

A Way to Accelerate Land Registration Programme through Participatory Mapping (Case Study: Indonesia)

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SUMMARY

Land registration in Indonesia has been conducted for decades through annual systematic and sporadic registration programme including several cooperative projects with donors. The completion in registering land in all over Indonesia is, however, still unforeseeable. Currently, the proportion of registered parcels in Indonesia is still around 44%. It means that around 56% or approximately 54.8 million parcels have not been entitled any legal certainties. In order to speed-up the land registration programme, therefore, some actions including initiating parcel based participatory mapping have been undertaken by several land offices in collaboration with local governments. In this project, local government could have a role in providing financial support. Meanwhile, besides engaging as an implementing party, land offices could involve in providing technical assistance and delivering training for local communities. Besides accelerating land registration programme, parcel based participatory mapping is preferable since at the same time thematic information such as actual land use, tax parcel, administrative boundaries and socioeconomic related information can also be collected and be mapped in a more accurate level. Generally, the main activities of participatory mapping for land registration consist of parcel identification and delineation. To be able to be followed by registration process, quality control over identified and delineated parcels must be taken by NLA's surveyors or cadastral licensed surveyors. On the other hand, parcels which do not meet requirements and have not been validated will still be stored and recorded on the NLA's database which can later be used as preliminary information for land registration. Based on the implementation of the project in Tangerang Selatan, Grobogan, and Gresik, parcel based participatory mapping presents with several opportunities and challenges in accelerating land registration. The opportunities include the availability of complete land record and an increased efficiency in completing surveyed parcel. Meanwhile, the main challenges include infrastructure related challenges, existing regulations which may hinder the progress of land registration programme, data management, and communities related challenges.

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1. INTRODUCTION

Prior to the enactment of One Map Policy, it is obviously normal in Indonesia that many government agencies vest to design their own sectoral/thematic maps by using their own base maps. Besides resulting in many issues like overlapping the utilisation of land and permits, having many sectoral maps means ineffectiveness in bureaucracy due to the lack of data sharing. Hence, in order to support One Map Policy at local level, some local land offices in collaboration with local government have initiated joint parcel based participatory mapping projects. This cooperation is expected to produce an up-to-date parcel based integrated record with multiple thematic information which can be used by both government bodies. While land office can take this project as an opportunity to boost land registration programme, local government can use the data for land taxation purpose, for instance. This paper is intended to review the implementation of parcel based participatory mapping conducted specifically by Tangerang Selatan, Grobogan, and Gresik Land Office, some challenges and how such programme can be used to support land registration acceleration. A brief explanation regarding land registration system including past efforts in accelerating land registration programme in Indonesia will also be revealed in this paper.

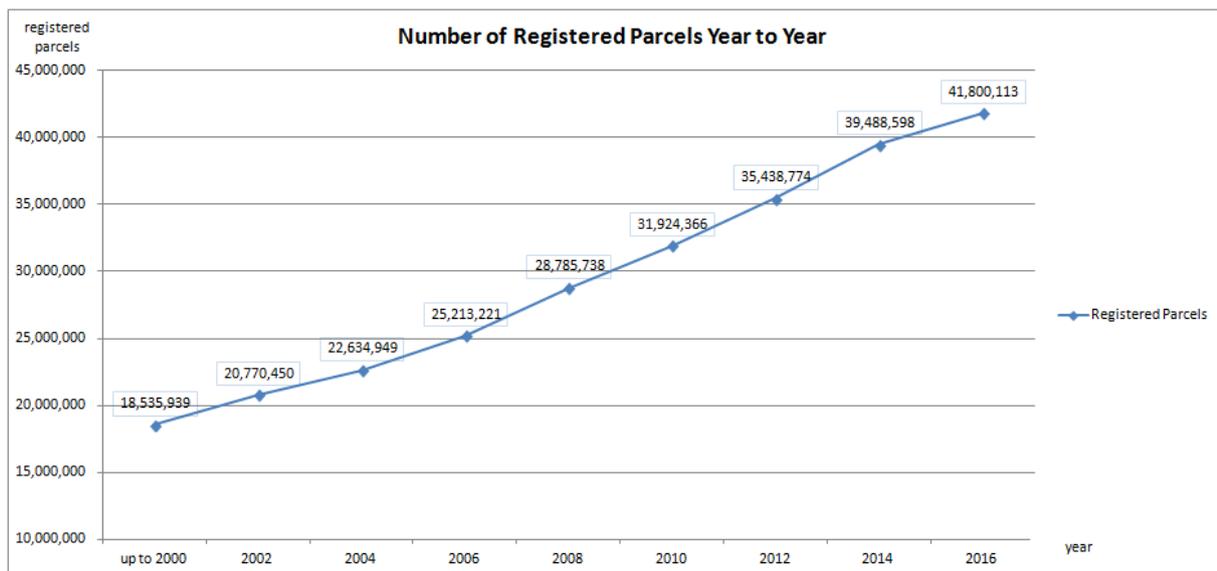
2. LAND REGISTRATION OVERVIEW IN INDONESIA

Land registration in Indonesia was firstly initiated in the year of 1620 under the Dutch colonisation (Nasution, 2003). At that time, VOC (*Vereenigde Oostindische Compagnie* - Dutch East India Company) promulgated a decree to control the lands allocated to its employees and resettled occupants from the Netherlands. In 1875, regulation regarding cadastral survey and mapping was issued and implemented in the whole Indonesia (Handoko, 2014). After the independency of Indonesia, as stated in the Basic Agrarian Law (BAL) No. 5 of 1960 (specifically article 19), conducting land registration to secure and guarantee the land right of entitled parties throughout the territory of Indonesia has become the responsibility and obligation of the Government of Indonesia (GoI). The institution appointed to have an authority and responsibility to conduct land registration is *Badan Pertanahan Nasional* (NLA- National Land Agency). In terms of its implementation, land registration can be classified into two approaches; systematic and sporadic approach. While systematic land registration approach is typically massive registration in a selected locality conducted within a period of time, initiated and funded by the GoI; sporadic land registration is mostly conducted based on the initiative, request, and funding from landholders.

In order to boost land registration throughout the territory of Indonesia, various schemes of systematic land registrations have been conducted over the past 36 years. One of the systematic land registration schemes is National Land Registration Project (Prona - Proyek Operasi Agraria

Nasional). This village based initial massive land registration programme targeting economically weak society was firstly hold in 1981 and has become an annual national programme since then to target the register of 500.000 to 1 million parcels per year. Another scheme of systematic land registrations is Land Administration Project (LAP or *Proyek Administrasi Pertanahan*). A 5-year-cooperative project between NLA and the World Bank held in between 1994 – 1999 generically aimed at assisting further development of the land policy and enhancing tenure security by accelerating land titling in particular. The total number of registered parcels achieved by this project reached 1.9 million (World Bank, 2002). As the project was able to raise the awareness of communities regarding the benefit of land titling, another 5 years project named Land Management and Policy Development Project (LMPDP) was launched in 2004. Land certificates issued by this project reached 2.4 million or 480.000 in annual rate (Van der Eng, 2016).

Eventhough annual regular land registrations, both sporadic and systematic such as Prona and several international cooperation projects have been implemented in decades, certification to all parcels in Indonesia remains incomplete. Currently only under half of the total amount has been fully registered; around 43% or 41.8 million (KKPWeb, 2017). Meanwhile, there is approximately 54.8 million more still awaiting entitlement of any forms of legal certainties (Litbang ATR, 2016).



	up to 2000	2002	2004	2006	2008	2010	2012	2014	2016
Number of registered parcels per year	18,535,939	2,234,511	1,864,499	2,578,272	3,572,517	3,138,628	3,514,408	4,049,824	2,311,515
Total	18,535,939	20,770,450	22,634,949	25,213,221	28,785,738	31,924,366	35,438,774	39,488,598	41,800,113

Source: Aplikasi KKP Web per 17/1/2017

Fig. Number of registered parcels year to year

There are several concerned constrains in hindering the progress of land registration. Those include limited public budget and limited number of human resources particularly NLA’s surveyors whose proportion to unregistered parcels is 1: 22.750(Dit. PPK, 2016); high cost registration programme as it is needed to provide high-tech survey and mapping equipments; and long procedures consisting of at least 7 steps and multilayer approvals must be followed. The continuing increase in the amount of

parcels due to rapid rural/urban growth and development as well as land use change are factors which can be anticipated in delaying the registration programme.

As land registration offers many positive impacts, not only for the societies but also for national economic development, acceleration in registering land is necessary. Thus, it is targeted by the current President of Republic of Indonesia, Joko Widodo, that land registration to parcels in all over Indonesia will have to be completed by 2025. To do so, many acceleration strategies were prepared by NLA. One of them is by introducing parcel based participatory mapping for land registration.

3. PARTICIPATORY MAPPING

Participatory mapping is a map making process involving local community to use their local knowledge in recording spatial details for particular purposes. Currently, the purposes in conducting participatory mapping are no longer limited to rural appraisal and natural resources management as its origin, but have expanded to broader purposes like planning and development as well as social and cultural domains. In conducting participatory mapping projects, collaboration between many sectors is inevitably required. The first sector is those who initiates and develops the participatory mapping activity such as the state, NGOs, and universities. The second sector is invited local communities who will directly participate in the data collection; and the other sectors are external those who may not directly engage in every stages of the project but will get the benefit from valuable information resulted by the projects such as local government (Social-Life, 2015).

Participatory mapping for land registration alone is not something new. It is widely recognised and used in many countries with various scales and circumstances. Those scales and circumstances include potential landholders involvement in order to improve the efficiency of the registration process conducted by the state; continuum of land rights adoption in which the classification and the recordation are delegated to the local communities but the state will still control the overall registration; and non-state actors involvement such as a group of landholders in initiating participatory mapping for land registration (Laarakker et al, 2014). Rwanda is an example of countries adopting continuum of land rights and Fit for Purpose (FFP) Land Administration based participatory mapping. By employing high resolution orthophotos and general boundaries approach, Rwanda was able to register all 10.4 million its parcels within 5 years (Enemark et al, 2014).

4. PARTICIPATORY MAPPING FOR LAND REGISTRATION IN INDONESIA

Prior the year of 2017, participatory mapping for land registration in Indonesia was conducted solely by the initiative of land offices. Land offices have invited local government to collaborate in the project. While local government could have a role in providing financial support, land offices would mainly give technical assistance such as providing base map, delivering training for local government employees and communities who would involve in the project as well as conducting quality control over the process and collected data resulting from the project.

Generally, the main activities of parcel based participatory mapping consist of parcel identification and delineation. While parcel identification is identifying parcel boundary including spotting parcel corners and collecting tenureship data such as parcel owners, parcel users and parcel utilisation; parcel delineation is tracing identified parcel corners and delineating those corners into polygon. Community engagement and base map availability are definitely required in this process. Meanwhile, In order to proceed into registration stage, quality control of identified and delineated parcels by conducting direct field measurements must be taken by NLA's surveyors or cadastral licensed surveyors. The different approaches of participatory mapping for land registration implementation conducting by Tangerang Selatan, Grobogan, and Gresik land office will be further explained in the following chapters.

4.1 Tangerang Selatan

Tangerang Selatan is a fast growing district occupying an area of 147,19 km² and with a population of 1.543.209 inhabitants (2015). It consists of 7 sub-districts and 54 villages. In 2016, Tangerang Selatan Land Office in collaboration with Tangerang Selatan Local Government launched a project called *Sensus PBB dan Pertanahan* (Fiscal Cadastre and Legal Cadastre Census). The project is parcel based participatory mapping which the outcome will be used by local government for land taxation and land permit issuance purposes and by land office for supporting land registration programme and improving land administration. Information collected in this project included land tenure, land value, land tax, land use, and spatial planning suitability. Together with Tangerang Selatan Local Government and Land Office employees as well as community element including village youth organisation as census officers, approximately 395.412 parcels will be inventoried. The whole process including land registration is expected to be completed in 2019.

To implement the project particularly for identification and delineation purpose, the Android mobile app "Smile Cadastre" is employed. "Smile Cadastre" alone has several useful features such as a base map derived from aerial photo with a scale factor of 1:500 and ground sampling distance (GSD) of 8 cm as well as land record feature that is a form to record the required information. Another important feature is an integration of Smile Cadastre into KKP (Komputerisasi Kantor Pertanahan -land office data base application to store parcel information both its spatial and legal information) so that the distribution of existing registered parcels and their information can be loaded on the apps. Delineated parcel and collected information can also be directly stored on the KKP. Parcel identification and delineation activities are followed by direct field measurement by NLA's surveyors.



Fig. “Smile Cadastre” display and socialising parcel based map participatory mapping

During the first year (2016) of census programme, out of 59.448 parcels located in Ciputat Sub-district 42,78% or 25.435 parcels have been inventoried with land ownership documents (Kantah Tangsel, 2017). Parcels which fulfil the requirements will basically be allocated to register through systematic registration programme. Only if landholders intend to shortly obtain their land certificate, sporadic registration is suggested. In 2017, 62.866 parcels located in 2 sub-districts, Ciputat Timur and Setu, are targeted to participate in the project.

Some obstacles encountered during the census programme are associated with collecting parcel information from landholders. As mostly landholders are working in the capital city nearby during the daytime, collecting questionnaires back will be more challenging. Unstable network signal also slows down the efficiency of Smile Cadastre application. Thus, facilitating census officers with paper base maps and conducting offline parcel identification and delineation as well as offline data entry will have to be considered.

4.2 Grobogan

Grobogan is a district consisting of 281 villages occupying an area of 1.975,865 km² and has a population of 1.431.535 inhabitants. Approximately 84 % of area in Grobogan is utilised as an agricultural area with less than 20% of total area has been certified.

Initiated by Grobogan land office and Grobogan local government, participatory mapping in this district is intended to provide integrated spatial utilities which is expected to be beneficial to rural development. Funded with village funding, the participatory mapping project in Grobogan has been conducted since 2014 and is expected to be completed in 2017. Besides involving community elements such as sub-district and village officers, this project also involves a consultant consisting of 30 mapping surveyors as an implementing party.

The project starts by developing village-based base maps utilising high resolution satellite imageries with a scale of 1:5000. During the base map development, tracking actual village boundaries, road and river networks, and pointing important places like village owned parcels showed by involved communities are also involved. The following stage of base map creation is the development of village - parcel based information system, *Sinden Bertapa (Sistem Informasi Desa/Kelurahan Berbasis Bidang dan Peta Partisipatif)*. *Sinden Bertapa* is portraying existing registered parcel spatial data and delineated unregistered parcels based on general boundaries portrayed on the base maps as well as information regarding parcel ownership.

Currently, all 281 villages in Grobogan have its own base maps with actual village and sub-district boundaries which will soon be ratified through regional decree. In addition, 241 villages have been facilitated by *Sinden Bertapa* application, while the rest is still in progress. As *Sinden Bertapa* is updatable and developable, various thematic data including parcel tenureship and socioeconomic related data such as income, education and employment as well as parcel usage and its productivity has also been collected to complete information on *Sinden Bertapa*. *Sinden Bertapa* which currently is still a desktop application will soon be developed as a web based GIS application (Kantah Grobogan, 2016). Total expense invested in conducting the project is around \$1.150 per village (IDR.15 million) which every village consists of approximately 4.000 – 5.000 parcels. In terms of workload per day, a surveyor can approximately work through 60 parcels.

As the implementation of participatory mapping in Grobogan is more focussing on establishing thematic village maps and developing complete land record, the procedure and the result do not necessarily comply the requirement standards for land registration. To register, quality control over delineated parcels must be conducted by NLA's surveyors.

4.3 Gresik

The third parcel based participatory mapping project is conducted in Gresik District. The participatory mapping funded and conducted by Gresik Land Office is focusing on only one village, Wotan Village. The aim of the project is to identify all parcels both in non forest and forest area which will be used to develop integrated land administration service /system. Wotan Village alone has mainly rural characteristic with 3.081 inhabitants and occupying an area of 599,06 ha. Total number of parcels in Wotan Village is 3.665 with a proportion of 545 or 14.87% registered parcels (Kantah Gresik, 2016).

The implementation of participatory mapping alone has started by developing base map derived in 2007 from Quickbird satellite imageries with 2,5 m of horizontal accuracy. The base map development is then followed by parcel identification and delineation over general parcel boundaries. Based on the parcel identification, it is found that 89,25% or 2.616 parcels can potentially be registered; 21,41 ha of 15 parcels are in absentee land; 42,66 ha of 2 parcels are in forest area. Started in 2017, participatory mapping in Wotan Village will be adopted and be implemented in other sub-districts in Gresik and it is expected that 16.000 parcels can be recorded during this year.

Some obstacles are found during the participatory mapping project. Those include less updated base map thereby most of parcels portrayed on the base map have different boundaries compared to those on the ground; parcel owners who do not live in the Wotan Village and some land owners who do not have any land ownership documents causing difficulties in collecting information.

5. DISCUSSION

5.1 Opportunities

According to the case study of parcel based participatory mapping conducting in 3 different districts, parcel based participatory mapping provides several opportunities and challenges in supporting land registration acceleration. Those opportunities include the availability of complete land record covering both spatial and parcel ownership information. Land record consisting of parcels which fulfills technical requirements and quality control can be used on further registration steps. On the other hand, parcels which do not meet requirements and have not been validated will still be stored and recorded on the NLA's database which can later be used as preliminary information for land registration. Parcel based participatory mapping is also preferable since at the same time thematic information such as actual land use, land tax, administrative boundaries, and socioeconomic related information can also be collected and be mapped in more accurate level. Therefore, parcel based participatory mapping can be used as an approach to develop multipurpose cadastre in near future.

Sources of efficiencies are also identified during the implementation of the project. The first efficiency is related to the survey and mapping expense. Referring to Grobogan case study adopting general boundaries mapping, the cost invested in conducting participatory mapping is around \$1.150 per village with approximately 4000 – 5000 parcels. It means that in comparison to around \$10 per parcels of survey and mapping expense on systematic registration, the cost per parcel of participatory mapping is much cheaper at only less than \$1. It means that by implementing the project, more and more parcels can be mapped. The second efficiency is related to the increase of number surveyed and mapped parcels in a day. While in normal process, a surveyor can only identify, deliniate, and measure 7 – 7.5 parcels per day, by involving locally trained communities, 60 parcels or more can be accomplished.

5.2 Challenges

To implement parcel based participatory mapping in Tangerang Selatan, Grobogan, and Gresik in particular and in Indonesia in general, some challenges are inevitably encountered. Those potential challenges can primarily be classified into three categories; infrastructure availability related challenge, existing regulations which may decelerate the registration process, data management, and challenge coming from the community itself.

Table. Identified challenges

No	Challenges	Descriptions	Current actions/ recommendation
1	Infrastructure availability challenge	Base map availability	Employing UAV to produce 1: 2500 and 1:5000 base map. UAV offers fast data acquisition at low cost, accurate and high resolution geo-referenced images which will be suitable for land registration purposes.
2	Existing regulations hindering acceleration of land registration programme	Limited number of NLA's surveyors with proportion of 1: 22.750 of number of NLA's surveyors and unregistered parcels. Obligation to do direct parcel measurement to all sides of parcel boundaries in order to generate fixed boundaries or accurate spatial position	Optimising the role of cadastral licensed surveyors and recruiting more cadastral licensed surveyors Implementing FFP approach by combining general boundaries derived from high-resolution ortho-photos and one side field parcel boundaries measurement as a quality control
3	Data management	The availability of metadata Data sharing	The information attached on the metadata should not only be related to technical specification of base map or survey instruments, but also information regarding parties who acts as parcel identifiers and its relation with the parcels, information about neighboring parcels, officers who collect the information, etc. Mechanism in sharing, maintaining, and managing the collected data after the completion of the project might be required.
4	Community related challenge	Difficulties in collecting back questionnaires; the head of villages and neighborhoods have lack of knowledge regarding land tenureship information	Changing the way in socialising and conducting surveys into digital/electronic for urban area; optimising direct community's role in collecting information for rural area.

- a. **Infrastructure availability challenge:** is associated with the availability of base map. The availability of base map provided by NLA is still limited, mainly focussed on big cities, and does not necessarily cover all area in a district (Feryandi et al, 2014). In particular area, moreover, the available base map may be considered out of date for current use due to fast development growth of covered area. Using different base map from different sources and specifications such as smaller scale, coarser resolution, and unstandard processing method should not be taken into account since it will likely lead into adverse impacts such as shifting and overlapping parcels causing probable land dispute issues in the future. As minimum required specification standards of base map are with a scale factor of 1:1000 for residential area and 1:5000 for rural area, employing UAV (Unmanned Aerial Vehicle) to produce standardised and up-to-date base map might be suggested. Besides offering fast data acquisition at low cost, it is arguably that UAV can also provide accurate and high resolution geo-referenced images which will be suitable for land registration purposes.

- b. **Existing regulations regulating technical aspects which can potentially decelerate land registration programme:** it is stated on the BAL 5/1960 that land registration throughout all territory in Indonesia is the responsibility of the GoI. This responsibility is interpreted that the implementation of land registration programme have to be conducted by government officers including in conducting cadastral survey and mapping. Having proportion of 1: 22.750 of number of NLA's surveyors and unregistered parcels, the regulation will likely create delays in accelerating land registration programme. In order to minimise conceivable setbacks, NLA is trying to encourage cadastral licensed surveyors to more actively participate in accelerating land registration by giving them more authorities in conducting whole sequence of surveying

jobs including issuing parcel map used for land certificate and determining their own cost in conducting surveying service.

Another strict regulation is stated on the Decree of the Minister of Agrarian Affairs/ PMNA No. 3 of 1997 article 26 (2). It is stated that direct parcel measurement to all sides of parcel boundaries is obligatory step in land registration process so that fixed boundaries or accurate spatial position can be generated. As fixed boundaries can only be obtained by using high-tech survey instruments and the number of those instruments is limited, regulation stated on PMNA No.3 of 1997 article 26 (2) can be taken into account as an obstacle in boosting land registration programme. In order to resolve this issue, FFP land administration approach which offers flexibility and affordability in capturing spatial data can be adopted. FFP approach which might be suitable for Indonesia previously implementing fixed boundaries and field survey are by combining general boundaries derived from high-resolution ortho-photos and one side field parcel boundaries measurement as a quality control. To do so, other advanced implementing regulations might be required.

- c. **Data management:** the availability of metadata is considered as necessary parts in managing participatory mapping data. The information attached on the metadata should not only be related to technical specification of base map or survey instruments, but also information regarding parties who acts as parcel identifiers and its relation with the parcels, information about neighboring parcels, officers who collect the information, etc. The other necessary part is that as the implementation of the project is mainly collaboration between 2 or more stakeholders, mechanism in sharing, maintaining, and managing the collected data after the completion of the project might be required.
- d. **Community related challenge:** the challenges in conducting participatory mapping can apparently emerge from the community itself. In Tangerang Selatan, for example, as the majority of citizens are working in Jakarta, collecting back distributed questioners from landholders might be more difficult. Therefore, changing the way in socialising and conducting surveys into digital/electronic forms might be suggested in order to obtain required information from urban citizens and to minimise possible delays in conducting census. Meanwhile, in Grobogan as parcel information is mainly derived from head of villages and head of neighbourhoods, the barrier can be encountered when the head of villages and the head of neighbourhoods have lack of knowledge regarding land tenureship information located under their authorities. Thus, optimising direct community's role in collecting information and participating more in the project might be recommended not only in collecting tenureship data but also other thematic data.

As prior the year of 2017, participatory mapping project was conducted solely by initiative of local land offices, various process and results might be accomplished by different land offices. In order to standardise so that the collected data can be used for land registration process, technical guidance has been issued by NLA. The guidance mainly regulates base map specification, implementing parties, required parcel information, and implementation steps of parcel - based participatory

mapping including sort of quality control which must be taken. By providing technical guidance, it is expected that the coming parcel based participatory mapping projects which the implementation is conducted by land offices or joint collaboration with local government and other stakeholders will fulfil the required NLA's standards so that the result of the project can be used to support land registration acceleration.

6. CONCLUSION

Parcel based participatory mapping can be considered as a convincing approach in effort to accelerate land registration programme. It is not only offering sources of efficiencies such as in project expenses and an increased efficiency in completing surveyed parcel, but also offering valuable complete village-parcel based land records. In order to implement the project in more effective way, however, several challenges such as base maps availability, limitation number of NLA's surveyors, engaged communities, and approach in conducting the participatory mapping must be reckoned. By doing so, it is expected that acceleration in registering land throughout territory of Indonesia can be achieved.

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