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Counter-mapping Land Grabs with Community Drones in Indonesia

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Abstract

Indonesia is up for grabs. In the division of labour in the newly liberalised ASEAN economy, it has taken on the role of providing natural resources to the more advanced economies in Southeast Asia. With its MP3EI “accelerated development programme,” a national, state-coordinated programme of land grabs is taking place, in which different provinces are assigned different development foci (food and energy for Papua, palm oil processing for North Sumatra, mining for Central Kalimantan etc.). A key dynamic in this development plan is the commoditisation of space by spatial planning. Although the spatial planning process is supposed to be open, transparent and participatory in Indonesia, in reality it is the opposite. Maps are made by consultants and government offices favoring the interests of capital and local elites. Concessions are given mostly without the consent (and often without the knowledge) of local communities. Access to maps and spatial information is limited and commodified. This paper shares our experience of using unmanned aerial vehicles (drones) to generate high-quality community controlled maps to challenge spatial planning from above. Developed at first as a component of action research looking at the political ecology of the Kapuas River, the drone mapping soon developed its own dynamics. In one case of a large bauxite mining operation in Tayan, the community could use maps made with the drone to prove that the company had operated outside the concession and had destroyed a nearby lake that was important for their livelihood. This evidence was presented at the provincial spatial planning meeting and led to the inclusion of a passage guaranteeing customary land rights within the provincial spatial planning law. In a further development, community members used drone photographs to give testimony before the constitutional court that was reviewing a challenge by large mining corporations to the 2009 national mining law. The court ruling subsequently upheld the stipulation in the law that requires mining corporations to build smelters and refineries. The drone technology is now being replicated, with a community training centre now set up at the Swandiri Institute in Pontianak, and with plans by the environmental justice network WALHI to introduce the technology across the country.

Keywords: land grabbing, oil palm plantation, mining activities, West Kalimantan, Inclusive technology, drones

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Introduction

Land grabbing in Indonesia is an integral part of the state-coordinated development effort. In trade-liberalised ASEAN, Indonesia has been awarded the role of resource supplier. The Indonesian state has operationalised this place in a regional division of labour with a “plan for accelerated development” – the MP3EI (Master Plan Percepatan Pembangunan Ekonomi Indonesia) – in which different provinces are earmarked for different industries. In this vision, the development of West Kalimantan will be led by the palm oil, bauxite mining and timber industries (Rachman and Yanuardy 2014), industries which operate by obtaining concession permits for large areas. Concessions for mining, palm oil, logging and pulp and paper plantations now cover – because of overlapping permits - 130% of the total area of West Kalimantan.

A key component of this strategy are maps produced in the spatial planning process that “facilitates large-scale accumulation strategies” and “consolidates state control” (Peluso, 1995: 383). The basis for spatial planning is the Law No. 26 /2007 regarding Spatial Planning. Spatial plans are drawn up by various state agencies at the national, provincial, regency and district level and create spatial plan documents (RTRW : Rencana Tata Ruang Wilayah) at each of these levels. Officially, the law guarantees the participation of local communities in the spatial planning process and is supposedly characterized by the following principals: (1) integrating multi-sector interests, (2) protecting public interests where community’s interests are the priority and (3) legal assurance and justice, where spatial planning processes have to comply with laws and regulations and promote justice for all parties. In reality permits are often handed out by government bodies at the provincial and regency level without the knowledge or consent of the people living in the area. Government planners decide whether an area is conservation forest, production forest, conversion forest, a mining area etc. The commoditization of space becomes a transaction between local elites and investors (Lembaga Gemawan, 2013). One expression of this in West Kalimantan is that 447,635 ha of oil palm concessions which are located inside areas classified as forest are to be “legalized” by retrospectively changing the “forest” status to *Area Penggunaan Lain* (APL) („other land use“) (Swandiri Institute 2014).

Challenging state power over maps and its categorization of land uses by “counter-mapping” (Peluso 1995) indigenous and local claims to territory has developed into an important movement in Indonesia, in particular in West Kalimantan (Prmono et al. 2006). In the run up to the passing of a new Provincial Regulation on Spatial Plan Documents (RTRW) of West Kalimantan, in 2015, civil society organisations created the Civil Society Coalition for Just and Sustainable Spatial Plan in West Kalimantan to influence the content of the new legislation and to challenge specific land categorizations. The commoditization of space within the spatial planning process thus becomes a contested arena, a crucial terrain on which resistance to land grabbing needs to intervene.

In this context, this paper discusses the potential for using unmanned aerial vehicles (drones) as a counter-mapping tool against land grabs. We draw on empirical action research conducted within a project on the political ecology of the Kapuas River between 2011 and 2015 (see paper by Pye/Radjawali/Julia). The paper starts with a discussion of the counter-mapping movement in Indonesia and some of the problematic questions related to issues of community representation and participation and the politics of counter-mapping. Mapping needs to be understood as a political process rather than a merely technical tool. Mapping is not only an act of how to produce maps, it is important to always ask who produces the maps, how people can access the maps and how the maps can be used for emancipatory purposes. Subsequently, we discuss recent political and legal developments in Indonesia that provide a unique window of opportunity for the counter-mapping movement. We then share some of our experience with using drones for counter-mapping before discussing some of the political victories that the drones helped to create. We argue that – if embedded

within political action – drone technology can revolutionize counter-mapping and become an effective weapon in the struggle against land grabs.

Counter mapping in Indonesia

Participatory mapping in Indonesia first emerged in 1992 under two circumstances: (1) the spread of an international discourse on community based natural resources management (CBNRM) and (2) the evolution of Indonesian environmental movement from a movement against non-environment-friendly large scale development projects into a movement to reclaim customary rights (Jaringan Kerja Pemetaan Partisipatif, 2009). The first participatory mapping was organized by the World Wildlife Fund for Nature Indonesia Program to map Long Uli Village in East Kalimantan Province which is located on the border of the now Kayan Mentarang National Park. In this context, participatory mapping has been criticized as a method to collect spatial data in order to take into account community perspectives and to create the image that a program of a certain organization is participatory (Jaringan Kerja Pemetaan Partisipatif, 2009).

A more political counter mapping movement began as a response to two decades of industrial timber exploitation and the Indonesian government's superseding of customary forest rights through official planning and mapping efforts (Peluso, 1995). It was conducted by local activists with assistance from international organization and sometimes government, delineating and formalizing claims to forest territories and resources their village have traditionally managed by using sketch maps (Peluso, 1995). In some cases, geographical referencing using Global Positioning System (GPS) and sophisticated software (Sirait et.al., 1994; Momberg, 1994 in Peluso, 1995) was used. The aim is to appropriate the state's techniques and manner of representation to strengthen the legitimacy of "customary" claims of resources (Peluso, 1995).

Participatory mapping has been used and developed scatteredly by various organizations in Indonesia, particularly those dealing with agricultural issues (JKPP, 2009). In 1996, a workshop on community mapping in Bogor gave birth to Jaringan Kerja Pemetaan Partisipatif (Community Mapping Network, JKPP) which connects and facilitates the participatory mapping movement (JKPP, 2009). By 2009 510 villages and/or communities were able to map their territory, involving 2.5 Million ha of land (JKPP, 2009). JKPP's membership has grown to 63 organization and 35 individual members (JKPP, 2009). JKPP has been working closely with the Alliance of Indigenous Peoples of the Archipelago (Aliansi Masyarakat Adat Nusantara, AMAN) to support AMAN's ongoing initiative on reclaiming customary areas.

Participatory mapping has been possible due to the high interest of international donor agencies (JKPP, 2009). Flows of grants have been the key factor of the success of participatory mapping at its early years. However, it didn't last forever. After the fall of Suharto's New Order regime in 1998, the interest of donor organizations shifted towards the issue of good governance. This has left the participatory mapping movement without enough "resources" resulting in the stagnation of this movement (JKPP, 2009). JKPP was too late to anticipate this shift and became trapped into the "technicalities" of participatory mapping. JKPP reformulated its participatory mapping missions by putting the social, economic, cultural and political context as its context, thus evolving from "technical mappers" network to an advocacynetwork. In particular, it started focusing on spatial planning process which had become the main tool of land control by state and corporations and in which local communities were not involved.

The counter-mapping movement was particularly strong among the Dayak groups in West Kalimantan, where "challenging the state claims over indigenous territories" was at the "core of their struggles" (Pramono et al. 2006:1). According to Pramono et al. (2006:8), "hundreds of kampungs in West Kalimantan had been mapped within the framework of counter-mapping" leading to a greater

cohesion between community members and to a “revitalization of Dayak identity.”

However, the counter-mapping movement soon came up against serious problems. Peluso (388) problematizes the use of counter-mapping by pointing out three interrelated constraints and ambiguities. Firstly, it is “unlikely to become a ‘a science of the masses’ simply because of the level of investment required by the kind of mapping with the potential to challenge the authority of other maps. Investment in specialized computers and software and knowledge will make the costs of mapping prohibitive for *most* local people, particularly in poor areas”. Secondly, the cost of the technology required creates “new types of power relations around the control and knowledge of mapping technologies”, placing a key brokerage power in the hands of international NGOs and funding agencies. Thirdly, counter-mapping, by accepting territorialisation, can become problematic when defending mobile and fluid livelihood strategies (such as swidden agriculture). In a similar vein,

Parker (2006: 247) argues that the technology of community mapping needs to be contextualized within the political fields of inclusion, transparency, and empowerment. Particularly problematic is the presumption of “solidarity, solidity, or shared values” within a geographically defined “community.” Rather, the mapping process is “fraught with tension and marked by unacknowledged privilege” (ibid 482) as shown by the fact that “women’s space and perceptions of place were often excluded in indigenous maps” (ibid 473).

Reviewing the movement ten years later, Pramono et al. (2006) uncover a multitude of problems. By accepting state administrative units, counter-mapping can produce knowledge that can then be used by the state for land grabbing. Computer-based mapping technologies “separates the communities from map production” while the maps themselves transfer spatial knowledge to the hands of outsiders such as NGOs and state entities. In addition, the counter-mapping movement has become obsessed with the technicalities of map production, seeing them as an end in itself and losing sight of the political content of land rights and a concept of customary land use that differs from the state spatial view. Perhaps most importantly, the profusion of local maps was unable to “influence the political landscape at the kabupaten level, not to mention provincial and national levels” (ibid 11).

A window of opportunity

Recently, however, political developments have created a window of opportunity for counter-mapping to have a major impact on the spatial planning process. In 2012, through the Constitutional Court Decision No. 35/PUU-X/2012, the Government of Indonesia (GoI) officially acknowledged that customary forests belonging to indigenous communities are not state forest as previously stated by the 1999 Forest Law. This is a major victory for AMAN, which had challenged the Forest Law in the courts. Following the enactment of this decision, AMAN, JKPP and BRWA registered about 4.8 million ha of customary territories in December 2014. The REDD+ Department (Badan Pengelola REDD+) was appointed as the temporary official host for registering customary forests. However, in January 2015, the current administration of President Jokowi has liquidated the BP REDD+ and distributed its responsibilities to several related ministries such as Ministry of Environment and Forestry. Yando Zakaria (2015) of Epistema Institute argues that two years after the enactment of Constitutional Court Decision, there hasn’t been any practical solutions to make it work. Changes has only occurred at the conceptual level. Furthermore, Myrna A. Safitri of Episteman (2015) argues that there is a crucial need of an agreement between Ministry of Environment and Forestry Republic of Indonesia and Ministry of Agrarian & Spatial Planning / National Agrarian Agency (Kementrian Agraria dan Tata Ruang / Badan Pertanahan Nasional) to recognize customary forest. Until this is done, the implementation of the principled recognition of customary forests remains vague.

A second interesting development is the Village Law (No. 6 / 2014) enacted in 2014. . In general, this has been seen as an opportunity to sort out the messiness of village borders as villages are given

the larger authority to plan their area. Out of about 74,000 villages all over Indonesia, only 19% of them have been mapped, the rest are only indicative maps (maps which are not yet legalized), one consequence of which is the problem of concessions overlapping village land that is one source of land conflicts (Hanafi, 2015). The Village Law has given the legal back up for every village to conduct their own village mapping. It is seen by various organizations as a new chance to use participatory mapping to reclaim local territory.

A village level movement called Gerakan Desa Membangun (GDM) / Village Development Movement has emerged in 2011. In 2013, GDM and Budiman Sudjatmiko (Member of Parliament and ex-chair of People Democratic Party) established an online support for villages called Web Desa Indonesia (www.desa.web.id) providing the means to connect and to consolidate villages. One of the biggest achievements of this movement is the political pressure and lobby to President Joko Widodo to set up a Ministry of Village Affairs (Kementrian Pedesaan). This has been seen as another window of opportunity by some grassroots movements and NGOs to speed up their reclaiming of territory.

These new legal and political opportunities could mean that counter-mapping can be scaled-up to the national level. In 2010, AMAN with several other NGOs (JKPP, Forest Watch Indonesia, Konsorsium Pendukung Sistem Hutan Kerakyatan/KpSHK and Sawit Watch) established Badan Registrasi Wilayah Adat (BRWA) / Customary Territory Registration Body with the aim of consolidating the data and information on customary territories that have been mapped through participatory mapping. The establishment of BRWA has been crucial in consolidating customary territories but it is not without challenges. BRWA identifies that the biggest challenge is the discrepancies between government agencies and NGOs active in participatory mapping, especially over the methods used. The problem is rooted in the 'legal' recognition of the maps and methods. Participatory mapping hasn't been officially accepted and recognized by the Badan Informasi Geospasial (BIG) / Geospatial Information Body as a base map to be used. According to the Republic of Indonesia Law No. 4 / 2011 regarding Geospatial Information, BIG is the only official body of the state which can produce the official map of Indonesia at any level. This has been a problem for participatory mapping as a method in which legality, tools used for mapping and license of mappers are subjects of discrepancies (Hanafi, 2015).

Using Drones for counter-mapping

The use of drones in our action research project in 2013 and 2014 took place in this context of excitement and optimism within the counter-mapping movement. Drones are usually associated with their use as military weapons, but since 2006 the civilian use of autonomous unmanned aerial vehicles has been gaining pace. It became popular among the hobbyists of aeromodelling after a Chinese based technology company DJI started to manufacture recreational and commercial drones that were accessible to the public. Another breakthrough was made by Chris Anderson, an ex-journalist, who started an online forum called www.diydrones.com in 2007. The idea was to create an online platform for UAV hobbyists to discuss and to exchange information regarding autonomous UAVs. The spirit was open source. In 2009, 3Drobotics was established for commercializing their autopilot system known as APM (ArduPilot Mega). This has been an important milestone for the community as the autopilot system (APM) was easier to use. Several initiatives using autonomous UAV on various works ranging from conservation and mapping have been established following this milestone. One of the most well-known ones is Conservation Drones (www.conservationdrones.org) an initiative established by Dr. Lian Pin Koh and Dr. Serge Wich to use drones to monitor forest and wildlife in Sumatra, Indonesia (Pin Koh and Wich, 2012).

Our work with drones in West Kalimantan was part of a larger research project on "Connecting the urban and the rural: A political ecology of the Kapuas River (Kalimantan, Indonesia)." The project

developed an action-research approach with a series of seven “Participatory Hydro-Political Appraisals” (PHPAs) to provide a qualitative understanding of major transformations affecting the Kapuas. PHPAs were conducted in 7 locations from Kapuas Hulu down to Pontianak on the issues conservation and REDD, logging, palm oil, gold mining, bauxite mining, fisheries, and drinking water and sewage politics (see paper by Pye/Radjawali/Julia). The PHPAs took an empowering and active research approach by forming “citizen research groups” with who key research questions and a collection of modules including place narratives, river transects, spatial problem analysis, change objective discussion and spatial intervention analysis were developed.

Initially, the drones were only meant to be an additional tool to support our research with high-quality and high-resolution spatial data in areas where access was restricted by company security and police. Irendra Radjawali built the first drone without any former training, by using the internet and the online forum. He also sourced much of the material second hand via ebay. The advantage of using do-it-yourself drones is that they are relatively inexpensive. A drone with a mapping camera cost us little over 500 USD to build. Because they were more of an additional option, we did not deploy the drones in most sites, sometimes because of security issues where critical questions on land grabs and the river were regarded with suspicion by company management, police and local elite.

At the end of the day, the drones were deployed in two research sites. One, in Desa Mungguk Kelapa, Kecamatan Ketungau Hilir, Kabupaten Sintang, had a focus on oil palm plantations. The work was supported by a Sintang-based NGO called FAMKI (Forum Aliansi Masyarakat Korban Investasi) / The Forum of Victims of Investment. The CRG and PHPA were developed with victims of criminalization by the company. Three members of a family had been imprisoned for the “crime” as reported by an oil palm company of destroying the company’s property by ripping out planted young oil palms. The family never knew that their land is a company’s concession area. The work was challenging as we had to enter the companies’ “area” to be able to observe what’s really going on. We managed to fly our drones at several places, capturing several community’s areas which have been grabbed by the company, including the customary area. However, the follow up work with the drones couldn’t be performed due to some safety issues that need to be tackled. Nevertheless, Swandiri Institute, GEMAWAN (a Pontianak based NGO) and FAMKI are elaborating ways to follow the case up.

A more successful deployment was possible in the context of the PHPA conducted in Desa Pedalaman and Desa Sejutang in Kecamatan Tayan Hilir, Kabupaten Sanggau. The area is affected by the expansion of large scale open mining for bauxite. Bauxite is exported to China to be further processed into aluminum. Members of citizen researcher groups brought us to see some areas which are severely degraded due to the mining activities. One of these areas is the Semenduk lake which has been drained for bauxite processing by a mining company. We saw how the mining activities have been changing the ecosystem into a condition which we believe irreversible. Tailings from the mining site have been discharged directly into the Kapuas River, degrading water quality. Fishing grounds do not exist anymore as the lake has dried up. This condition has affected and hit the community’s livelihood severely. Local community members through Dewan Adat Dayak (DAD) / Dayak Customary Council have conducted protests many times, however the operations of mining companies in the area are expanding. Our field research has been able to capture some of the areas using our drones and generating some high-quality and precise maps. One of the maps has been used as an evidence to disclose illegal mining company exploiting bauxites operating outside of their concession area. Following this work, we teamed-up with a local NGO based in Pontianak, the capital of West Kalimantan, to continue the action research.

Drone Mapping in Tayan

The Citizen Research Group and the Participatory Hydro-Political Appraisal exercises developed the conclusion that a key intervention could be using drones to document the draining of the lake, territorial breaches to the concession area and also to map customary forests and village forest as well as community-managed land in Tayan. In collaboration with the Swandiri Institute, a strategy for counter-mapping and political advocacy could be continued well after the intervention of the research project. Community members are involved in establishing the community drone and in deciding who will be responsible to perform drone mapping activities. The first village meeting was conducted at the meeting room of a local church Kecamatan Tayan Hilir, where 30 community members from Sejotang and Subah villages participated. Villagers discussed the environmental condition of Tayan Hilir before the companies came and compared it to the current situation. Village meetings also discussed the plans and strategies to perform mapping activities at various different villages with different challenges and contexts. One part of village meetings was training on mapping and drones where participants were informed about participatory counter-mapping techniques as well as the use and the operation of drones to support rapid participatory counter-mapping for high-quality spatial data. A meeting in Subah village agreed to fund the mapping themselves by a monthly contribution of 500,000 Indonesian Rupiah (IDR) (about 50 USD) from each dusun (sub-village).

The Swandiri Institute team was considered as a partner by the Dayak Customary Council as the host to advocate community's interests facing the expansion of oil palm plantations and mining companies. Spatial planning process was put as the main context of mapping activities. Community members very rarely have access to the spatial plan documents, and so could hardly ever actively participate in the spatial planning process. The opportunity to produce high-quality and precise maps is seen by community members as the chance to claim and to re-claim their lands.

Sejotang Village is located in a wetland ecosystem which provides fish for the local communities. In 2004, an oil palm company tried to start their operation, but local communities refused to give permission to the company as they wanted to use their lands for farming. Nevertheless, some of community members sold their "unproductive" land to the company. Nowadays, the company is able to extend their operation to the swamp area and far from residential area. The company is not seen as problem as the company rewards local communities with corporate social responsibility schemes including roads, remuneration for teachers and support for cultural activities. In 2010, a mining company called PT. Mahkota Karya Utama (MKU) started to operate in the area, extracting bauxites. Two more companies attempted to operate in the area in 2013 but they were rejected by the local community. PT. MKU's operation had dried up a lake (Lake Semenduk) in the area resulting in the destruction of the ecosystem and loss of the community's fishing grounds. The Dayak Customary Council is now demanding the existing mining company to restore the mining area into its natural condition.

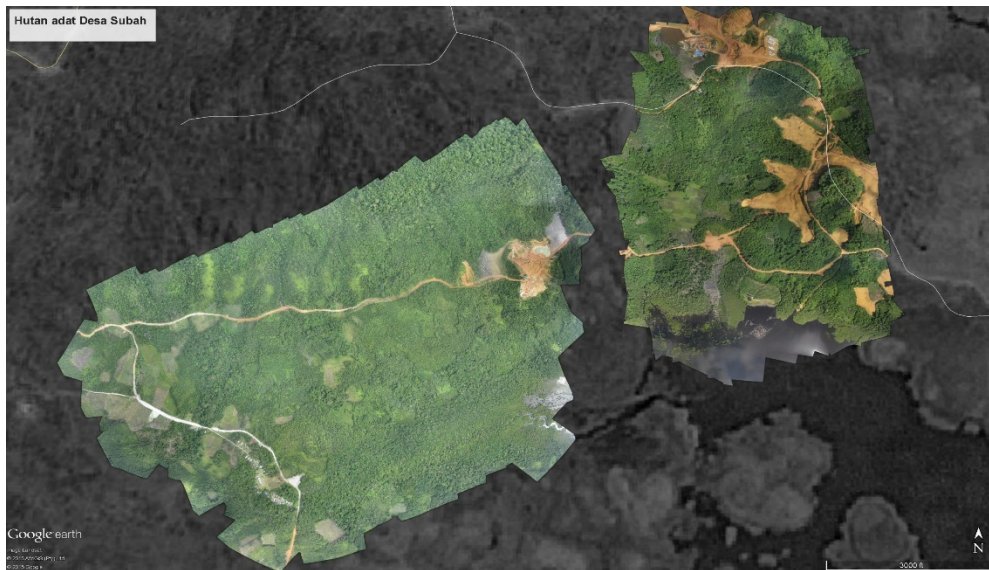


Figure 1: Ortophotos of the proposed customary area by drone overlaid to GoogleEarth

Drone counter-maps are being used to provide evidence against the mining company, but also to support local community's efforts to protect their existing lands and forest. Sejotang has customary-managed fruit forests (locally called "tembawang") that cover several hills surrounding the village which also function as the water catchment area serving the needs of drinking water for local community. Maps made by drone are going to be used to provide high-quality data support for obtaining the customary forest title for these forests (Figure 1). They will also be used as evidence in supporting local community's effort to challenge the current state prescribed "forest" status of their residential and farming areas. With the current "forest" status, the local community does not have legal rights over the area. The land use planning maps were made on the basis of satellite imagery where the small hamlets were not visible. In the process of map-making by the state, the hamlets literally disappeared, losing any rights to their land in the process. With the high resolution drone maps, however, residential areas, farming, fruit tree forests and other long-term uses of the land are rendered visible (Figure 2). Furthermore, local community require high-quality maps to re-claim those residential areas which now are "officially" part of company's concessions. These maps are used to supports their arguments to halt new concessions for mining and for oil palm.



Figure 2: Ortophoto made by drones of the BatuBesi Village categorized as “forest” area. This area is proposed to be categorized as APL (other land use area)

The counter-mapping process uncovered also uncovered simmering territorial conflicts. Sejotang village has a conflict with its neighboring Kawat village regarding a mining area which is claimed by both. Through the series of group discussions interviews, it emerged that the unsettled village border is one the problems. The mining area was claimed by an elite individual from the neighbouring village. One of the aims of community drones is to map the area of several villages in Kecamatan Tayan Hilir and to confirm village borders. On the 27th of May 2015, representatives from each villages and members of community drones as well as Swandiri Institute were invited for a meeting with and organized by the local parliament members of Sanggau District as well as the Head of Sanggau Regency resulting in the full political support from Sanggau executive and legislative to reinforce the initiative so that the maps could be strengthened by district regulation.

Scaling-up and some initial victories

The experience in Tayan is significant because a small action research intervention led to a fully fledged counter-mapping initiative in the area that continued after the project ended. The involvement of the Swandiri Institute played a crucial role. The Swandiri Institute was able to establish an approach they call “Community Drones,” i.e. a group of mixed NGO activists and local community members performing participatory counter-mapping using drones (Figure 3). Swandiri Institute was able to organize financial support from PWYP-Indonesia and Samdhana Institute (a Bogor-based NGO) to perform the drone mapping of customary forest, customary land, village forest and community-managed land with further objective of obtaining the customary forest title, village forest title and re-claiming the lands that have been grabbed. Furthermore, community members aim to bring illegal activities to the court.



Figure 3: Community members and activists prepare drones for mapping a mining site in Tayan

But the Tayan case led to further political developments that went beyond the local level. Two achievements are worth noting. The first is the success in using drone maps to obtain legal recognition on the West Kalimantan Spatial Plan document (RTRW Propinsi Kalimantan Barat / Spatial Plan Document of West Kalimantan Province). The second is that the drones counter-map was used as legal evidence at the Constitutional Court trial on the 1st September 2014, providing the chance for drone counter maps to be recognized by the Indonesian legal system in the future.

On the 25th September 2015, the Provincial Government of West Kalimantan has enacted a Provincial Regulation on Spatial Plan Documents (RTRW) of West Kalimantan Province. In the years before, civil society organizations had campaigned and developed a discursive process with the provincial government. Lembaga Gemawan and The Civil Society Coalition for Just and Sustainable Spatial Plan in West Kalimantan had been disputing the RTRW plan due to its orientation which favours investors in obtaining concessions. As much as 4.1 million ha of forest and land have been designated for oil palm concessions and other 800.000 ha have been designated for mining concessions (Lembaga Gemawan, 2013) in ways which disregard the land rights of local communities. Furthermore, Swandiri Institute (2014) identified that 447,635 Ha of forest area was proposed to be transformed into area penggunaan lain (APL), a category of land use where oil palm concession can be given. Swandiri Institute (2014) proved that the forest area were already allocated for oil palm concessions which is violating Republic of Indonesia Law No. 41/1999 regarding Forestry. In other words the proposal to turn it into APL are legalizing the illegals, favoring the interests of investors (Swandiri Institute, 2014). Refusal using evidences (including maps made by community drones in Tayan) had been able to challenge the provincial government to accept what the civil society organizations demand. Some of their demands were achieved and accepted, including: (1) Recognition of community-managed lands, (2) Recognition of customary community rights, and (3). active community engagement in the spatial planning process. These demands had not been addressed before.

On the 1st of September 2014, one of Dayak Tobag leaders from Tayan gave his testimony at a Constitutional Court trial. The trial was on the constitutional challenge made by several mining companies to the Republic of Indonesia Law No. 4 / 2009 regarding Mineral and Coal Mining as contradicting the Republic of Indonesia Constitution 1945. The companies dispute the obligation to process the raw materials from mining in Indonesia before exporting them and the requirement to build processing smelters. The Dayak Tobag leaders was asked to support the arguments on the need to build smelters and to promote socio-ecological awareness. Maps made by drones were used to support

his arguments that often mining activities are causing detrimental social and ecological effects. The Constitutional Court ruled against the mining corporations on the 3rd of December 2014, upholding the obligation of mining companies to install smelters and to process raw minerals and coal before exporting them. Civil society organizations view the trial processes as having set a legal precedent for recognizing drone counter-maps as legal evidence in the Indonesian legal system. The maps of illegal operations of bauxite mining in Tayan was one of the maps used as evidence (Figure 4).

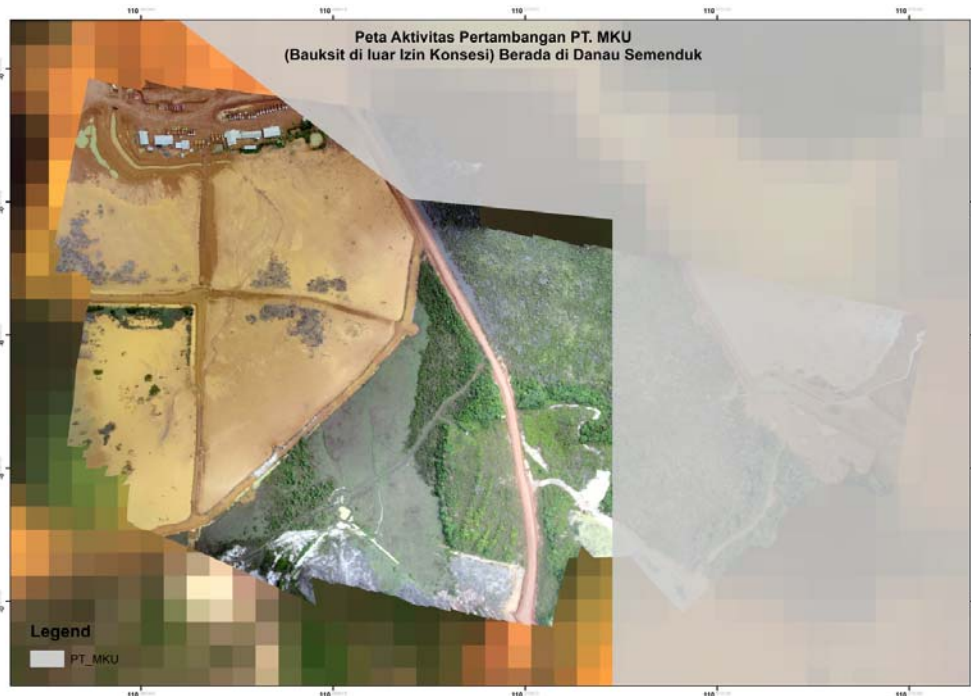


Figure 4: Georeferenced Ortophoto taken by drones showing illegal mining activities operating outside of the concession area (grey shading)

The successful development of the community drone concept of Swandiri Institute in West Kalimantan generated a lot of interest, particularly from organizations working on indigenous issues like AMAN, Samdhana Institute, Sampan and Lingkar Borneo (two NGOs based in Pontianak, West Kalimantan). Donor organizations like Ford Foundation Indonesia and the Asia Foundation are also interested in this development.. Because of the level of interest and the potential use of drones within the new legal framework, Swandiri Institute as well as Sampan of West Kalimantan organized serials of drone trainings. Swandiri Institute established a “drone school” in West Kalimantan, in which civil society organizations and community activists who are interested in learning and using drones for mapping and for advocacy work could join and participate. Another drone school called “Sekolah Drone Desa” (Village Drone School) was established by Pusat Studi Pembangunan Pertanian dan Pedesaan (PSP3) / Village and Agriculture Development Study Center of Institute Pertanian Bogor (IPB) / Bogor Agricultural University in early May 2015. The focus is on using drones at village levels to map village areas and to confirm village borders.

AMAN is interested in speeding up their participatory mapping using drones, given the fact that drones can map larger areas in a relatively short time and provide high-resolution and geo-referenced ortophoto, and has started organizing trainings of its own. Wahana Lingkungan Hidup Indonesia (WALHI) / Indonesia Friends of Earth network is also interested in using drones to support their advocacy work. Various members of WALHI have started to use drones (i.e. Walhi Kalimantan Barat, Walhi Kalimantan Tengah). Interestingly, do-it-yourself drones are also used for investigation work

through aerial filming. Several environmental groups have started to use drones to capture aerial videos of the area where they work to provide themselves with audio-visual evidence. This has been an interesting development of drones to support the work of environmental justice groups.

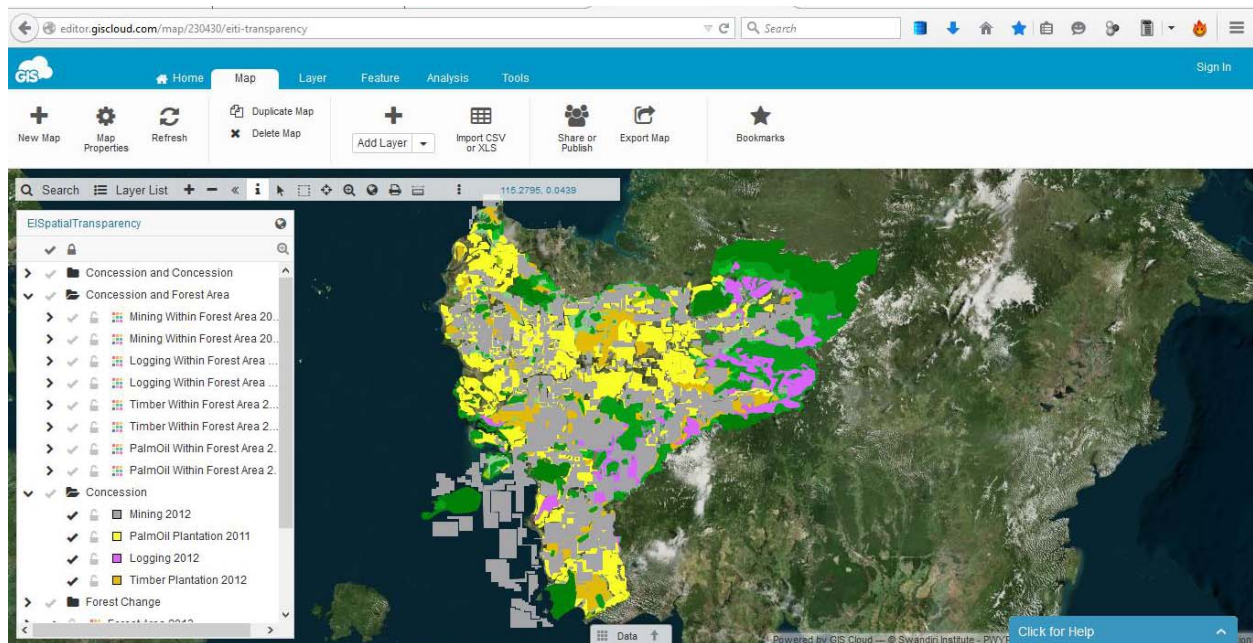


Figure 5 : Extractive Industries Spatial Transparency web-based GIS

PWYP-Indonesia has also been interested in using drones to support their work which focuses on transparency issues in the extractive industries sector. PWYP-Indonesia has supported Swandiri Institute to conduct research related to the Extractive Industries Transparency Initiative (EITI). Using drones combined with spatial analysis and Open web-GIS application as well as opensource GIS application (Qgis), Swandiri Institute has conducted research which explored further spatial transparency issues. Overlapping concessions are plotted in a GIS application and supported by high-resolution orthophoto made by drones. This has been a useful tool to monitor illegalities as well as the real condition of mining sites in West Kalimantan. This also has been a useful tool for advocating local community members whose land are encroached and grabbed. Furthermore, this tool has been very useful as the map of all concessions in West Kalimantan including overlaps with other concessions or c with other types of land use (i.e. forest, community-managed land) can be accessed online (Figure 7). The orthophotos made by drones give the opportunity to zoom-in at the area thus providing the precise data on specific areas. This has been a very helpful tool for NGOs and civil society organizations to build their arguments and action-plan resisting the on-going land encroachment and land acquisition.

Conclusion

Drone technology is currently revolutionizing the counter-mapping movement in Indonesia. Previously, counter-maps had various technical limitations with corresponding social and political implications. Conventional counter-mapping strategies combined community sketches with low resolution satellite images that were freely available, such as Landsat. However, the results were often not of the quality that could compete with state spatial planning maps, as the images are usually of too low quality, can be obscured by cloud cover and are quickly out-dated (Koh and Wich 2012: 122). This led to the current problem that maps produced by counter-mapping are not yet recognized by the state to substantiate claims to customary land. In addition, interpreting satellite images is a specialized skill,

creating the problem of technology and information capture and control by outside organizations. High resolution aerial photographs were generally not available due to their prohibitive cost, or if used, required high levels of donor funding.

The use of drones changes all of this. Maps made using drones are developed from high-resolution photographs stitched into ortophoto (Figure 6). The resolution of the picture has been able to capture objects on the ground to the degree that has never been achieved before (i.e. photographs show very clear images of different trees on the mapped area, Figure 7). This process is affordable compare to other technology and able to capture a relatively large area in a relatively short time. Changes to an area can be captured by drones in the shorter time interval in the form of high-resolution ortophoto. Changes and transformation of an area of 1,000 ha can be captured and identified on a daily basis.



Figure 6: Ortophoto map of Sejtang Village, Kecamatan Tayan Hilir, Kabupaten Sanggau, West Kalimantan (Taken by drone mapper flying at 350 m AGL)



Figure 7: Zoom of Ortophoto map of Sejotang Village, Kecamatan Tayan Hilir, Kabupaten Sanggau, West Kalimantan (Taken by drone mapper flying at 350 m AGL)

The appropriation of the drone technology by community activists has the potential to improve the situation with regard to inclusion, transparency, and empowerment. The Swandiri Institutes experience of “community drones” in Tayan, in which community members were actively involved, could show that the drone technology is more accessible than former counter-mapping technologies. Nowadays, younger members of local communities are computer literate. After a mapping flight, images and videos can be directly downloaded on to a laptop, giving instant transparency to village meetings during the mapping project. The resolution is so high that individual houses, trees, swiddens etc. can be clearly identified, also increasing transparency and the potential to include just about everybody in territorial discussions. The technology is also very empowering. The sense of power and achievement when community members themselves fly the drone is substantial. The empowerment impact that comes with the knowledge that these images are of greater quality than the concession maps and that they have been acknowledged by the Constitutional Court is even greater.

However, drones are not a magic wand that can conjure away hierarchies and power structures at the local level or in wider society. We were unable to use drones in those areas where local elites were in cahoots with plantation and mining companies and controlled traditional institutions such as customary councils and where opposition was marginalized. And in Tayan, where we had the backing of the customary council, hierarchical gender relations in the village, power dynamics, and territorial disputes between different villages were replicated in the mapping process. Civil society organizations are still necessary for some funding, and also for training and advocacy.

Still, the concept and use of community drones is currently spreading like wildfire in Indonesia. This is because the technological revolution that has the potential – together with campaigning and political pressure – to force through the recognition of community counter-maps in the spatial planning process is happening at the same time as the political opportunity of reclaiming millions of ha of customary forests and of initiating active involvement of people at the village level in spatial planning processes is there to grasp. In this context, community drones for counter-mapping could well become a technology of the masses, by the masses, and for the masses.

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