

Forest Area Boundary Situation Survey: A National Land Strategic Program to Support Land Tenure Security in Indonesia

**MULYADI, PRASETYA, Muhammad NURDIN, and Agus W KUSHENDRATNO,
Indonesia**

Keywords: Land management, land tenure security, land registration; forest boundary; Indonesia

SUMMARY

Land tenure insecurity due to increasing agrarian conflicts and land disputes may be compounded by unclear boundaries of forest areas. There is a debate on how to reduce agrarian conflicts and improve land tenure security around forest areas in Indonesia. This paper investigates the implementation progress of forest area boundaries survey in five provinces implemented by the Ministry of Land Affairs and Spatial Planning / National Land Agency (ATR/BPN). The paper employs study literature and analysis of several project implementations in five provinces in Indonesia. The paper identified that forest boundary demarcation maps in Indonesia are issued by the Ministry of Environment and Forestry (KLHK). ATR / BPN uses the map to support its national land administration program. However, land conflicts often occur in the areas near the forest boundary due to the unavailability of coordinate marks and the differences in the map scale used by the KLHK and ATR / BPN. The unclear forest area boundaries led to the issuance of certificates in forest areas that violated Law Number 41 the Year 1999 concerning Forestry. The analysis of the project implementation found the existence of technical, social, and coordination challenges. The paper suggests that the publication of forest area boundaries should be a priority activity in the national priorities for agrarian reform in Indonesia.

Forest Area Boundary Situation Survey: A National Land Strategic Program to Support Land Tenure Security in Indonesia (10995)

Mulyadi Mulyadi, Prasetya Prasetya, Muhammad Nurdin and Agus W Kushendratno (Indonesia)

FIG e-Working Week 2021

Smart Surveyors for Land and Water Management - Challenges in a New Reality

Virtually in the Netherlands, 21–25 June 2021

Forest Area Boundary Situation Survey: A National Land Strategic Program to Support Land Tenure Security in Indonesia

**MULYADI, PRASETYA, Muhammad NURDIN, and Agus W KUSHENDRATNO,
Indonesia**

1. INTRODUCTION

The forest area of Indonesia is around 125 million hectares and approximately 70% has been formally designated as forest areas (Bappenas, 2020). The importance of forest area boundary is stated in the 2020-2024 National Medium Term Development Plan (Bappenas, 2020). The publication of the demarcation of forest areas is important for the Ministry of ATR / BPN so that it becomes part of the National Priorities for Agrarian Reform (BPN, 2019). This is also relevant to the national agrarian reform strategy published by the Presidential Staff Office in 2016, where it is stated that one of the priority activities in the 2017 government work plan is strengthening the regulatory framework and settlement of agrarian conflicts by reviewing business land rights/permits, as well as changing forest area boundaries for the welfare of the people (KSP, 2016). This policy aims to increase the synergy of regional development, through the arrangement and publication of forest and non-forest areas boundary on a cadastral scale (Bappenas, 2020). Also, this policy will ensure land tenure security in the national land registration system.

However, the designation of forest areas has not been fully implemented, so the boundary status of several forest areas is unclear. Social conflicts often occur when villages and communities are considered to occupy and cultivate several forest areas illegally (Lucas & Warren, 2013). Forest area boundaries dissemination is a challenge for the Ministry of Environment and Forestry (KLHK) and its subordinates (Srinivas, Bell, Collier, Wallace, & Hidayat, 2014). Uncertainty over forest area boundaries can result in delays of village administrative boundaries determination, and there is no legality of land ownership near forest areas; as well as reducing the productivity of land (Bappenas, 2020).

The occurrence of land conflicts in forest areas often due to unavailability of coordinates of forest area boundary markers and differences in scale. Unclear and out of date boundaries can lead to the accidental issuance of land certificates in forest areas (Srinivas et al., 2014). As a result, land officers could be subject to criminal charges because they were deemed to have violated Law Number 41 of 1999 concerning Forestry (Lucas & Warren, 2013).

This paper aims to investigate forest area boundary situation survey as a national land strategic program to improve land tenure security in Indonesia. It employs an analysis of progress reports on the forest boundary survey conducted by ATR/BPN. A question that arises is what are the technical, social, and coordination recommendations of forest boundary surveys to support the acceleration of agrarian reform in Indonesia?

2. METHODS

This paper presents the results of Focus Group Discussions (FGD) with officials of ATR/BPN, Forest Area Consolidation Center (*Balai Pemantapan Kawasan Hutan* or BPKH), district forestry agency, district spatial planning agency, head of sub-districts, and head of villages in the case study areas. The officials were selected based on their availability and equal distribution of geographic representation. FGDs were conducted in five provinces (Jambi, South Sumatera, South Kalimantan, East Kalimantan, and West Kalimantan). The FGDs were carried out in conjunction with the regional coordination meeting of forest area boundary situation survey conducted by the Directorate of Base Survey and Mapping, the Ministry of ATR/BPN in the fiscal year 2020.

The focus group discussions were designed to investigate stakeholders' perceptions of forest area boundary situation survey and to identify the policy that was perceived as needing improvement in support of forest area boundary situation survey to support land administration in Indonesia. This paper is part of the research that explores the relationship between forest area boundary situation survey and the acceleration of systematic land registration in Indonesia. Although this paper is focused more on forest area boundary situation survey, a few aspects of the relationship between land tenure security near forest area and systematic land registration are also discussed.

3. FOREST AREA BOUNDARY SITUATION SURVEY

3.1. Current forest area boundary situation projects in Indonesia

To support the positive land registration system, which is projected to be implemented in 2025, ATR/BPN will register all land parcels (BPN, 2019). According to the 2020 systematic land registration guideline, the location of the land parcels must be located outside the forest area and following spatial planning regulations (BPN, 2019). The authors argue that this can be implemented if spatial information of forest and non-forest area boundaries are available in the land registration system. Safitri (2011) suggested improving policies and accelerating the process of gazettelement of forest areas, resolving forestry conflicts, expanding community management areas, and improving the welfare of indigenous peoples and other local communities.

One of the reasons for the unavailability of forest area boundary information to support land registration activities is the difference in map scale. KLHK uses a small map scale for its forest area boundary map (scale 1: 100,000 or smaller) whereas ATR/BPN uses a big scale for its land registration map (scale 1: 5,000 or greater). Therefore, it results in differences in the interpretation of boundaries areas and this may cause land disputes/conflicts.

As stated in the National Medium Term Development Plan (RPJMN) 2020-2024, the Ministry of National Development Planning (Bappenas) has encouraged efforts to increase the certainty of forest and non-forest area boundaries through detailed measurement of forest area boundaries with a target of 189,000 km (Bappenas, 2020). Detailed forest boundary markers will be installed so that they can be identified in large-scale land registration maps and the maps are expected to become part of the early warning system in the national land registration.

The forest area boundary situation surveys discussed in this paper were carried out by ATR / BPN in the 2020 fiscal year using the World Bank grant and loan as shown in Table 1. There are also similar projects that are funded by the state budget but will not be discussed in this study. The Forest area boundary situation project involves multi-stakeholders: internal (Ministry of ATR / BPN) and external (Ministries/institutions / local governments). Activities related parties consist of:

a. Central ministries/agencies:

Ministry of Environment and Forestry (KLHK), National Development Planning Agency (Bappenas), Geospatial Information Agency (BIG)

b. Regional/province level:

BPN Regional Office; Natural Resources Conservation Agency (BKSDA); Provincial government; Provincial Forestry Service; Forest Area Consolidation Center (BPKH); Perhutani Public Corporation.

c. District/sub-district/village level:

District/city land office; district /city government; head of sub-district; and the village head.

Table 1: The location of the forest area boundary situation survey 2020 (BPN, 2020b)

No	Province	Forest areas*	District	Perimeter (Km)
1	Jambi	HP Sungai Betara II, HP Sungai Keman-Londerang-Rasau, HP Pasir Mayang-Danau Bangko	West Tanjung Jabung, East Tanjung Jabung, Tebo	280,9
2	South Sumatera	Hutan Produksi Yang Dapat Di Konversi (HPK) Gelumbang, HP Sungai Rotan-Sungai Belida	Muara Enim, Banyuasin	102,1
3	West Kalimantan	HL Selat Dampang-Teluk Pakedai, Hutan Produksi Terbatas (HPT) Loban Papau-Nanga Sibau, Sebagian Kelhut S.Palin-S.Palin-S. Mendalam	Kubu Raya, Kapuas Hulu	252
4	South Kalimantan	Central Hulu Sungai, Hulu Sungai Selatan, Tapin	Tapin, Banjar, Hulu Sungai Selatan	111,5
5	East Kalimantan	Mahakam Watershed, Kelompok Hutan Sungai Ratah-Sungai Nyuatan-Sungai Lawa	Mahakam Ulu	226,11
Total perimeter				972,61

* All of the projects were implemented by surveying and mapping consultants

3.2. Project implementation

Statistical data from the Directorate General of Forestry Planning and Environmental Management shows that 2,046 forest areas have been determined by Ministerial Decrees with a total area of 88,034,203.55 hectares, and a length of $\pm 158,232$ km (Bappenas, 2020).

Forest Area Boundary Situation Survey: A National Land Strategic Program to Support Land Tenure Security in Indonesia (10995)

Mulyadi Mulyadi, Prasetya Prasetya, Muhammad Nurdin and Agus W Kushendratno (Indonesia)

FIG e-Working Week 2021

Smart Surveyors for Land and Water Management - Challenges in a New Reality

Virtually in the Netherlands, 21–25 June 2021

According to BPN (2020b), the mapping of forest area boundary situations by the Directorate of Base Survey and Mapping from 2017 to 2020 are 4,733.7 km (3%). The low percentage indicates the large target that must be achieved by ATR / BPN in the following year.

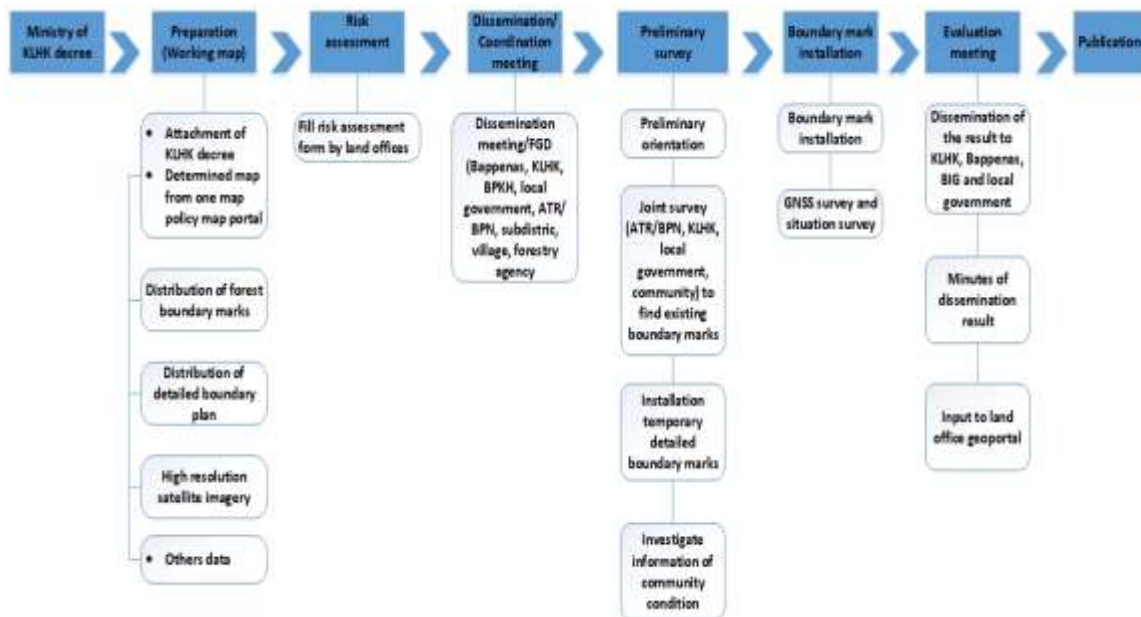


Figure 1: Implementation process of forest area boundary survey (BPN, 2020a)

As shown in Figure 1, in general, the process of forest area boundaries situation survey are as follows:

a. Coordination

A coordination meeting was held in Jakarta by inviting KLHK, BIG, and Bappenas. The results of the agreement at the coordination meeting are:

- The object of forest area boundary situation survey is a forest area that already has a forest Area Decree (SK);
- Measurement of the length of forest area boundaries is only carried out in locations outside the forest area, namely Other Use Areas (*Area Penggunaan Lain*) which are directly adjacent to the forest area of 158,232 Km;
- The satellite imagery used as a working map has been orthorectified by BIG.

b. Dissemination meeting

The meeting is held in city or district, where forest area boundary situation survey is carried out, with the assistance of the provincial ATR/BPN regional office, and the local land office. This meeting aims to coordinate with the sub-district head, village heads, and related communities.

c. Project implementation

Due to limited human resources, survey equipment, and time, the project was carried out by consultants. In its implementation, it is divided into two stages, namely preliminary survey and staking out.

- a) A preliminary survey consists of field orientation and tracking of forest area boundary positions. It is carried out by joint survey team. The team involved parties at the central level and local government. The preliminary survey produces project documentation, and provisional detailed boundary markers based on the working map and appointment by the authorized agency.
- b) Staking out measurements aim to determine the position of the coordinates of the previous measurement to the field. It shows details of the situation (land use) around the forest area boundary up to a distance of ± 100 meters
- d. Supervision

Supervision is carried out by officers from the Directorate of Base Survey and Mapping - Ministry of ATR/BPN, and related agencies. Supervision is carried out three times: initial supervision (supervision of consultant's survey equipment readiness and personnel in the field), middle work supervision (monitoring of the suitability of work), final supervision (quality control of consultant's work)

e. Evaluation

The evaluation meeting was held in Jakarta by inviting the head of the survey division of the Provincial BPN regional office, district/city land office, BPKH, Perhutani, BKSDA, and the provincial government, regional forest agency, district/city government, sub-district, and village heads whose territories are adjacent to the area.

3.5. Interactive map of forest area boundary situation

An interactive map was created using the facilities from ESRI ArcGIS online to shows the progress of the projects as shown in Figure 2. ArcGIS Online provides tools to create and present spatial data online by compiling data from forest area survey. Authors can also create an online ArcGIS map layout, compile an online ArcGIS web app and finalize it as shown in Figure 2 below.

Before compiling an interactive map using ArcGIS Online, it is necessary to create an account on the ArcGIS Online portal. After the account is active, the spatial data presented on an interactive map is uploaded. The format of the files can be shapefile (*.shp), CSV, JSON. In this paper, the data used is a compressed shapefile (ZIP format). The author does symbology settings: symbols, colors, visibility, and layer order so that the map display is informative and easy to understand. The attribute pop-up is also displayed to show information when the user clicks on a feature.



Figure 2: Interactive map of forest area boundary situation survey

The next stage is to build a web application to display maps and their supporting features (widgets which include a legend, layer options, base map, show to my location, ruler, zoom in / out, navigation, and print). These widgets can be selected and arranged interactively. Interactive map layout settings are designed: map title, symbols, and theme before publication. The interactive map is equipped with various features (from the widgets we choose) to make it user-friendly.

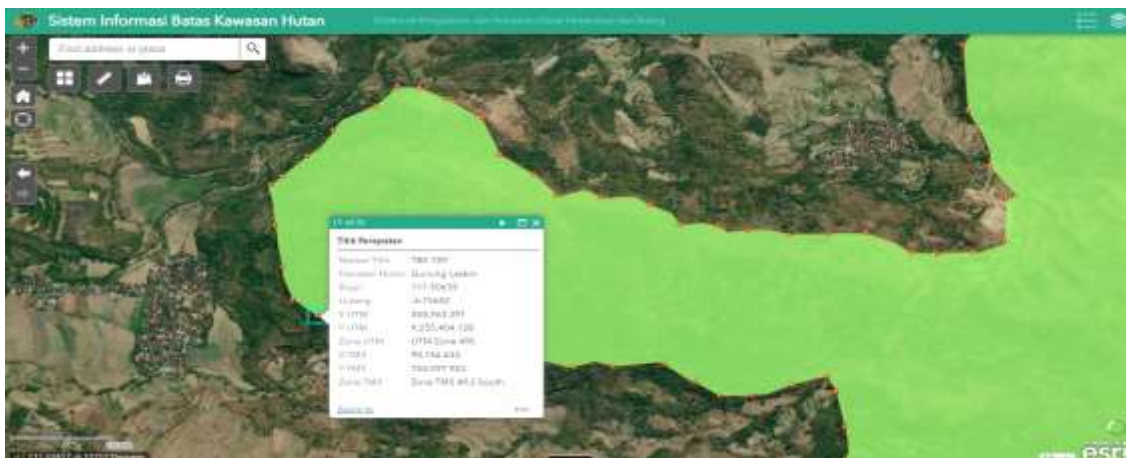


Figure 3: Interactive map of boundary markers of a detailed forest area boundary situation survey

This interactive forest area boundary situation map is expected to be an early warning for stakeholders. For example, it informs land officers not to issue certificates in forest areas. By using a gadget, ATR/BPN officers can use the interactive map when measure land parcels.

The results of forest area boundaries survey are coordinate points (Figure 3), forest boundary polygon and lines (Figure 4), and the situation (land use) along the forest area boundary

difficult to carry out AOI planning as early as possible. To anticipate this, ATR / BPN uses forest area boundary determination map downloaded from the One Map Policy website. But the data is sometimes not up to date or it is different from the latest data available at the KLHK and BPKH.

Moreover, the forest area boundary map of KLHK is a small-scale hardcopy. The map is not equipped with a list of boundary mark coordinates, and sometimes the physical boundaries are different and not found in the field. Also, forest management sometimes cannot show the location of the boundary marks in the field

The results of forest area boundary situation survey have been distributed to the ATR/BPN's data and information center, with the hope that it will soon be uploaded on its land geoportal, but the map's legitimacy is questionable. This occurs because the map was not immediately determined as a definitive forest boundary map by KLHK

The results of the forest area boundary situation survey have also been distributed to BPN Regional Offices, then distributed to the land office where the forest area is located, as offline data in cadastral surveys as well as an "early warning system".

Table 2: Technical issue and recommendation

No	Issue	Recommendation
1	<p>Boundary marks</p> <ul style="list-style-type: none"> • Shape standardisation • Specifications and size of the border monument • Physical boundaries are not visible, the monuments damage • Physical boundaries are not disseminated 	<ul style="list-style-type: none"> • The dimension of the marks are regulated by the regulations • There are technical guidelines for measuring forest area boundaries in ATR / BPN • Community dissemination • Maintenance of the area boundary monument
2	<p>Survey and mapping equipment</p> <p>The process of determining the forest area boundaries of KLHK uses handheld GPS and theodolite so that it is less precise</p>	<p>The survey uses the latest survey technology: GNSS RTK</p>
3	<p>The results of the reconstruction of the KLHK boundary with boundary marks in the field were different</p> <p>The position of the boundary marks were not at the correct coordinates. This can be caused by the boundary measurement method, projection system, map scale used, and human error in the past</p>	<p>The current single reference is SRGI2013</p>
4	<p>Data presentation</p> <p>There is no inter-ministerial integrated system for the agreed forest area boundaries</p>	<p>Development of a single land administration system between ministries to present data as a single reference</p>
5	<p>Field survey method</p> <p>The binding method still does not meet the technical survey principles</p>	
6	<p>Area boundary survey unit</p> <p>The boundary monument units were used in 2017 and 2018. In 2019, the length unit (km) was used. In measuring the right to cultivate, the area unit is used. Of the three units (monument, km, area), what is the most effective unit to use in measuring forest area boundaries?</p>	<p>Perimeter or length</p>
7	<p>Forest area polygon</p> <p>KLHK uses closed polygons, while in some cases, there are open polygons in forest areas that are directly adjacent to natural boundaries such as rivers, seas, or lakes.</p>	<p>The forest area boundary situation survey aims to support the land tenure improvement program for the community, which is carried out in the area of interest (AOI) bordering community land (APL).</p>

8	Availability of high-resolution satellite images Some forest area locations do not yet have base map or working map	Submit a request for rectified satellite data to BIG
9	The legitimacy of project results What is the legitimacy of the survey map for forest area boundaries that will be published? There is a difference with the old map of KLHK: the coordinates of the boundary monument that have been re-measured are different from the coordinates shown in the determination decree of KLHK.	In the preliminary survey phase, boundary tracking emphasizes the existence of boundary agreements between forest area managers and the community
10	The forest area boundary data of KLHK and BPKH (as regional implementing unit) are different. It was found that the coordinates of the KLHK's area boundary were different from those used by the BPKH (field implementer)	Requesting assistance from the National Development Planning Agency (Bappenas) so that KLHK endorse the results of the forest area boundary survey

Table 3: Social issue and recommendation

No	Issue	Recommendation
1	Occupation of forest areas by the community. Occupation by communities (through transmigration programs as well as traditional occupation by indigenous peoples and others) in forest areas	Is the enclave possible? Forest release mechanism? The mechanism if there is a land certificate issued in a forest area?
2	Community resistance There have been several cases of community refusal claiming that their land parcels were not forest areas.	Dissemination and mapping the boundary to identify the disputes
3	Village boundaries are not definitive Village boundaries obtained from the portal of the Presidential Secretariat Office, Ministry of Home Affairs, and BIG are indicative boundaries that differ in reality when checked in the field. This causes the coordination and allocation of human resources from the village to assist in surveying forest area boundaries be constrained.	Effective coordination with villages officers
4	The existence of public facilities or social facilities in the forest area. For example roads, soccer fields, and other utilities	Document as evident

Table 4: Coordination issue and recommendation

No	Issue	Recommendation
----	-------	----------------

1	<p>Coordination with KLHK Intensive coordination with KLHK is required, especially during initial data preparation: shapefile coordinates for area boundaries, and prepare supervision teams</p>	<p>Referring to the letter of the minister of ATR / BPN to the Ministry of Environment and Forestry number TU.01.01 / 845 / V / 2019 dated 21 May 2019 regarding the follow-up to Presidential Instruction Number 2 of 2018 concerning Complete Systematic Land Registration (PTSL) throughout the territory of the Republic of Indonesia, on point 4, 5, 6, and 7 related to forest areas and the need for requests for active assistance from KLHK during field verification</p>
2	<p>Coordination with BPKH BPKH involves as technical implementing unit: as boundary demarcation verifier</p>	<p>Intensive coordination with the BPKH team regarding forest area data and preparation of working maps</p>
3	<p>Coordination with BIG Coordination with BIG is required to obtain high-resolution, rectified images and other up-to-date basic data.</p>	<p>In connection with the Letter of the Minister of ATR / BPN to the head of BIG number PU.03.01 / 846 / V / 2019 dated 21 May 2019 concerning Activities to Fulfill Land Base Map Coverage in the National Medium Term Development Plan (RPJMN) 2020-2024, ATR / BPN plans to use drones to make base maps</p>
4	<p>The Regional Government oversees the local provincial / regency Forestry Service which is one of the managers of the forest area. The number of human resources are limited</p>	<p>Coordination</p>
5	<p>Safety issue Coordination with the security forces has not been carried out properly</p>	<p>Coordination is required to ensure team safety</p>
6	<p>Coordination with village and sub-district heads Not all village heads understand and know where the boundaries of forest and non-forest areas are</p>	<p>Dissemination and coordination</p>
6	<p>Human resources to support forest area boundary demarcation. The number of human resources from KLHK to assist is limited, especially if there are several activities in several locations in one fiscal year in the same province.</p>	<ul style="list-style-type: none"> • Delegation of authority to forest area stakeholders/ managers (Perhutani, Tahura, forestry office, or BKSDA) • Make a schedule including the allocation of human resources

b. Social issues

Table 3 shows social issues and recommendation to solve the challenges. One of the FGD participant mentioned that the survey sometimes cannot be carried due to community objections to the forest area boundary. This occurs because of the community occupation. Community resistance also occurred due to a lack of dissemination. In some cases, village boundaries are located in forest areas, causing community concerns about the status of their cultivated land

c. Coordination issues

Table 4 shows coordination issues and recommendation to solve the challenges. A limited number of joint survey officers at KLHK and BPKH is challenging.

There is sometimes no agreement on boundaries between the parties concerned at the time of the joint survey, which is due to:

- a) Area managers cannot show boundaries in the field;
- b) Community objections to the forest area boundary of the Ministry of Environment and Forestry.
- c) The map of the detailed measurement results of the forest area boundary situation has not been approved as a replacement map in the decision decree by KLHK.

4. DISCUSSION AND CONCLUSION

This project involves multi-stakeholders and it is expected to be able to provide benefits to the parties especially the communities. One of the most important points is the government policy to improve land tenure security for the people who live near forest boundary areas.

Forest and non-forest area boundaries that have not been determined on a detailed scale can hamper the land registration process, especially on land parcels directly adjacent to the forest. There are concerns that the unpublished data on forest area boundaries will create a problem namely the issuance of certificates by the ATR / BPN in forest areas.

This project is expected to reduce unclear boundaries of forest and non-forest areas (which often results in land conflicts). The difference in the scale of the forest area map with the ATR / BPN cadastral map can be resolved by the completion of this project throughout Indonesia. KLHK's policy by providing information on existing indicative and definitive forest boundaries to BPN deserves appreciation.

Data discrepancies in the decree and the field should be resolved following applicable regulations. In the FGD, an alternative solution for land disputes caused by the occupation of the community working on the forest area was proposed. Some of these alternative solutions can refer to regulations, for example, Presidential Decree Number 88 of 2017 and Regulation of the Coordinating Minister for Economic Affairs number 3 of 2018 concerning Settlement of Land Tenure in Forest Areas through an inventory mechanism and verification of Settlement of Land Tenure in Forest Areas (PPTKH) including:

- a. Forest areas that have been cultivated by the community for a long time can be considered to be excluded from the forest area by changing the boundaries of the area through the Land for Agrarian Reform (TORA) mechanism.

~~The World Bank financed project stipulates that the project plan for mapping the situation of forest area boundaries is carried out in locations intersect with villages where systematic land registration activities are being carried out (which is also being financed by the World Bank). The indicative map of TORA is sometimes different in the field because the map refers to the settlements depicted on the topographic map (*Rupa Bumi Indonesia* or RBI).~~

FIG e-Working Week 2021

Smart Surveyors for Land and Water Management - Challenges in a New Reality

Virtually in the Netherlands, 21–25 June 2021

In fact, not all existing settlements in the field are covered by the RBI map. The results of the FGD concluded that if there are rights of third parties in the forest area, then the area can be excluded from the forest area by taking into account the regulatory requirements and the chronology of the area.

- b. Resettlement and swapping forest areas can also be considered as an alternative solution
- c. Currently, the possibility of providing access to forest area management for the community through social forestry is being assessed. This mechanism is also used in dispute resolution in land registration, for example for certificates that have already been issued but are located in forest areas.

As a follow-up, the results of the project (which have been mutually agreed) should be defined as a definitive map that can be used immediately as a common reference. Formally, it should also be followed up with a decree on forest area determination by KLHK. The results of the FGD suggest that ATR / BPN should prepare guidelines for the implementation of the publication of forest area boundary arrangements to clarify the role of all parties by involving KLHK and the Ministry of Home Affairs.

The legal umbrella and the existence of a technical guide for forest area boundaries survey are expected to provide a reference for the implementation of the project and reduce technical problems during implementation phase. Regarding social issues, it is necessary to have a shared understanding of the status of determining forest area boundaries both within the government (central/regional) and in the community. Common perceptions regarding land status in forest areas and legal consequences for land occupation in forest areas can be provided through awareness-raising and dissemination. The delegation of authority between KLHK and its subordinate work unit (provincial BPKH) will reduce coordination problems. Synergy and coordination are the keys to the success of this project, especially to carry out a joint survey on forest area boundaries.

REFERENCES:

- Bappenas. (2020). *Tata Batas Kawasan Hutan*. Paper presented at the Rapat Koordinasi Koordinasi Kegiatan Pengukuran Batas Kawasan Batas Kawasan Hutan Anggaran 2020, Jambi.
- BPN. (2019). *Petunjuk Teknis Pengukuran PTSL No 01/JUKNIS-300.01.01/II/2019*. Jakarta: Menteri of Agrarian Affairs and Spatial Planning/National Land Agency Indonesia
- BPN. (2020a). *Kerangka Acuan Kerja: Pembuatan Peta Situasi Batas Kawasan Hutan Tahun Anggaran 2020*. Jakarta: Menteri of Agrarian Affairs and Spatial Planning/National Land Agency Indonesia
- BPN. (2020b). *Laporan Kinerja Direktorat Pengukuran dan Pemetaan Dasar*. Jakarta: Menteri of Agrarian Affairs and Spatial Planning/National Land Agency Indonesia
- KSP. (2016). Pelaksanaan reforma agraria. Retrieved from <http://kpa.or.id/publikasi/download/ac891-strategi-nasional-reforma-agraria.pdf>
- Lucas, A., & Warren, C. (2013). *Land for the People: The State and Agrarian Conflict in Indonesia*: Ohio University Press.

Forest Area Boundary Situation Survey: A National Land Strategic Program to Support Land Tenure Security in Indonesia (10995)

Safitri, M. (2011). *Menuju Kepastian dan Keadilan Tenurial*. Jakarta: Epistema Indonesia.

Mulyadi Mulyadi, Prasetya Prasetya, Muhammad Nurdin and Agus W Kushendratno (Indonesia)

FIG e-Working Week 2021

Smart Surveyors for Land and Water Management - Challenges in a New Reality

Virtually in the Netherlands, 21–25 June 2021

Srinivas, S., Bell, K. C., Collier, B., Wallace, J., & Hidayat, L. (2014). *Towards Indonesian Land Reforms: Challenges and Opportunities. A Review of the Land Sector (Forest and Non-forest) in Indonesia*. Jakarta, Indonesia: World Bank

BIOGRAPHICAL NOTES

Mulyadi is the Coordinator of Data Synchronization at the Directorate of Base Surveying and Mapping, Ministry of Land Affairs, and Spatial Planning/National Land Agency Indonesia. He commenced his Ph.D. study on land policy to support Disaster Risk Reduction at Mathematical and Geospatial Sciences, School of Science of RMIT University in July 2016 as an Australian Award Scholarship (AAS) awardee. He holds a BSc in Geodesy and M.App.Sc in Geographical Information System.

Prasetya is the Coordinator of Base Surveying, Ministry of Land Affairs, and Spatial Planning/National Land Agency Indonesia. He holds a BSc in Geodesy and M.Eng in Regional Planning

Muhammad Nurdin is Head of Base Mapping and Survey Instruments Sub-Directorate, Ministry of Land Affairs and Spatial Planning/National Land Agency Indonesia. He holds a BSc in Geodesy and a Master of Engineering in Regional Planning.

R Agus Wahyudi Kushendratno is Director of Base Surveying and Mapping, Ministry of Land Affairs and Spatial Planning/National Land Agency Indonesia. He holds a BSc in Geodesy and M.Eng.Sc in Land administration

CONTACTS

Mulyadi

Directorate of Base Surveying and Mapping, Ministry of Land Affairs and Spatial Planning/National Land Agency Indonesia.

Kuningan Barat I No 1 RW 1 Kuningan Barat Mampang Prapatan, South Jakarta INDONESIA

Tel. +62 5202328

Email : mulyadi.katiyo@gmail.com

Website : www.atrbpn.go.id

Forest Area Boundary Situation Survey: A National Land Strategic Program to Support Land Tenure Security in Indonesia (10995)

Mulyadi Mulyadi, Prasetya Prasetya, Muhammad Nurdin and Agus W Kushendratno (Indonesia)

FIG e-Working Week 2021

Smart Surveyors for Land and Water Management - Challenges in a New Reality

Virtually in the Netherlands, 21–25 June 2021