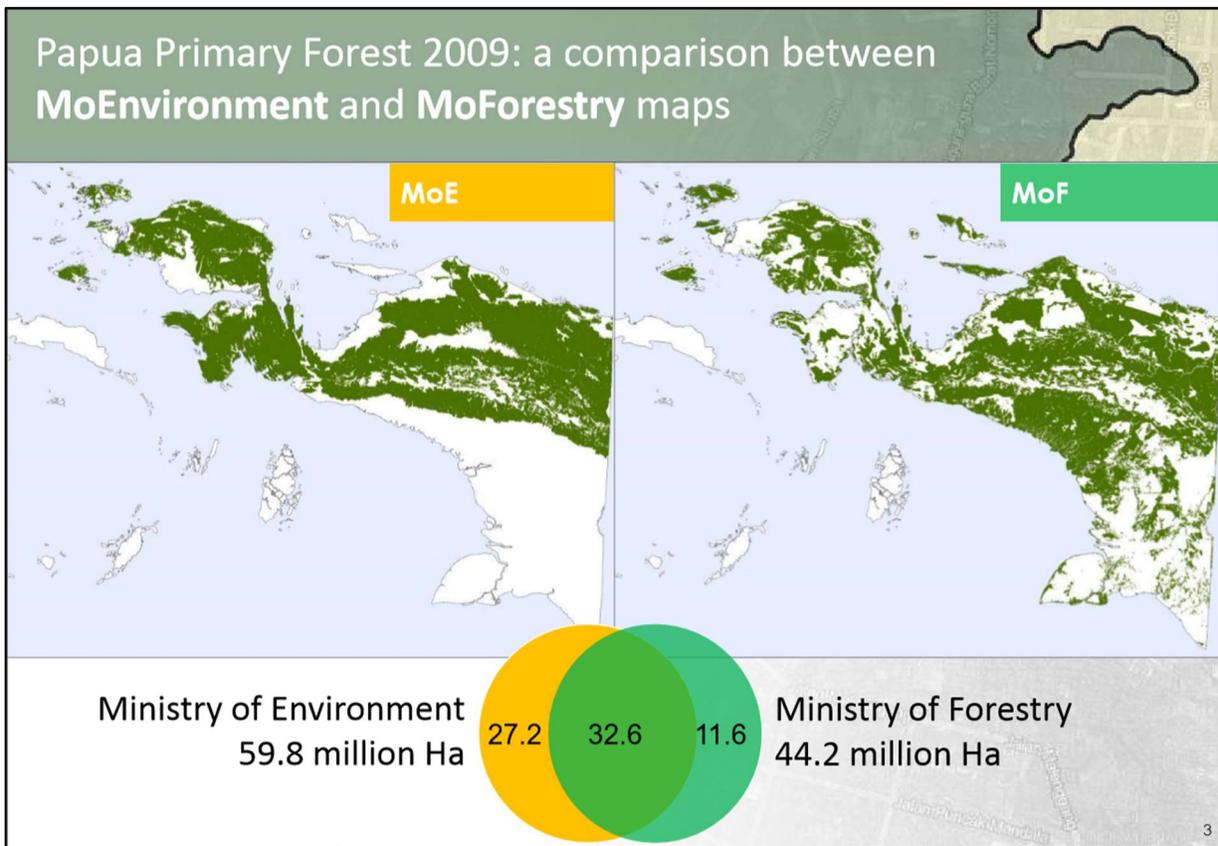


Figure 7. Two maps illustrating the distribution of forests in Papua
Source: Samadhi (2013)

³ For additional examples of inconsistent spatial data, see Appendix A

To understand why the meeting with President Yudhoyono took place, we must look at the beginning of climate change policies in Indonesia. Momentum for improved forest governance grew when Indonesia hosted the 13th annual session of the Conference of the Parties (COP 13) under UNFCCC in 2007. COP 13 culminated in the Bali Road Map, a collection of “forward-looking decisions that represent the various tracks that are essential to reaching a secure climate future...[including] the Bali Action Plan, which charts the course for a new negotiating process designated to tackle climate change” (UNFCCC, 2007). Spurred by Indonesia’s central role in COP 13, President Yudhoyono created greenhouse gas (GHG) emission reduction goals in 2009: 26% GHG emission reduction by 2020 on a business-as-usual baseline alongside 7% economic growth). In 2008, Yudhoyono created the National Council on Climate Change (Dewan Nasional Perubahan Iklim, DNPI) that was tasked with overseeing the implementation of climate change programs. This agency helped garner a 1 billion USD commitment from Norway in 2010 to aid in reducing greenhouse gas emissions. (Wibowo & Giessen, 2015; Di Gregorio et al., 2017). As part of the Letter of Intent between Norway and Indonesia, Indonesia established an independent REDD+ Agency by first designating a REDD+ Task Force to develop a National REDD+ Strategy (Di Gregorio et al., 2017). This REDD+ Task Force operated under UKP4, which was directly overseen by the President. The REDD+ Task Force supervised state ministries to facilitate the vertical integration of climate change policies and maintaining ten REDD+ working groups that expanded horizontal integration of climate change objectives.

A major weakness in the government’s organization was the existence of internal conflict between state agencies which impeded horizontal collaboration. The Ministry of Forestry, the Ministry of Environment, and the Ministry of National Development Planning felt particularly threatened and actively withheld their respective data from the REDD+ Task Force (Di Gregorio et al., 2017; Wibowo & Giessen, 2015).

The initial cabinet meeting with President Yudhoyono was instigated by UKP4 (the Presidential Delivery Unit for Development Monitoring and Oversight), who had the idea to have a single standardize map for all of Indonesia. Before creating a national map of Indonesia however, UKP4 proposed the creation of a map illustrating the moratorium on forest and peatland concessions. A moratorium on resource extraction was part of the agreement reached in the Letter of Intent between Norway and Indonesia, and has two key objectives:

“(1) cease licensing in primary forest areas, at least temporarily, in order to dampen high rates of forest loss; and (2) during this cessation, integrate registries, maps, and regulations concerning the extent and status of licenses and forest cover, to allow for rational forest management” (Astuti & McGregor, 2015, p. 2278).

This map would outline regions where resource extraction would be prohibited for two years as part of an effort to reduce GHG emissions and to give the government time to develop improved processes for governing land use. UKP4 worked with ministries whose jurisdictions covered these forests and peatlands and created a standard thematic map for reference (Figure 8).

In May 2011, Presidential Instruction No. 11/2011 postponed the issuance of any new licenses and delegated the responsibility of forest and peatland governance under the Indicative Moratorium Map (IMM) to the Ministry of Environment (Wibowo & Giessen, 2015; Mulyani & Jepson, 2017). The IMM was scheduled to have semi-annual updates on forest and peatland cover and currently has seven published versions. It is important to remember however, that the IMM obscured sensitive issues of corruption and Indonesian officials' rent-seeking practices by focusing only on the technical issues created by missing spatial data and inter-governmental competition (Astuti & McGregor, 2015). By ignoring the political problems with land use governance and instead focusing on the weaknesses of technology, UKP4 and REDD+ Task Force avoided outright accusing political actors or alienating any agencies.

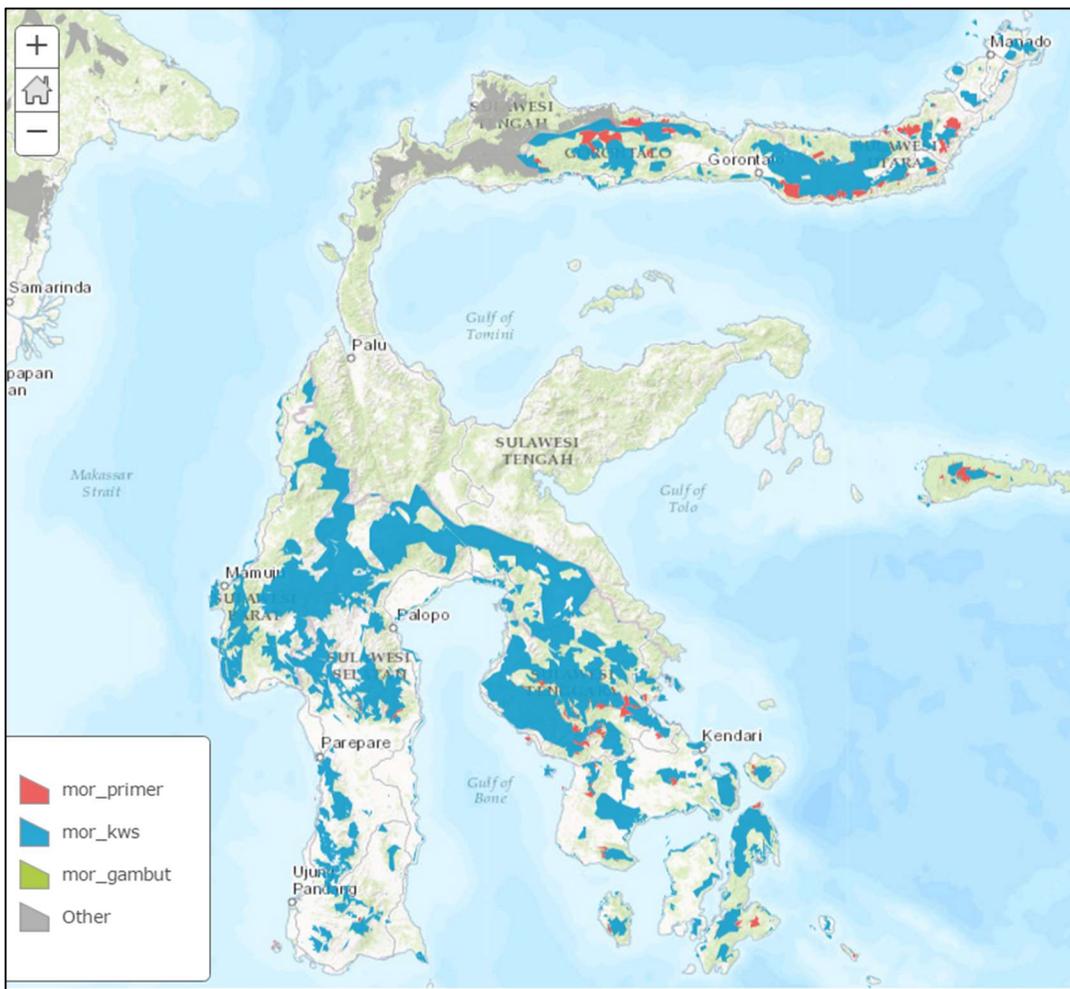


Figure 8. Indicative Moratorium Map (IMM Version7) published by Ministry of Forestry in November 2014. This clip is only a small part of the entire dataset and shows the distribution of moratorium areas on Sulawesi
 Source: Global Forest Watch (2014)

The IMM was the first step to a standardized map for the Indonesia. In their study, Mulyani and Jepson (2017) quote interviewees saying “though the idea for ‘one map’ and initiative to integrate forest data have been introduced before, it had never gained such momentum until it was attached to the REDD+ initiative” (2017, p.11). Following the presentation by REDD+ Task Force and UKP4, President Yudhoyono issued Decree No. 4/2011 which outlined the concept for the One Map Policy (OMP, also referred to as the One Map Initiative (OMI)). While the decree does not explicitly define OMP, it simply requires Indonesia to have one base map to be used as reference by other government agencies in designing their own sectoral maps (Article 19 of Law No 4/2011) (OBG, 2016; Wibowo & Giessen, 2015). The law further states that the Indonesian government will be the only party with the authority to design and create the national base map, which will be implemented by the Geospatial Agency, BIG. BIG in turn, will coordinate the mapping program involving twelve working groups from 18 ministries/agencies (Wibowo & Giessen, 2015).

One Map Policy Objectives 2010-2014

The OMP contains three significant aspects: (1) ‘one reference’, meaning that the map will be based off a single geodetic control network (one spatial coordinate system); (2) ‘one standard’, namely the Indonesia National Standard that would summarize the major thematic data for the nation; and (3) ‘one database’, or the publication of an online integrated database of spatial and non-spatial data available to the public (Mulyani & Jepson, 2017). When Mulyani and Jepson (2017) asked about the benefits and challenges presented by the OMP, respondents’ answers were grouped into six major themes: coordination, transparency, participation, cost efficiency, data quality, and the protection of indigenous peoples’ land. A senior REDD+ Task Force official went so far as to say “the [OMP] is not merely a map or product, it is a movement towards greater transparency and public participation in map-making, and importantly transparency in the land-use licensing process, all of which represent a new paradigm in the governance of map-making” (Mulyani & Jepson, 2017, p. 12). From here on, the OMP will be divided into two parts: a uniform, standardized map and a single online database.

The national map contains general spatial information about Indonesia’s current boundaries. This can further be divided into two types of data: basic geospatial information (*peta dasar*, often portrayed as regional boundaries) and thematic geospatial information (*peta sektoral/tematik*, information on the contents of land parcels). The base map contains only boundary-related spatial data that will serve as a reference for state agencies to use, with the goal of preventing overlapping land use claims (see Table 2) (Kurniawan, 2016). Maps currently employed by state agencies are supposed to be merged and spatial data harmonized to a scale of 1:50,000 (i.e., one centimeter on a map corresponds to 500,000 centimeters in real space).

Scale (broad to fine)	Total National Coverage (sheets)	Available Data (sheets)	Unavailable Data (sheets)	Percentage Available
<i>1:250,000</i>	309	309	0	100%
<i>1:50,000</i>	3,899	2,837	1,062	72.76%
<i>1:25,000</i>	13,020	3,894	9,126	29.91%
<i>1:10,000</i>	91,547	1,074	90,473	1.17%
<i>1:5,000</i>	379,012	539	378,473	0.14%

Table 2. Report from BIG indicating the availability of basic geospatial information in the form of topographic maps. Reported in ‘sheets’ which are likely the grids used to organize large spatial data (the finer the scale, the more grids it takes to cover an area).

Source: Hasyim et al., 2016

Thematic maps, or sectoral maps, describe data of a particular subject within an area (e.g., land cover, private land, mining concessions, and conservation reserves). BIG was given the mandate to integrate sectoral maps issued by any governmental agency (including local agencies) into one unified and integrated sectoral map called the Indonesia National Standard. To facilitate this integration, the Law No. 4/2011 officially defined geospatial data as “the location of [an] area, object, or an event that is naturally or artificially occurring in, on, and above the earth. The data has been processed through certain analyses...and could be used as a tool in policy formulation, decision-making, and/or implementation of activities related to spatial aspects” in order to keep agencies from using different mapping methodologies (Hasyim et al., 2016, p. 2). Different agencies are in charge of organizing data under their respective jurisdiction and individual agencies can be in charge of creating anywhere between 5 and 43 maps (see Table 3) (Wibowo & Giessen, 2015).

Providing the public with all the collected spatial data is the second significant objective for the OMP. Giving Indonesian citizens access to spatial data via a geo-portal (found at: <<http://tanahair.indonesia.go.id/home/>>) makes government officials accountable to their constituents. If an official makes a claim about a certain area, citizens can check that claim against data from the geo-portal and draw attention to it. ‘One database’ specifically targets the private sector, forestry officials, and district authorities to make them accountable for green economy investments and to reduce corruption. UKP4 and REDD+ Agency officials have also proposed to collect and store licensing data in another centralized database and to develop a ‘situation room’ that would promote national surveillance of licensing through real-time satellite data (Astuti & McGregor, 2016). In this way, the One Map Policy could serve to clarify questions about land rights, but could also be used as a very powerful weapon for the government (Astuti, personal communication, 22 Feb 2017). A nationwide surveillance program is likely to increase distrust of the national government by stakeholders and may increase conflicts between corporations and the Indonesian government. The OMP and the map it produces is not supported by the majority of Indonesia, enforcing land use policies would likely

Scale	Thematic Geospatial Information	Specific Maps
Province → 1:250,000 District → 1: 50,000 City → 1: 25,000	Climatology	rainfall
	Topography	Elevation Slope
	Geology & Soil	Geological Soil Type
	Minerals	Potential excavation class C Potential mining
	Hydrology	Surface water Groundwater
	Natural Disaster	Tsunami disaster risk Volcano disaster risk Landslide disaster risk Flood disaster risk Earthquake disaster risk
	Land Cover & Land Use	Land cover & Land Use
	Land Resources	Land capability Land suitability
	Infrastructure	Transportation system Energy/electricity Telecommunications Water resources
	Physical Development	Forestry Mining

Table 3. Thematic geospatial data required to adequately use the OMP. Data initially gathered from Ministry of Public Works Regulation No. 20/2007 that outlines technical guidelines for preparing and analyzing spatial data. Source: Hasyim et al., 2016

revert to the pre-OMP effectiveness. Furthermore, the issue of accessibility and usefulness of the collected geospatial data can be problematic. To access the data you must have internet access and a computer (or equivalent technology) with the ability to access and view geospatial data. Moreover, geospatial data is not easily understood without some training, which further limits the number of people that can access the data *and* understand it enough to use it appropriately.

After passing the OMP, the Indonesian government organized their leadership by placing BIG in charge of collecting spatial data and supervising various ministries to submit attribute data for the areas under their respective jurisdictions. To help create the online platform that the spatial data would be uploaded to, Indonesia enlisted the help of several foreign organizations, including the United States Agency for International Development, United States Forest Service International Programs, and the Spatial Informatics Group (SIG).

SIG is an environmental think-tank based in the United States and was one of the organizations approached by the Indonesian government to help assist BIG with meeting the goals outlined by the OMP. SIG was first tasked with examining the potential software platform that could facilitate the integration of existing spatial data. Second, SIG created Indonesia's first portal for participatory mapping that enabled any user to create a map layer within the platform as well as download and share any dataset of interest. With SIG's assistance, Indonesia's first basic geospatial map and select thematic maps were published in 2014 after three years of data compilation. (One Map-Indonesia, 2017; OBG, 2016). Despite having an integral role as a technology advisor, the current state of SIG's involvement with the One Map Policy is unclear and has been since the national elections took place in 2014.

In reality, SIG's involvement with the OMP appears more conflict-ridden than their site makes it out to be. In an interview, Pak Ketut spoke about key problems with remote sensing and GIS. One example that stood out is when project proposals are released and companies submit their bids for hire, smaller organizations like SEKALA are often passed over for larger international organizations such as the American International Group and SIG. Grimly laughing, Pak Ketut added that after winning the bid the larger companies often turn around and try to hire smaller companies like SEKALA to do their work for them (personal communication, 29 Nov 2016). GIS can serve as a 'buzz word' within certain associations because it is a high-prestige, highly-priced, high-modernity project that provides training and hardware for a country while minimizing that country's responsibility for policy reform, social conflict, and/or corruption (Harwell, 2000). Large international organizations are viewed as affluent enough to use up-to-date software and unbiased in the sense they have little to no investment within the country itself and thus supposedly have no competing interest.

One Map Policy Objectives 2014 - Present

The OMP began to stall after only a few years under President Yudhoyono's administration, likely due to diminishing political momentum after the policy's initial years. In 2014, President Widodo (2014-present) won the national elections, removing President Yudhoyono from his seat. This caused a shift in administrative organization and political objectives. In a move to once again centralize the government, Widodo dismantled the UKP4, DNPI, and REDD+ Agency and combined the Ministry of Forestry and Ministry of Environment into the Ministry of Environment and Forestry. The Ministry of National Development Planning (BAPPENAS) took over DNPI's climate change adaptation agenda and the Ministry of Environment and Forestry established a Steering Committee on Climate Change, much like the working group previously overseen by the REDD+ Agency.

By dismantling the climate change policy groups, Widodo effectively created a vacuum in the central government which has yet to be filled by current agencies (Di Gregorio et al. 2017). Though the Ministry of Environment and Forestry established a committee for climate change and BAPPENAS took over DNPI's climate change agenda, there remains a number of tasks set by UKP4 and the REDD+ Agency that have yet to be administered. The One Map Policy, for instance,

was left to BIG and the national ministries without the oversight of UKP4 or the REDD+ Programme. In our interview, Anne Rosenberger hesitantly mentioned that WRI (and by extension, Dr. Nirarta Samadhi) is negotiating with President Widodo's government officials about becoming the official liaison for the OMP. By working with the Ministry of Forestry and Environment and other stakeholders, WRI can continue to facilitate discussions and help mediate the consolidation of spatial databases (personal communication, 30 Nov 2016).

According to Rosenberger, Indonesian policies shift from administration to administration because the ministries change their priorities. In the case of the OMP, it simply fell out of favor with President Yudhoyono's administration over time (personal communication, 30 Nov 2016). However, Pak Ketut Deddy from SEKALA, another informant with experience working with the government, said that the policies surrounding spatial data in Indonesia have not changed in recent years. He said even if a new administration takes power, the problem of inconsistent jurisdiction boundaries still exists in maps and will continue to hamper project development as long as it exists (personal communication, 29 Nov 2016). These two responses address the same concern—the Indonesian government and spatial mapping policies—but have distinctly different responses about the influence of politics. It should be noted that Pak Ketut was speaking about mapping discrepancies as a whole, not just about the OMP, whereas my conversation with Anne Rosenberger spent more time focusing on the OMP. It appears that WRI has a more consistent relationship with government officials than SEKALA, who only works with the government when it is absolutely necessary, such as when they bring mismatched spatial data to officials for clarification.

In February 2016, President Joko Widodo signed Presidential Decree No. 9/2016 to accelerate and expand the OMP to help further the development and infrastructure projects he promised (Jong, 2016; Anne Rosenberger, personal communication, 30 Nov 2016; Shahab, 2016). Under this decree, the uniform base map is proposed to not only clarify administrative boundaries, resolve land use conflicts, and improve conservation and disaster management, but to also help the government create better spatial planning for economic development. The Jakarta Post reported in July 2016 that BIG aims to complete the integrated map of Kalimantan (Indonesian Borneo) by the end of 2016 and to begin the maps for Sumatra and Sulawesi in 2017, Maluku and Papua in 2018, and lastly Java, Bali, and Nusa Tenggara in 2019 (Jong, 2016). Widodo's administration is pushing BIG to have all thematic maps completed and published by June 2019 (Kurniawan, 2016). To expedite this process, WRI is apparently helping facilitate the consolidation of spatial data but has yet to formally confirm their active involvement with the OMP (Anne Rosenberger, personal communication, 30 Nov 2016).

As of late 2016, there were a handful of government agencies that have been revising their sectoral maps by using the BIG base map, including the Ministry of Forestry, the Ministry of Public Works, the Ministry of Agriculture, the Ministry of Defense, the Land Office, the Ministry of Transportation, the Ministry of Marine and Fisheries, the Ministry of Energy and Natural Resources, the Ministry of Health, the Ministry of Communications and IT, the Indonesian Police Force, the National Narcotics Agency, the Central Statistics Agency, the National Election

Commission, and 14 of 34 provinces. Additional ministries that publish revised maps will be uploaded to the database, especially since the OMP is expected to be fully implemented by 2019. (OBG, 2016)

There are high expectations regarding the OMP despite the delays and stalling political momentum. In a presentation to the Geospatial World Forum in 2013, Dr. Nirarta Samadhi, then the head of UKP4, said “[the] One Map processes create collaboration opportunity and trust building among ministries and state agencies...and gaining authoritative map quality” and “for the first time in Indonesia, ministries and state agencies work together and collaborate to conceive and update a common map!” (Samadhi, 2013). In an annual report, the Oxford Business Group (2016) further asserts that “it will be imperative for Indonesia to fully implement the OMP. Once it is implemented, there should be no confusion among investors regarding land utilization in Indonesia...the OMP will be able to serve as an ultimate solution, be it for the government or private businesses, to overcome the disarray and complexity of land overlapping problems in the country” (2016). The process of mapmaking is extremely political, yet the OMP is a move to make drawing boundaries a more democratic process by including local input and community land claims. In 2014, the Environment and Forestry Minister, Siti Nurbaya Bakar, was recorded saying that “the one-map policy could be considered as a form of democratic governance, whether by wiping away any hint of sectoral egotism or by involving international agencies like the Nature Conservancy” and that “the government needs to become the spearhead of negotiations, with the map as its instrument... [to] get rid of any sectoral egotism found on the map” (Salim, 2014). Despite these optimistic quotes, the reality is that the OMP has increased tensions between agencies and precipitated a struggle for greater authority and budgeting (Wibowo & Giessen, 2015). When Siti Nurbaya Bakar argues that the One Map Policy should be free of “sectoral egoism”, she dismisses the power that jurisdiction over land claims can provide an agency. It isn’t just egoism in play here, but political power over Indonesian citizens.

By the time BIG wants to publish the remaining thematic maps, it will have been a little under a decade since the initial policy was proposed. The OMP is an ambitious and politically contentious initiative, so it is hardly surprising that it has taken so long to compile data and publish the maps for public use. The administration changed after the 2014 elections, perpetuating Indonesia’s historical political oscillation. Furthermore, political turnaround delayed OMP’s implementation and reorganized all of the actors involved with collecting geospatial data. Many of the main officials involved with the OMP are still involved but hold different positions. The most striking example of this is Dr. Nirarta Samadhi, who was initially the 5th Deputy Head of UKP4 and is currently the director of World Resources Institute Indonesia (Shahab, 2015). In 2016, the central barrier to the OMP, as mentioned previously, is that so many different agencies have the authority to design their own sectoral maps but have no appropriate uniform base map to use (OBG, 2016).

While BIG has published the large base map (1:250,000,000) it is not detailed enough to allow the overlay of thematic data without significant error. Additionally, both the competition between ministries for mapping authority and the larger budget have increased (Wibowo &

Giessen, 2015). The OMP has directly challenged the individual authority of governmental agencies accustomed to managing their own spatial data, while simultaneously tackling the heart of land ownership, land tenure, and land rights all across Indonesia (One Map-Indonesia, 2017; Kurniawan, 2016; Wibowo & Giessen, 2015).

In response to President Widodo's Presidential Decree No. 9/2016, government agencies have slowly withdrawn their promise of transparency in order to speed up the process of collecting data, much to WRI's dismay. According to Rosenbarger, WRI is pushing officials to take charge of implementing the OMP, but allowing transparency so they can continue to facilitate stakeholder meetings between officials and communities (Anne Rosenbarger, personal communication, 30 Nov 2016). As of late 2016, most involved government agencies have submitted their existing thematic maps and BIG is in the process of verifying the data and integrating it into their base geospatial information map, published in 2014⁴ (Jong, 2016).

When it was initially proposed in 2010, the One Map Policy contained three significant parts which here are grouped into two sections: a uniform, standardized map and a single online database. By early 2017, the online database has been created and a few maps upload for the general public. A large-scale standardized map was published in 2013 by Indonesia's Geospatial Information Agency but has yet to be updated. President Widodo has set a goal to have the One Map Policy completed by 2019 and according to government officials, appears to be relatively on track. Despite the general enthusiasm surrounding the OMP, multiple delays and internal conflicts have slowed the process down and impeded the administration's goal of transparency, participation, and cost efficiency (Mulyani & Jepson, 2016). Others argue that the policy is doomed to fail if the mapping happens solely at the national level (Jong, 2016). There is a strong power imbalance if government officials control the entire mapping process for the OMP. The disparity between state's and local communities' perceptions of the environment (see river names and local consultation, page 7) have already been established; thus it can logically be argued that spatial data collected and organized by locals is necessary for OMP's success.

Participatory Mapping

"In response to two decades of intensive industrial timber exploitation and the Indonesian government's superseding of customary forest rights through official planning and mapping efforts, an alternative or "counter" mapping movement has begun" (Peluso, 1995, p. 384).

"Until the lions have their historians, the history of the hunt will always glorify the hunter" – African Proverb

Intensive mapping initiatives in Indonesia arrived with "global capitalism firmly entrenched and in advanced stages, particularly in the 'tigerish' economies of the East and Southeast Asia" (Peluso, 1995, p.385). By using high technology to organize spatial data and then using maps as part of an 'elite language', the Indonesian government effectively removed communities from land use policies and rendered them defenseless in the face of resource

⁴ For an exact list of agencies involved, what data they have authority over, and which agencies have adopted the base map, see OBG, 2016.

extraction (Peluso, 1995). Suharto's policy of removing Indonesian citizens from maps and ushering in foreign investment caused communities to lose their lands to concessions and development projects. In the mid-1990s, improvement of mapping technology and widespread use of the internet caused mapping to become a tool for frustrated citizens, not only the elite. Thus, "if maps can be seen as one of many 'authoritative resources' that states mobilize to consolidate their own power, then local groups' appropriation of the technology of mapping may help to counterbalance or at least offset the previous monopoly of authoritative resources by the state" (Peluso, 1995, p. 385). Counter-mapping is a process where communities map their lands to defend it against government appropriation.

Despite the counter-mapping movement in the 1990s, very few people in Indonesia know what GIS is or knowingly use maps in their lives. The beginning the Harwell (2010) article quotes an Indonesian official from the Agency of Forest Protection and Nature Conservation at a 'Discussion on the Impacts of Forest Fires in Jakarta': "all I have to say about the fire crisis is—Alhamdulillah (Thanks be to God). Because now everyone understands we need GIS" (2000, p. 307). Despite this realization over two decades ago and the recent acceleration of software development, many people in Indonesia remain ignorant of GIS, including my program directors and project advisor. I realized during my fieldwork that GIS is most often used by NGOs that were directed by or staffed in part by western-trained individuals.

Critiques of Historical Surveys and GIS

'Geography is the discipline of imperialists' is a cautionary phrase often repeated in political ecology courses. Maps are not simply pictures of the world, but depictions of land that can be shaped and manipulated (Pickles, 1995). For example, the use of cadastral mapping, a land claims map, became popular in the 18th through 20th centuries in order to make complex patterns of local land use understandable by outsiders (i.e., government officials and tax collectors) (Scott, 1998). Non-state forms of measurement and boundary delineation impede administrative authority, so governments have been involved in defining scale and creating maps for centuries (Scott, 1998). Simplifying reality by drawing maps makes understanding the world easier, but narrows our vision, sometimes to the point where we lose sight of other perspectives.

Recent technological innovations have reduced the need for surveyors and map-makers. Today, maps are primarily collected from satellite imagery or other methods of remote sensing. These visuals appear to be unbiased and are often mass-distributed so stakeholders receive similar imagery, thus continuing the façade of unbiased analyses. Furthermore, remote sensing effectively expands the scale of analysis, removing the user from political situations. Making macro-level assessments has become the preferred method of data collection, rather than field data collected at the local-level. However, avoiding fieldwork means alternative perspectives of land and land use activities are lost, particularly experiences and opinions from local communities. Smaller-scale conflicts, such as those between individual stakeholders are also lost at such a large scale. In 1998, farmers in Borneo were inadequately represented when their fields and forests burned. Instead, massive media coverage was flooded with satellite images and GIS statistics describing the crisis

(Harwell, 2000). Satellite observations provide us a look at the Earth's surface, sometimes with amazing detail and accuracy; however, we have to be careful about getting lost in the allure of macro-level analyses. Satellite images never tell the whole story and multiple perspectives are always needed when doing spatial analyses.

Different actors – particularly those from different cultural backgrounds – can create wildly different interpretations from the exact same data because they are influenced by their values and beliefs. Creating a map is similar to telling a story: where you choose to begin and end the narrative (or visual) can alter its shape and meaning (Cronon, 1992). Each GIS analysis has a different perspective that establishes a hierarchy of power and control. Individuals that manage the data and create maps determine what is and what is not shown on those maps, as well as how those items should be interpreted. This imbalance leans heavily in the state's favor, often leaving communities powerless to stake their land claims.

Today, multi-stakeholder meetings are held in order to make sure the needs of different groups are heard. Organizations such as WRI and SEKALA act as intermediaries and facilitate stakeholder meetings prior to publishing maps. Sometimes these meetings include members of one community and other times these meetings include a mix government officials, corporations, and local communities. These meetings are dealt with differently and require different 'work streams' so that each voice is heard. Anne Rosenbarger, a WRI employee, put it simply: "you can't put community members and government officials together in a board room and expect there to be an equal exchange of information" (personal communication, 20 Nov 2016).

The rise of participatory mapping (also known as community mapping, counter-mapping, and bottom-up GIS) came about at the end of Suharto's regime in the 1990s (Suar, personal communication, 16 Nov 2016). Distrust in state powers was high and grew during the 1997-1998 Indonesian Fires and the subsequent unseating of President Suharto. Communities enlisted NGOs to help identify local resources, delineate land claims and land use, and trace historically/culturally significant areas (Warren, 2005; Peluso, 1995). In this way, using GIS to organize data and draw maps actually empowers communities who would otherwise be silenced. (Pickles 1995; Robbins, 2003)

The majority of organizations I contacted were in some way involved with participatory mapping: Wisnu used it to plan community-managed eco-tourism businesses in Bali (Suar, personal communication, 16 Nov 2016); SEKALA used it to help Papuan communities create future development projects (Widiastuti, personal communication, 9 Nov 2016; Ketut, personal communication, 29 Nov 2016); WRI used it to protect community and indigenous rights and land claims (Rosenbarger, personal communication, 30 Nov 2016). SEKALA was especially passionate about working with local communities and NGOs, even offering a GIS course for government offices (regional- or district-level) and NGO volunteers (Ketut, personal communication, 29 Nov 2016; Widiastuti, personal communication, 9 Nov 2016). Of these organizations, only SEKALA and WRI have dealt directly with the One Map Policy.

PT Serasi Kelola Alam (SEKALA)

SEKALA's entire business model appears to revolve around the idea of scale, to the point where even their logo shows a series of scaled leaves embedded within one another (see Appendix B). This was done intentionally to illustrate how SEKALA believes that spatial analyses need to be conducted at all scales, not just a select few (Ketut, personal communication, 29 Nov 2016). Additionally, '*sekala*' literally means 'scale' in Bahasa Indonesia. Pak Ketut and his employees dedicate themselves to helping groups understand the world from a local to even international scale. They have been involved with local communities on Papua, palm oil plantations in Sumatra, mining concessions in Java, and heritage sites in Bali, and has supported REDD+ Programme since its inception in Indonesia.

As a consulting firm, SEKALA is often hired by a group to help with an environmental and/or geospatial problem. Local NGOs often act as liaisons between SEKALA and local communities, and in turn can request training in GIS software. Educational workshops, including GIS coursework, are an important part of SEKALA's mission. During their Papua land assessment, SEKALA teamed up with the World Wildlife Foundation to provide GIS training for a local NGO. Despite this initial introduction to GIS, Papuan stakeholders require further training before they will have the capability of using GIS to create spatial plan or make informed spatial planning decisions (Ketut, personal communication, 29 Nov 2016; SEKALA, 2014).

Pak Ketut spoke at length about several weaknesses in SEKALA's GIS training course, specifically community access to technology and the feasibility of community members actively using the software. GIS is a product of computers and the internet and requires an understanding of the visual representations of digitized spatial data (Pickles, 1995). Computers, data processing software, and servers are only a few of the supplies needed to use GIS in an analytical capacity, and thus access to this software is limited to those with computers and telecommunications. GIS applications are subject to additional restrictions. For example, groups that have unequal access to computers could produce uneven relationships and undermine the ability to have fair and open discussions about spatial data (Kyem, 2004). SEKALA attempts to avoid these barriers by working with local NGOs on technology and software available to them, rather than relying on organizations to invest money in hardware they won't use in the future (which has happened previously when large international NGOs came to help certain groups by providing materials but no training) (Ketut personal communication, 29 Nov 2016). Other organizations that SEKALA has worked with, including the Wisnu Foundation, sometimes use a handheld global positioning system, tape and basic GIS software to accommodate villagers (Suar, personal communication, 16 Nov 2016). An additional concern about GIS technology is the misuse or incorrect collection of spatial data. Kyem (2004) argues that communities involved in participative mapping that have no experience may be detrimental to the movement (2004). If not done properly, communities can waste the time, resources, and energy of all parties involved. In an interview at SEKALA headquarters, Pak Ketut mentioned that several local NGOs and communities have mapped areas and presented their data to the government, only to be rejected (sometimes multiple times) (personal communication, 29 Nov 2016). NGOs should remember that while GIS may be touted

as the solution to land mapping problems, this software may not be easy for some citizens to access or use effectively.

SEKALA has not been contracted by the national government to work with the One Map Policy, however their employees remain cognizant of the policy's spatial data requirements. When SEKALA discovers overlapping boundaries in an area they are working, they are required to approach government officials and agree on what boundaries will be used in formal publications. SEKALA may not be actively drawing boundaries or organizing attribute data for the OMP, but their work in local communities is not going unnoticed.

World Resources Institute

WRI frequently partners with SEKALA. In 2013, they finished a project in Kalimantan that dealt with identifying land available for palm oil plantations. Though not specializing in GIS consultation, WRI is heavily involved in community mapping. Currently, nearly every project WRI is working on involves spatial data. Two of these projects directly address the One Map Policy: Sustainable Energy One Map and the One Map Initiative at the Local Level.

Sustainable Energy One Map is a tool that would organize information related to the development of renewable energy. WRI has partnered with the Ministry of Energy and Mineral Resources to create this map and promote investment in clean energy. This map is still in development, but WRI appears to have published a general nation-wide map (Figure 9).



Figure 9. Clip of map published by WRI as part of the Sustainable Energy One Map tool.

Source: <http://www.wri-indonesia.org/en/our-work/project/sustainable-energy-one-map-seom>

The One Map Initiative at the Local Level is a project aimed at directly supporting the implementation of One Map Policy. WRI wants to promote sustainable and equitable land use planning by supporting the Local Geospatial Information Network and establishing a multi-stakeholder forum that involves key stakeholders, such as the government, consulting service organizations, private sectors, community groups, and indigenous people. One Map Riau is the first application of this initiative and was announced in early July 2016. The project is likely to begin in a few months, and if you search online for One Map Riau you will see that the position of coordinator has not yet been filled. The project will take around four years to complete and involves the daunting task of gathering spatial data via surveying. WRI selected Riau as their first site because of its high frequency of land-related conflicts and infamous position as the region with the highest rate of deforestation and carbon emissions in Indonesia.

WRI has close ties with the national government and has worked with ministry officials for some time. Their current director was even the leader of UKP4 when the OMP was first proposed. The maps produced by WRI in partner with local communities are strong candidates for incorporation into the OMP. As mentioned previously, WRI may be in negotiation with the

national government to formally become a consultant for the One Map Policy; however, their final role in mapping Indonesia has yet to be determined.

Considerations for Applying GIS in Community Mapping

Providing local communities the opportunity to map their land gives them a modicum of defense if government officials improperly map the region. Though the OMP and participative mapping are both moves to make nations more transparent and allow communities to represent themselves, there are a few things to be taken into consideration: foreign involvement, conflict during mapping, politics, and historical maps.

As mentioned previously, all of the NGOs I spoke with that actively use GIS have western-trained employees. Non-local organizations must be willing to acknowledge the potential for a community to have different values and perceptions. As a foreign student, this was brought up in almost every interview I held, but was especially important in my conversation with Anne Rosenbarger, an American living in Bali. Rosenbarger has worked with local communities before, but has recently taken a step back in order to work with international corporate stakeholders. Her justification for removing herself from local mapping was that “as a foreigner, I am better suited to working with the corporate side of the issue...while working with community members is fun, it isn’t as productive” (Rosenbarger, personal communication, 30 Nov 2016). I was surprised to hear her say this and for her to realize what she represented to local communities: a foreigner coming in and mapping their lands without fully understanding their culture, history, and language. The current political atmosphere amongst international corporations is heavily influenced by western ideals and capitalism. As a Western scientist trained at Duke University, Anne Rosenbarger likely has more in common with corporate employees than Indonesian citizens.

One detrimental assumption for any organization to make is that all communities are homogenous and have the same goals or desires. Drawing a map for a community has the potential to bring up pre-existing conflicts that could complicate the process (Ketut, personal communication, 29 Nov 2016). No matter what the final decision is, one or both conflicting parties will lose out. Another significant issue is that of representation within the community: who is drawing the map for the community? Not having demographically-representative delegates may cause some members of the community to be marginalized. Attention should be paid to minority groups and vulnerable individuals. (Astuti & McGregor, 2016)

After submitting community-drawn maps and having them approved by state officials, the next concern is about the government’s political resolve to uphold spatial plans. Political will for spatial planning can be insecure, especially concerning economic development and foreign investment. For example, SEKALA published a report in 2008 that stated “[in Bali], government officials do not adhere to spatial plans and issue land to villa developments when it has been categorized for conservation or watershed management” (SEKALA, Nordic Consulting Group & Papuan Civil Society Strengthening Foundation, 2008). This issue could provide incentive for officials implementing the OMP to work directly with the Corruption Eradication Commission

(Komisi Pemberantasan Korupsi, KPK) to maintain the integrity of spatial data while also identifying corruption from local governments.

Spatial data and maps are inherently static: they offer a picture of what the world was like at one moment in time. Maps in particular become historical the instant they are created. When drawing maps, communities need to keep in mind that once something major changes (e.g., more land is claimed than before), the maps they have created need to be updated. For example, if a community purchases land but the spatial data outlining their claims to the government is not updated, that land may be allocated for a different land-use, which would instigate more conflict. This cycle is what triggers land claim conflicts that exist today.

Despite these critiques, participative mapping (and counter-mapping) remains a strong tool that empowers local communities. With the right training and technology, Indonesian citizens and the NGOs they partner with will have a stronger chance to defend land claims and keep other stakeholders from unlawfully seizing property. This may also reduce future land use conflicts within and between communities, particularly if communities collaborate to create integrated maps.

The “Mess”

Who Benefits?

From a literature review of historical Indonesian politics, it appears that Indonesia’s land use policies are a convoluted mess of legislation and mapping standards. Because of this, corrupt individuals are able to use the political system to their advantage by making money off selling concession licenses, use-rights, and resources that otherwise may have not been available (i.e., been claimed by a different stakeholder). In fact, because of the economic policies pursued by Sukarno and Suharto in the late 1900s, Indonesia has a reputation for corruption and crooked capitalism. The Indonesian government acknowledges this history and is actively fighting it with KPK. In fact, KPK is actively involved in the issue of land disputes in Indonesia and is currently entered into a ‘Joint Agreement’ with agencies (including the Ministry of Forestry and Environment and the Ministry of Agriculture) that promotes the collaboration between these various agencies when granting land claims and land ownership (Astuti, personal communication, 22 Feb 2017).

Today, organizations with dominant information and the authority to draw boundaries for land use policies and business concessions are the actors benefiting the most from mapping’s inconsistencies. By using the broad array of overlapping policies to their advantage, policy makers and businessmen can claim resources and access-rights to land without worrying about any meaningful opposition from local communities. Actors who attempt to support local communities and indigenous groups, such as NGOs similar to the World Resources Institute and SEKALA, are the ones who often describe the government’s land-claim processes “a mess and inaccurate” (Rosenbarger, personal communication, 30 Nov 2016).

The One Map Policy aims to open the policy arena to the citizens of Indonesia. The national government has given Indonesian citizens the power to make their own maps and defend their land

by making mapping transparent and providing everyone who has internet access with spatial data (enabling them to make their own thematic maps). The policy also organizes spatial data for the entire state of Indonesia, enabling them to create a single base map which every policy will be associated with. In order to organize this data collectively, the One Map Policy (OMP) is “synchronizing governmental agencies in carrying out their development programs” (Kurniawan, personal communication, 7 Feb 2017). Though described in a scientific manner, this process is highly political. The organization of power between stakeholders is guaranteed to shift in response to the OMP and can move two ways: power and control will shift to the Indonesian government or it will enable local communities to defend their land and assert their land claims to the government.

In order to control a population, governments must make the land legible to administrators, a process that often requires intense simplification of local culture and practices. By establishing a single base map which every agency has to work from, the Indonesian administration is simplifying the spatial data that they deal with. Every stakeholder that wants their claim heard must submit a map (or spatial data) that follows the government’s demands and standards. If they fail to do so, their claims will not be recognized and they are effectively silenced. Thus, the OMP will enable the national government to have a higher degree of control over the country, particularly concerning land-claims, and will improve the ability for officials to monitor the population.

On the other hand, by making spatial data legible to everyone in Indonesia – including individual citizens – mapping could be efficient and effective at the grassroots level. As long as the data itself is correct, the spatial organization of an area can be used to defend land claims. A population with access to official spatial data can more easily defend their land, as long as their previous claims were recognized. Within this authority however, lies another level of political power. Communities are often spoken of as distinct, unified entities when in reality they are anything but. Conflict within and between communities is quite common and whoever represents these communities has the most power when it comes to making claims to certain lands. Those with more information, influence, and a higher political position within the community are more likely to have their voices heard than other members of the community. This puts certain people at a distinct disadvantage.

In their respective interviews, Dr. Astuti and Dr. Kurniawan have argued that the government will be the one to benefit the most from the OMP. Dr. Astuti went so far as to say that the government “will have a very powerful surveillance mechanism to govern not only the private sector, but also the indigenous communities...and citizens of Indonesia” and that the “One Map Policy, in a way...can be good in terms of providing clarification for all the questions, but it also provides a very powerful weapon for the government” (Astuti, personal communication, 22 Feb 2017). The reason that the government will claim more power from the OMP is because communities are not able to use spatial data as is: the “communities require support and resources from the NGOs and the NGOs have limited capacity because they rely on donor support” (Astuti, personal communication, 22 Feb 2017). Dr. Kurniawan further states that the OMP “is intended to

strengthen the national government's power in order to control for land use development" (Kurniawan, personal communication, 7 Feb 2017).

Dr. Astuti and Dr. Kurniawan are likely correct in their assertions and the Indonesian government will, in the end, benefit the most from the OMP when it is implemented. Dr. Astuti brings up a good point when she mentions that communities rely entirely on NGOs in order to process spatial data. Funding sources for NGOs are low and the more communities that want to use the data provided by the OMP, the more pressure will be placed on these NGOs.

Addressing Land Conflicts:

Quantifying conflicts is an important aspect in determining whether the OMP is actually effective. When promoting the OMP, government officials assert that its main purpose is to help "solve problems, such as land disputes arising from the use of data and maps from different sources" (Samosir & Aisyah, 2017). Thus, by political measure, the OMP is successful only if it reduces reported land use conflicts. The issue then becomes how you define 'conflict'. What qualifies as a conflict for government officials? What qualifies as a conflict for community members? The international community? Land use conflict can range from village discussions to sit-ins or from physical violence to mass incarcerations. Different interactions need to be considered when quantifying land use conflicts to estimate the success of policies.

There are mixed predictions about how the OMP will affect land use conflicts. Pak Ketut from SEKALA said that mapping, particularly participatory mapping, will in the end reduce conflict because it forces the community to address their claims and make a decision (personal communication, 29 Nov 2016). Logically, I believe he is correct; however, I do not believe it is the entire picture. The amount of external conflict will likely decrease because it is addressed during the mapping process, however, I don't believe the total negative interactions will actually decline: the person who loses the conflict is unlikely to simply shrug their shoulders and move on. Even if the land will not be actively fought over, the conflict occurring underneath the agreement will not disappear.

Scholars Dr. Astuti and Dr. Kurniawan, both assert that the OMP will initially increase land use conflicts. Dr. Astuti mirrors the statement made by Pak Ketut, saying that the beginning of the OMP "is the stage where people bring forth their contests or their land claims" (Astuti, personal communication, 22 Feb 2017). Dr. Kurniawan simply states that the "One Map Policy has not done anything to reduce land conflicts" (personal communication, 7 Feb 2017). At the end of the interview, however, Dr. Kurniawan suggested that land conflicts would actually increase in some areas, particularly in regions with competing interests in mining and palm oil concessions (personal communication, 7 Feb 2017). Additionally, external conflicts within communities may decrease, but underlying animosity among individuals may not change.

To reiterate, a baseline of what land use conflicts actually means needs to be clarified prior to making any sweeping conclusions about the success of the OMP. How communities will respond over the long term to the OMP has yet to be seen, but academics already seem wary of its success in terms of reducing conflict.

Conclusion

Indonesia has a turbulent political history that cycles between centralizing and decentralizing land use policies. Government officials have been able to take advantage of overlapping and inconsistent boundaries by issuing concessions for the same areas, renting out land to multiple investors, and manipulating community borders to create resource concessions. These policies (and international organizations pressuring Indonesia to reduce its greenhouse gas emission and deforestation rates) have shed light on government corruption and ushered in a new era of political policies: the *Reformasi* period of the 21st century. Since the 2000s, there has been a push for greater transparency and policies that are a combination of decentralizing and centralizing actions. For example, Indonesian citizens want to have a say in land use policies (decentralization) but the government feels it is necessary to standardize spatial data to unify data across the state (centralization). International pressure provides additional incentive to standardize data and to create a single map for all of Indonesia to use. In 2010, UKP4 and the REDD+ Taskforce brought the issue of inconsistent maps to the President, who subsequently issued a policy that led to the Indicative Moratorium Map and the One Map Policy.

The One Map Policy has three parts, each of which serve to unify Indonesia's spatial data and provide opportunities for communities to submit their own land claims. Government officials partnered with outside organizations, including the Spatial Informatics Group, to help accelerate the creation of a single database (hosted by Indonesia's Geospatial Information Agency). The entire One Map Policy is set to be completed in 2019, but due to some delays and miscommunications, may take longer.

Despite the high expectations for a democratic implementation of the One Map Policy, the simple premise of organizing and analyzing spatial data within GIS is a highly political move. Unifying spatial data to control the creation of official maps are methods that have been used for centuries by colonial powers and today is no different. The Indonesian government still wishes to control the citizens and resources within their boundaries and the creation of a single base map by the One Map Policy will allow them to do just that. So while the opportunity for citizen-drawn maps and communal participation mapping exists, it is unlikely to give communities the power they are expecting.

Social concerns about GIS software in general are also present and need immediate attention. It is important to understand who is gathering spatial data, what groups they represent, and how their maps are interpreted. The concern for maps to marginalize members of a society always exists and needs to be kept in mind during large projects like the One Map Policy. The power structure between members of the community, and between the communities and government agencies should be acknowledged and accommodated for during negotiations.

As it stands today, the One Map Policy has provided more power to the Indonesian government than it has to local communities. Some sources say that the One Map Policy has provided a 'weapon' to government officials. Many also argue that the One Map Policy will create more conflicts than solve them during the first few years. The annual reports published by KPA provide evidence for these assertions: land use conflicts have been rising since the early 2000s. Though the number of conflicts peaked in 2014 and then dropped in 2015, conflicts are again rising to 2014-levels in 2016 and 2017. The centralization of spatial data is unlikely to solve land-use

conflicts over the long-term and future administrations have the potential to withdraw their cooperation with requests with transparency. Indonesia has a turbulent history with spatial planning and a single policy is not likely to solve decades of 'messy' policies.

References

- Astuti, R. Y. (2016). *REDD+ Governmentality: Governing Forest, Land, and Forest Peoples in Indonesia* (Doctoral thesis). Retrieved from <<http://researcharchive.vuw.ac.nz/xmlui/handle/10063/5214>>.
- Astuti, R., & McGregor, A. (2015). Responding to the green economy: how REDD+ and the One Map Initiative are transforming forest governance in Indonesia. *Third World Quarterly*, 36(12), 2273-2293.
- Astuti, R. & McGregor, A. (2016). Indigenous land claims or green grabs? Inclusions and exclusions within forest carbon politics in Indonesia. *Journal of Peasant Studies*. doi: 10.1080/03066150.2016.1197908.
- Badan Informasi Geospasial, BIG (2016). Home. Accessed Nov 2016. <<http://tanahair.indonesia.go.id/home>>.
- Cronon, W. (1992). A place for stories: Nature, history, and narrative. *Journal of American History*, 78(4): 1347-1376.
- Dalem, A.G. R. Lecture "Cultural Tourism," 18 October 2016, SIT Bali Program Center, Kerambitan.
- Di Gregorio, M., Nurrochmat, D. R., Paavola, J., Sari, I. M., Fatorelli, L., Pramova, E., ... & Kusumadewi, S. D. (2017). Climate policy integration in the land use sector: Mitigation, adaptation and sustainable development linkages. *Environmental Science & Policy*, 67: 35-43.
- Forests and Landscapes Indonesia. (2017). *World Resources Institute*. Retrieved from <<http://www.wri.org/our-work/project/forests-and-landscapes-indonesia>>.
- Forest Watch Indonesia. (2017). About: Vision/Mision. Retrieved from <<http://fwi.or.id/english/about>>.
- Gingold, Beth, A. Rosenbarger, Y. I. K. D. Muliastira, F. Stolle, I. M. Sudana, M. D. M. Manessa, A. Murdimanto, S. B. Tiangga, C. C. Madusari, and P. Douard. 2012. "How to identify degraded land for sustainable palm oil in Indonesia." Working Paper. World Resources Institute and Sekala, Washington D.C. Retrieved from <<http://wri.org/publication/identifying-degraded-land-sustainable-palm-oil-indonesia>>.
- Global Forest Watch (2014). Indonesia forest moratorium [data set]. Retrieved from <http://data.globalforestwatch.org/datasets/e1d58822d083492eb54d6e2af463d790_7>.
- Harwell, E. (2000). Remote sensibilities: Discourses of technology and the making of Indonesia's natural disaster. *Development and Change*, 31: 307-340.

- Hasyim, F., Subagio, H., & Darmawan, M. (2016). One map policy (OMP) implementation strategy to accelerate mapping of regional spatial planning (RTRW) in Indonesia. *IOP Conf. Series: Earth and Environmental Science*, 37: 012054. DOI: 10.1088/1755-1315/37/1/012054. IOP Publishing.
- Hodgson, M. (2015a). Lecture "Introduction to GIS," 24 August 2015, University of South Carolina – Columbia.
- Hodgson, M. (2015b). Lecture "Data Sources," 9 September 2015, University of South Carolina – Columbia.
- Jannah, K. (10 November 2015). Indonesia bakal punya one map policy, apa itu? *Economy*. Retrieved from <<http://economy.okezone.com/read/2015/11/10/320/1246914/indonesia-bakal-punya-one-map-policy-apa-itu>>.
- Jong, H. (22 July 2016). One map policy success hinges on local involvement. *Jakarta Post*. Retrieved from <<http://www.thejakartapost.com/news/2016/07/22/one-map-policy-success-hinges-local-involvement.html>>.
- Konsorsium Pembaruan Agraria, KPA. (2017) Profil. Retrieved from <<http://www.kpa.or.id/news/organisasi/profil-singkat-konsorsium-pembaruan-agraria>>.
- Konsorsium Pembaruan Agraria, KPA. (2012). *Catatan akhir tahun 2012: Terkuburnya keadilan agrarian bagi rakyat melalui reforma agrarian*. Jakarta, Indonesia.
- Konsorsium Pembaruan Agraria, KPA. (2013). *Catatan akhir tahun 2013: Warisan buruk masalah agrarian di bawah kekuasaan SBY*. Jakarta, Indonesia.
- Konsorsium Pembaruan Agraria, KPA. (2014). *Catatan akhir tahun 2014: Membenahi masalah agrarian: Prioritas kerja Jokowi-JK Pada 2015*. Jakarta, Indonesia.
- Konsorsium Pembaruan Agraria, KPA. (2015). *Catatan akhir tahun 2015: Reforma agrarian dan penyelesaian konflik agrarian disandera birokrasi*. Jakarta, Indonesia.
- Konsorsium Pembaruan Agraria, KPA. (2016). *Catatan akhir tahun 2016: Liberalisasi Agraria Diperhebat, Reforma Agraria Dibelokkan*. Jakarta, Indonesia.
- Kurniawan, N. I. (12 May 2016). Getting the One Map Policy Right. *Indonesia at Melbourne*. Retrieved from <<http://indonesiaatmelbourne.unimelb.edu.au/getting-one-map-policy-right/>>.
- Kyem, P.A. (2004). Of intractable conflicts and participatory GIS applications: The search for consensus amidst competing claims and institutional demands. *Annals of the Association of American Geographers*, 94(1): 37-57.
- Li, T. M. (2007). *The will to improve: Governmentality, development, and the practice of politics*. Duke University Press.

- Lorenzen, R. & Roth, D. (2015). Paradise contested: Culture, politics, and changing land and water use in Bali. *The Asia Pacific Journal of Anthropology*, 16(2): 99-105.
- Lubis, M. and Langston, J. (2015). Understanding landscape change using participatory mapping and geographic information systems: Case study in North Sulawesi, Indonesia. *Procedia Environmental Science*, 24: 206-214.
- Mathews, A. S. (2005). Power/knowledge, power/ignorance: forest fires and the state in Mexico. *Human Ecology*, 33(6), 795-820.
- Mulyani, M. and Jepson, P. (2017). Does the 'One Map Initiative' represent a new path for forest mapping in Indonesia? Assessing the contribution of the REDD+ initiative in effecting forest governance reform. *Forests*, 8(14). doi: 10.3390/f8010014.
- Nurdin, I. (2014). Resolving agrarian conflict through implementation of land reform by collaboration of CO and local government in Indonesia. In: Paper Presented at the 2014 World Bank Conference of Land and Poverty, Washington DC.
- One Map-Indonesia. (2017). *Spatial Informatics Group (SIG)*. Retrieved from <<https://sig-gis.com/projects/one-map-indonesia>>.
- Oxford Business Group, OBG. (2015). Indonesia introduces one map policy as a solution to overlapping land claims. Retrieved from <<https://www.oxfordbusinessgroup.com/overview/indonesia-introduces-one-map-policy-solution-overlapping-land-claims>>.
- Peluso, N. L. (1995). Whose woods are these? Counter-mapping forest territories in Kalimantan, Indonesia. *Antipode*, 27(4), 383-406.
- Picard, M. (1986). "Cultural tourism" in Bali: Cultural performances as tourist attraction. Revised Paper initially presented at the International Workshop on Indonesian Studies, Balinese State and Society: Historical, Textual, and Anthropological Approaches. Leiden, April 21-24, 1986.
- Pickles, J. (1995). "Representations in an electronic age: Geography, GIS, and democracy". Chapter in *Ground Truth: The Social Implications of Geographic Information Systems*. New York: The Guilford Press.
- Putra, D.Y.D. (2015). Konsekuensi yuridis penggarap liar pada tanah hgu ptpn II (Studi di pasar XII desa bandar klipka kecamatan precut sei tuan, kabupaten deli serdang). *Premise Law Jurnal*. 2. Retrieved from <<http://jurnal.usu.ac.id/index.php/premise/article/view/9329/4057>>.
- Riggs, R., Sayer, J., Margules, C., Boedhihartono, A.K., Langston, J.D., and Sutanto, H. (2016). Forest tenure and conflict in Indonesia: Contested right in Rempek Village, Lombok. *Land Use Policy*, 57: 241-249.

- Robbins, P. (2003). Beyond ground truth: GIS and the environmental knowledge of herders, professional foresters, and other traditional communities. *Human Ecology*, 31(2): 233-253.
- Rosenbarger, A., et al. (2013a). Issue Brief: How to change legal land use classifications to support more sustainable palm oil in Indonesia. *World Resources Institute*.
- Rosenbarger, A., et al. (2013b). Appendices A-C: How to change legal land use classifications to support more sustainable palm oil in Indonesia. *World Resources Institute*.
- Salim, T. (26 December 2014). One map policy helps resolve land disputes and overlapping permits. *Jakarta Post*. Retrieved from <<http://www.thejakartapost.com/news/2014/12/26/one-map-policy-helps-resolve-land-disputes-overlapping-permits.html>>.
- Samadhi, N. "Indonesia ONE MAP: Assuring better delivery of national development goals." [Presentation] 9 April 2014, Locate14 Conference. National Convention Center: Canberra, Australia.
- Samadhi, N. "Indonesia ONE MAP: Forging a functioning national geospatial information network infrastructure." [Presentation] 12-13 May 2013, Geospatial World Forum 2013. Rotterdam, Netherlands.
- Samosir and Aisyah (2017). One Map and economic development: Implementation of One Map Policy in Lubuklinggau – Assuring better economic development. *Ministry of Agrarian Affairs and Spatial Planning & National Land Agency*.
- Scott, J. C. (1998). *Seeing like a state: How certain schemes to improve the human condition have failed*. Yale University Press.
- SEKALA, Nordic Consulting Group, & Papuan Civil Society Strengthening Foundation (2008). A strategic assessment of spatial planning options for Papua province. Bali, Indonesia.
- SEKALA (2014). Modul pelatihan dasar SIG dengan quantum GIS 2.4.0 Chugiak.
- Shahab, N. (2015). Case Study: Indonesia One Map Policy. *Open Government Partnership*. Retrieved from <<https://www.opengovpartnership.org/country/indonesia/case-study>>.
- Strauß, S. (2015). Alliances across Ideologies: Networking with NGOs in a Tourism Dispute in Northern Bali. *The Asia Pacific Journal of Anthropology*, 16(2): 123-140.
- Tagliarino, N. (2016). Working Paper: Encroaching on land and livelihoods: How national expropriation laws measure up against international standards. *World Resources Institute*. Retrieved from <<http://www.wri.org/publication/encroaching-on-land-and-livelihoods>>.
- United Nations Framework Convention on Climate Change, UNFCCC. (2007). Bali road map. Retrieved from <http://unfccc.int/key_documents/bali_road_map/items/6447.php>.

- Warren, C. (2005). Community mapping, local planning, and alternative land use strategies in Bali. *Geografisk Tidsskrift-Danish Journal of Geography*, 105(1): 29-41.
- Wibowo, A and Giessen, L. (2015). Absolute and relative power gains among state agencies in forest-related land use politics: The Ministry of Forestry and its competitors in the REDD+ Programme and the One Map Policy in Indonesia. *Land Use Policy*, 49:131-141.
- Yusran, Y., Sahide, M., Supratman, S., Sabar, A., Krott, M., & Giessen, L. (2017). The empirical visibility of land use conflicts: From latent to manifest conflict through law enforcement in a national park in Indonesia. *Land Use Policy*, 62:302-315. DOI: 10.1016/j.landusepol.2016.12.033.

Appendix A: Examples of Inconsistent Spatial Data

The following visuals are selections from two sources: a presentation by UKP4 in 2014 describing why Indonesia needs to implement functional National Geospatial Information Network Infrastructure, and a report issued by SEKALA in 2015 as part of their project provisioning baseline data and cadastral maps for Papua, Indonesia. SEKALA's data was drawn up to fulfill requirements established by the REDD+ Programme. Some of the most prevalent data problems within this report are: administrative boundary discrepancies, coastal boundary discrepancies, topographic data gaps and inconsistencies, land cover inconsistencies, concession data discrepancies, incomplete data on customary and local communities, and incomplete metadata. UKP4's report pulls maps from uncredited sources, but shows the same spatial data inconsistencies found in SEKALA's report.

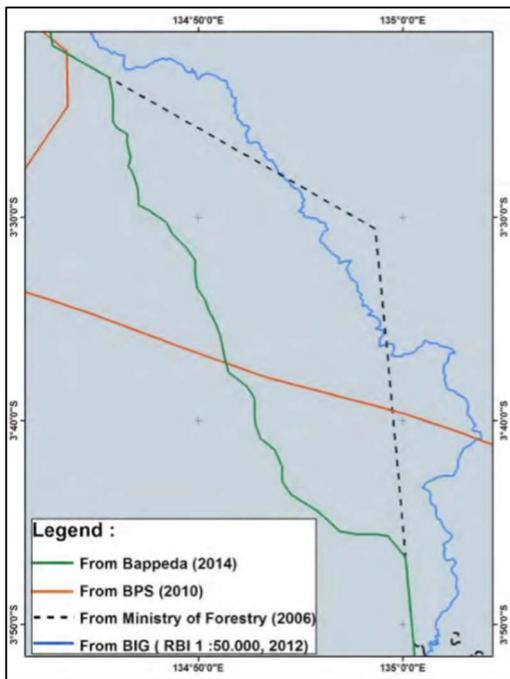


Figure A1. Different administration boundaries from BIG (2012), BPS (2010), the Ministry of Forestry (2006), and provincial BAPPEDA (2014).

Source: SEKALA et al. (2015)

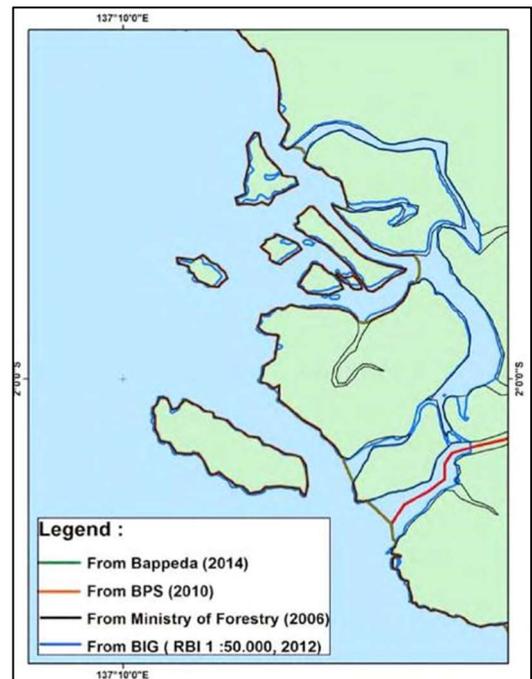


Figure A2. Comparison of coastal boundaries sourced from BAPPEDA Papua (2014), BPS (2010), the Ministry of Forestry (2006), and BIG (2012)

Source: SEKALA et al. (2015)

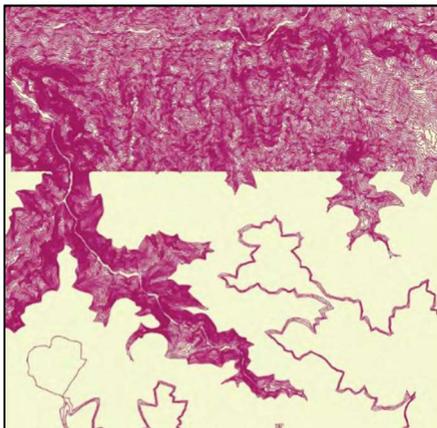


Figure A3. Inconsistency of topographic contour density representing the Papuan landscape.

Original source from BIG (2012)

Source: SEKALA et al. (2015)

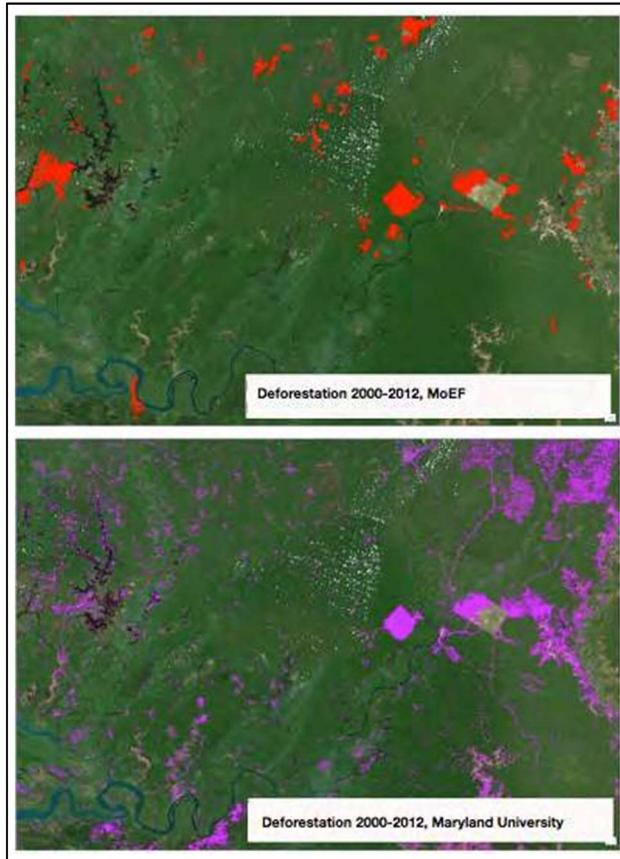


Figure A4. Forest change discrepancies between the Ministry of Environment and Forestry between 2000 and 2012 and the University of Maryland's Global Forest Change dataset (2013)
 Source: SEKALA et al. (2015)

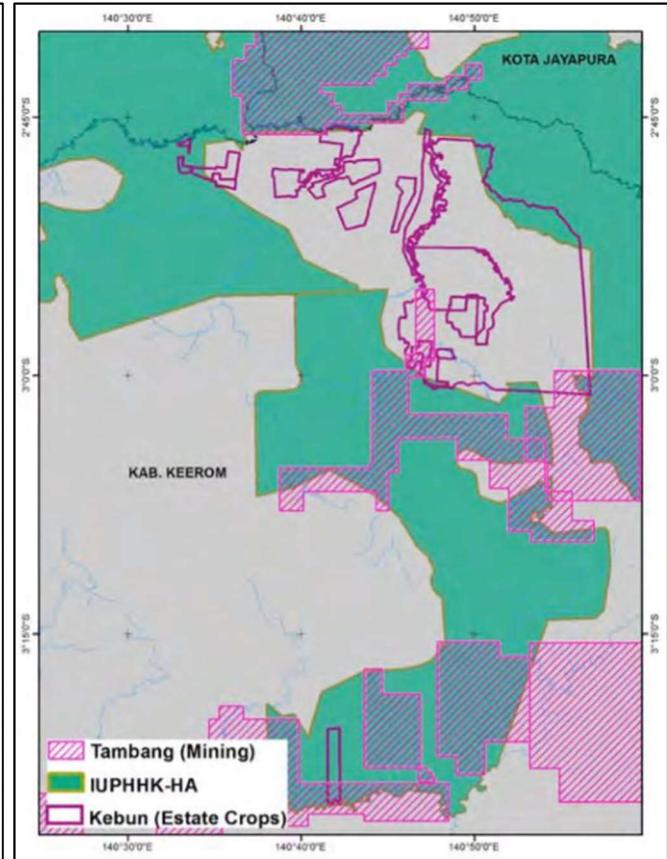


Figure A5. Overlapping concessions between mining, estate crops, and forestry concessions. Logging concession data sourced from the Ministry of Forestry (2014), estate crops concessions from Provincial Estate Crops Services (n.d.), and mining concessions from Provincial Energy and Mineral Resources Services (n.d.).
 Source: SEKALA et al. (2015)

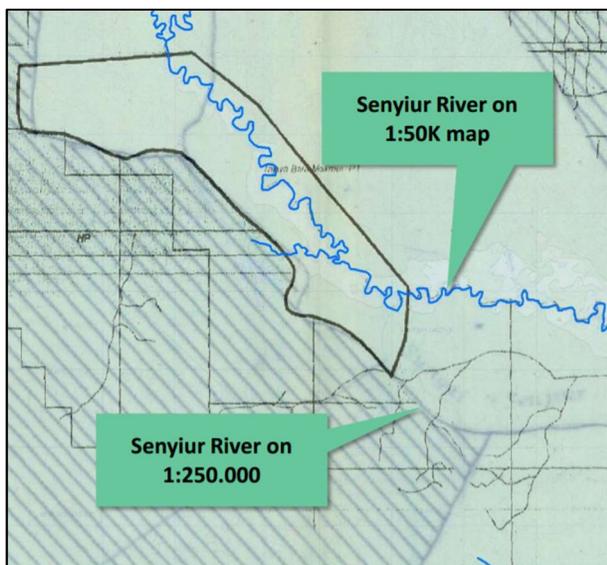


Figure A6. Inconsistent line depicting the Senyuir River. The border of a production forest concession had been outlined at the 1:250,000 scale using the river and its coordinates as a reference, however the position of the river changes markedly at a finer scale.
 Source: Samedhi (2014)

Appendix B: Profiles of Organizations Interviewed



PT Serasi Kelola Alam, better known as SEKALA, is an Indonesian consulting firm that specializes in environmental management and GIS, including forest governance, REDD+ program policies, land use change, conservation, community mapping, spatial land use planning, conflict mitigation, and remote sensing. They also provide GIS training courses for communities, NGOs, and government offices.

<http://sekala.net/>



The Wisnu Foundation is an independent, non-profit organization specializing in community resource management. They actively work with communities impacted by tourism and are proactive in promoting environmental stewardship

<http://www.wisnu.or.id/>



BaliFokus is a nongovernmental organization working to improve community's capacity, quality of life, and advocating a toxics-free environment together with stakeholder in a sustainable way. The director of this program served as my project advisor while I was in Bali, Indonesia.

<http://www.balifokus.asia/>



Gringgo is a company that develops waste management solutions to help organize waste collection and recycling services throughout Bali. They are also involved in web and app development in order to involve the community and reward all involved parties

<http://www.gringgo.co/>



World Resources Institute is a global research organization working on six critical global goals: climate change, energy, food, forests, cities, transportation. Operating as a think-tank, WRI produces strong scientific reports to advise policy makers around the globe. A smaller part of the larger organization, World Resources Institute Indonesia is a regional office heavily involved at the local scale throughout Indonesia.

<http://www.wri.org/>
