

# **Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) at the Kudus Regency Land Office**

**Kariyono, Zahirullah, and Virgo Eresta Jaya, Indonesia**

**Keywords:** Integrated Parcel Boundary Survey and Mapping; Complete Systematic Land Registration (PTSL); improved spatial data; photogrammetry; land census data.

## **SUMMARY**

Indonesia has around 126 million land parcels and its national land registration has been carried out since 1960. To present, The Ministry of Agrarian Affairs and Spatial Planning (ATR/BPN) has successfully registered 83.8 out of 126 million land parcels (66.5%). The number will increase every year with the massive systematic land registration (PTSL) and it is expected that all land parcels have been registered by 2025. The obstacles in implementing PTSL are mapped sporadically instead of regularly, there are gaps and overlaps of existing certified lots land parcels that have not been mapped (K4). According to the technical guidance of Complete Systematic Land Registration (PTSL) 2023 Number 3-HK.02 /III/2023 the step for integrated parcel boundary survey and mapping is get an aerial photo image of a village with the accuracy that has been defined, the boundaries survey method is focused on using aerial photo image, so people identify their boundaries on aerial image photo or using surveying if it is not visible, collect the information of land parcels owners and land use, land utilization, verify the spatial data of people and announce land parcels map, quality control physical data and preparation complete map of village. In 2023, the Ministry of ATR/BPN targets measuring and mapping 3 million Ha and the Kudus Regency Land Office has a target of 1975 Ha spread across 10 villages/sub-districts. In order to accelerate the progress of integrated parcel boundary survey and mapping, the Kudus Regency Land Office conducts a land data census by plotting at the location and going door to door using photo maps, with accompanied by physical data collection society (MASDASIK) and participation of village/subdistrict residents . The obstacle is that there is still K4 data that cannot be mapped, the steps that can be taken are to make an official report and a list of K4.2 and it is necessary to prepare a regulatory survey and mapping of K4 data to be announced over a certain period of time and followed up with the elimination of Parcel Identification Number (NIB) and Measurement Letter. The next obstacle is that there are differences in registered land parcels data in the land office and community, the steps taken by parcels which are the result of structuring and improvements shall be revised in the Land Book (Land Book), Measurement Letter (SU) and certificate if the right holder applies during PTSL implementation or during land registration data maintenance services. Integrated boundaries parcel survey and mapping activities will improve the quality of data registered and unregistered parcels, assisting in acceleration of PTSL progress and realization of complete city/ regency maps in Indonesia.

---

Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) in Kudus Regency Land Office (12461)  
Kariyono Kariyono, Zahirullah Zahirullah and Virgo Eresta Jaya (Indonesia)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all  
Accra, Ghana, 19–24 May 2024

# **Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) at the Kudus Regency Land Office**

**Kariyono, Zahirullah, and Virgo Eresta Jaya, Indonesia**

## **1. INTRODUCTION**

Indonesia has around 126 million land parcels and its national land registration has been carried out since 1960. To present, the Ministry of Agrarian Affairs and Spatial Planning (ATR/BPN) has successfully registered 83.8 out of the 126 million land parcels (66.5%). The number will increase every year with the Complete Systematic Land Registration (PTSL) and it is expected that all land parcels have been registered by 2025. PTSL is a new land registration process that is carried out concurrently and covers all land registration objects that have not previously been registered in a village area, sub-district, or other name at that level. Through this program, the government provides legal certainty or rights to community-owned land. Implementation of PTSL requires 4 (four) supporting components consisting of people, materials, money and methods.

According to the results of the PTSL implementation evaluation, the land parcels measuring and mapping activities carried out were not comprehensive in the village/subdistrict areas designated as activity locations, improving the quality of data for both mapped registered land parcels (KW 1, 2 and 3) as well as unmapped registered land parcels (KW 4, 5 and 6) and unregistered land parcels are carried out in a complete systematic, grouped in one area complete village/subdistrict. One of the obstacles in implementing PTSL is the quality of the data produced, including the implementation of measurements and mapping which is still sporadic, there are gaps and overlaps, the mapped registered land parcels do not match the actual conditions in the field and there are residues in the mapping of K4 land parcels.

According to the findings of the concerns listed above, it is known that the causes include the unavailability of a comprehensive registration base map and not equipped with a georeferenced photo map or high resolution satellite imagery (CSRT). With the rapid advancement of photogrammetric mapping technology using unmanned aerial vehicles (PUNA/UAV), the most recent technology now includes a positioning system in the form of a Global Navigation Satellite System - Post Processing Kinematic (GNSS-PPK) - which can be used to obtain orthophotos can reduce the need for Ground Control Points (GCP) as connection points. The results of the trials show that the difference between coordinates measured using GNSS Real Time Kinematic (RTK) and coordinates from orthophotos resulting from photogrammetric mapping using PUNA/UAV can be carried out relatively quickly and with accurate results, allowing Unmanned Aerial Vehicles (PUNA/UAV) with GNSS-PPK receivers can be used to create photo maps as references in implementing integrated physical data collection activities.

In PTSL activities in 2023, land parcels measuring and mapping activities will be carried out comprehensively in the village/subdistrict areas that have been designated as activity locations, both for registered land parcels, improving the quality of registered land parcels that have not been mapped yet, and unregistered land parcels that will be carried out in a complete systematic grouped in one complete village/sub-district area.

---

Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) in Kudus Regency Land Office (12461)

Kariyono Kariyono, Zahirullah Zahirullah and Virgo Eresta Jaya (Indonesia)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all

Accra, Ghana, 19–24 May 2024

This activity is prioritized to be carried out in village/sub-district locations that have never been designated as PTSL locations and physical data collection must be carried out based on the photo maps generated.

In 2023, the Ministry of ATR/BPN targets measuring and mapping 2.5 million Ha with a revised target of 3 Million Ha and the Kudus Regency Land Office has a target of 772 Ha with a revised target of 1975 Ha spread across 10 villages/ subdistricts. In order to accelerate the progress of integrated measurement and mapping, the Kudus Regency Land Office conducts a land data census by plotting at the location and going door to door using photo maps, with accompanied by the Physical Data Collection Society (MASDASIK) and participation from village/subdistrict residents. With integrated survey and mapping activities, it will improve the quality of data on registered and unregistered land parcels and will support the acceleration of PTSL progress and the realization of complete cities/ regency in Indonesia.

## **2. METHODOLOGY**

The research method used in this study is qualitative descriptive. Qualitative description aims to describe the nature or characteristics of a symptom, event, or event that occurred today (Jonah, 2010). This research focuses on the utilisation of Integrated of Land Survey Parcel Map (LSPM) activities in supporting the implementation of PTSL at the Kudus Regency Land Office. The primary research data is derived from the results of the implementation of Integrated LSPM activities, Dashboard Data from the Computerized Land Office (KKP), and data from the evaluation of the implementation of Integrated LSPM from the Regional Office of the Central Java Provincial Agency and the Directorate General of Land and Spatial Survey and Mapping. Secondary data is gathered from documentation of the implementation of integrated LSPM activities in the field.

Descriptive qualitative analysis techniques are used to analyse data. The qualitative description technique will describe the implementation of Integrated LSPM activities in supporting PTSL activities as well as obstacles and constraints and how to overcome them in supporting the implementation of the realization of a complete city/district in Indonesia

## **3. RESULTS AND DISCUSSION**

### **3.1 Mechanism Of Integrated Of Boundaries Survey And Mapping**

The stages of implementing integrated of boundaries survey and mapping activities using photo maps, can be seen in outline in Figure 1 below:

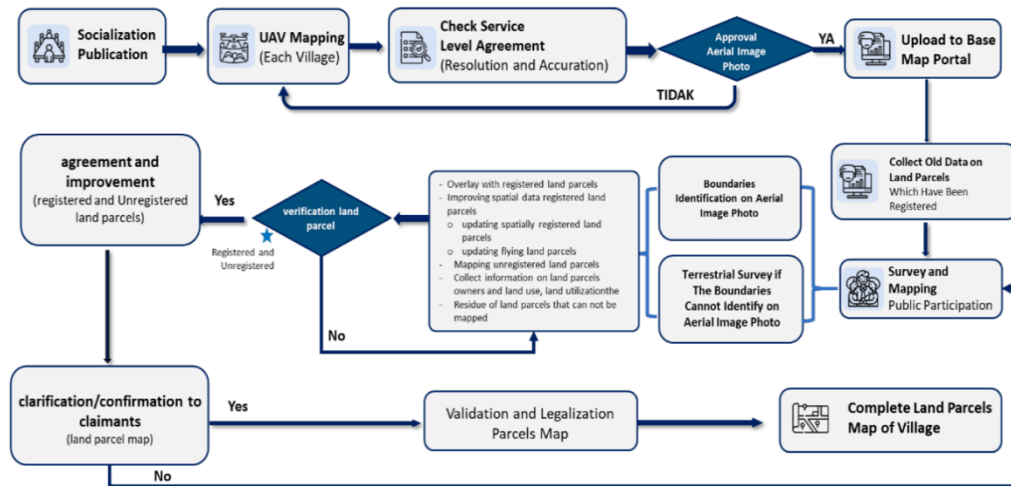


Figure 1. Mechanism of Integrated Parcel Boundary Survey and Mapping (Ministry of ATR/BPN, 2023)

### 3.1.1 Sozialization

Sozialization or counseling is carried out massively and comprehensively to the community at PTSL locations by the Head of the Land Office, Adjudication Committee, Physical Task Force and/or Juridical Task Force involving village/sub-district/sub-district officials, Regency/City/Provincial Government, TNI, Polri, Prosecutor's Office, elements external and/or community figures. Sozialisasi is provided to the community, including prospective participants and Land Parcels owners, village/sub-district/sub-district officials and local governments at PTSL locations. Sozialisasi is provided through in-person sessions as well as the dissemination of printed and electronic brochures/leaflets/banners. Following the outreach activities, it was followed up with the Joint Movement for the Installation of Boundary Marks (GEMAPATAS) as well as the creation and submission of Minutes of Installation and Approval of Boundary Marks and the Joint Movement for Preparation of Juridical Data (GEMADADIS) for the preparation of complete juridical documents as registration requirements in the PTSL program, as well as assistance in filling out the registration form.

### 3.1.2 UAV Mapping and Accuracy Testing

UAV Mapping is aimed at locations designated for Complete Systematic Land Registration (PTSL) Land Survey Parcels Map (LSPM) activities where a Land Base Map is not yet available, or in the case of a land base map that is available, but does not yet have results/output in accordance with the accuracy provisions specified (Spatial Resolution/Ground Sampling Distance (GSD)  $\leq 0.15$  meters and Horizontal Accuracy (CE90)  $\leq 0.5$  meters). To ensure that the final Photo Map output/product complies with the required specifications, then quality control and Accuracy Tests are performed by comparing the coordinates of the test points (ICP) in the field to the

coordinates of the points on the Photo Map. The number of test points follows the provisions as regulated in SNI 8202:2019 (Ramadhani, et al., 2023). The results of checking the Service Level Agreement on the photo map are approved (agree/disagree) and reported to the Head of the Land Office.

### 3.1.3 Upload Basemap to Portal

Aerial photo maps that have gone through the results of accuracy checks/tests and have received approval from the Head of the Survey and Mapping Section or appointed Functional Official, are then uploaded by the service provider into the base map application module (<https://petadasar.atrbpn.go.id/>)

### 3.1.4 Survey and Mapping with Public Participation

The primary approach utilised in measurement and mapping activities in integrated Physical Data collection activities is the photogrammetric method involving community participation. Land parcels boundaries are identified in collaboration with boundary markers and physical data collection communities by bringing work maps and study maps to the village hall, community hall, or other appropriate locations. The research Map is used to compare the results of identifying land parcels boundary points to existing research data. The process of identifying land parcels boundaries can be carried out using a computer, tablet or other device, as well as as well as a projector to aid the process of identifying boundaries. The process of identifying land parcels boundaries can also be carried out using printed media. If the boundaries of the Land Parcels cannot be recognised on the Work Map, then Supplement Measurements are taken in the fields. Physical data on land parcels is collected for all land parcels, whether registered or unregistered, as well as information on the use and utilization of land parcels.

### 3.1.5 Spatial Analysis

The spatial analysis steps from the results of physical data collection are as follows:

- Overlay with spatial data on land parcels (KW1-KW3) and mapped land parcels that have not yet been issued a certificate;
- Identification of spatial and textual data for Land parcels KW1-KW6 and mapped land parcels that have not yet been issued a certificate;
- Improve the spatial data of registered Land parcels (KW1-KW6) and mapped land parcels that have not yet been issued certificates according to the results of Physical Data collection.
- For Land parcels KW1-KW6 and mapped land parcels that have not yet been issued a certificate, a Minute of Arrangement and Improvement of Physical Data must be completed with an attached map of the Land parcels.
- Carry out mapping of land parcels that have not been registered yet.
- If the position of the K4 Land parcels cannot be determined in the field (cannot be mapped) after collecting Physical Data and gathering information from the public,

then the Land Parcels is put in the list of KW4-KW6 (K4) which are not mapped (K4.2)

- For the land parcels that overlap, mapping will still be carried out and included in the list of overlapping land parcels.

### 3.1.6 Clarification of Physical Data on Land parcels

The Working Map, which has mapped all Land parcels and analysis of repairs and arrangement of registered Land parcels has been converted into a Clarified Land Parcels Map that will be announced and clarified to the public, if there are objections, then measurements and mapping will be carried out again for improvements. The Deputy Chair of the Physical Sector and the Physical Data Collecting Society then sign the Clarified Land Parcels Map that results from the Clarification process. The Clarified Land Parcels Map is announced at the Land Office, village/sub-district office and/or announced on the Land Office's official social media as well as on the website [www.bhumi.atrbpn.go.id](http://www.bhumi.atrbpn.go.id) and/or SentuhTanahku application.

### 3.1.7 Verification (Quality Control)

Activities to verify the suitability of land parcels data are carried out by the Head of the Survey and Mapping Section or an appointed official. This activity includes: verifying unregistered land parcels whose area exceeds what is reasonable, ensuring that there are more measurements for supplementation measurements and in addition to examine a number of samples, field inspections are also conducted on spatial data that is deemed to require field verification.

### 3.1.8 Complete Village/Subdistrict Registration Map

The results of the integrated physical data collection in the spatial and textual KKP application of the land parcels that are complete becomes a complete village/subdistrict registration map. Land parcels created through structure and improvements are subject to revision in the Land Book, Measurement Letter and Certificate if the right holder applies during the PTSL implementation or later during the land registration data maintenance service.

### 3.1.9 Publication of Land Survey Parcel Map (LSPM)

Publication of Land Survey Parcels Maps covers:

- The Land Survey Parcels Map is an excerpt from the registration map;
- The Land Survey Parcels Map contains land parcels in one area/block
- The number of LSPM in one village/subdistrict is adjusted to the scale so that information and visualization of land parcels is conveyed clearly;
- The land parcels included in the Land Survey Parcels Map are all Land parcels resulting from Physical Data collection (KW1-KW6) and the mapped Land parcels that have not yet been issued certificates (land parcels of K2, K3, K3.1, K3.2, K3.3, K3.4, NIB without clusters) as well as unregistered land parcels). Land

Survey Parcel Map also contains geographical elements such as rivers, roads and buildings;

- The Land Survey Parcel Map is signed by the measuring officer and the deputy head of the physical division. For Land Parcels Maps carried out by a third party, it is signed by the cadastral surveyor, the head of the company/KJSB, and acknowledged by the head of the physical task force.

### 3.2 Implementation Integrated Parcel Boundary Survey and Mapping at Kudus Regency Land Office

#### 3.2.1 Aerial Photo Map as part of the Integrated of Land Survey Parcels Map (LSPM)

The Kudus Regency Land Office, through the service procurement process, appointed PT. Infomap Geo Survey as a provider of survey and mapping services to carry out vertical photo mapping using unmanned aerial vehicles (PUNA) at the Kudus Regency Land Office, covering an area of 1975 ha spread across 10 villages. The tools used are the Phantom 4 pro drone and Comnav T300 Geodetic GPS. The geometric accuracy of the map is significant information written in the form of a statement in the metadata and cartographic presentation of the base map. Information on the geometric accuracy of a map is important, especially if the map is used as a base map or reference for obtaining spatial information. Based on the report made by PT Infomap Geo Survey, the results of the aerial photo map accuracy test can be seen in the following table:

Table 1. Aerial Photo Accuracy Test Results

Test	RMSE (m)	CE Accuracy 90 (m)	GSD
Geometric	0.0336	0.0511	0.086

The horizontal accuracy test on the aerial photo map was carried out using 35 test points. The horizontal position (x and y) of the aerial photo map compared to GNSS measurements does not differ significantly, by a fraction of a centimeter. The RMSE value from the horizontal position accuracy test of the aerial photo map is 0.0336 m. When compared to the GSD value of a photo, which is 8 cm per pixel, the above RMSE value meets the required tolerance, which is less than one pixel. The size of the GSD can be taken into account when creating a basic map for land registration purposes. The registration base map in the application is used to visualize land parcels boundaries. According to PMNA/Head of BPN Number 3 of 1997, the land parcels boundaries themselves use stakes with a diameter of 0.05 m to 0.2 m, for this reason the GSD of the registration base map used has that size. The horizontal position accuracy is obtained using the CE90 horizontal accuracy equation: 0.0511 m. Based on the 2023 PTSL Technical Guidelines, the accuracy requirements are set (Spatial Resolution/Ground Sampling Distance (GSD)  $\leq$  0.15 meters and Horizontal Accuracy (CE90)  $\leq$  0.5 meters). Based on these several things, the aerial photo map meets the standards as a Registration Base Map and can be used as a reference for implementing integrated LSPM at the Kudus Regency Land Office.

Aerial photo maps that have gone through the results of accuracy checks/tests and received approval from the Head of the Survey and Mapping Section or appointed

Functional Official, are then uploaded by the service provider into the base map application module (<https://petadasar.atrbpn.go.id/>) . The photo map upload display can be seen in the following image:

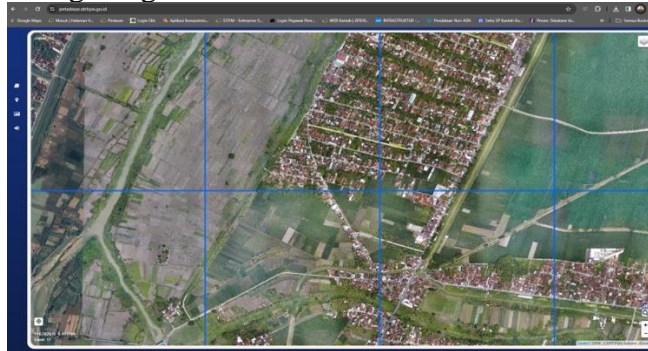


Figure 2. Aerial Photo Map (<https://petadasar.atrbpn.go.id/>)

### 3.2.2 Integrated of Land Survey Parcel Map (LSMP)

Participatory Mapping for mapping land parcels based on the experience of the International Land Coalition (ILC), one of the participatory mapping initiatives for land registration activities. Participatory mapping is accomplished by gathering spatial data the results of which can assist communities in having their rights recognized by state institutions (Stefano, 2008). In the case study of Rwanda in the Land Tenure Regulation program, land boundary delimitation procedures were implemented to encourage land owners to be willing to guide surveyors and agree on boundaries with adjoining owners before surveyors delineate parcel boundaries on photo maps (Gillingham and Buckle, 2014). With this method, Rwanda can register all 10.4 million plots of land within 5 years at a cost of 6 USD per plot (Enemark, et al., 2014).

The use of digital aerial photography for land activities is carried out by Rudianto (1999), Nature (2001), Kusmiarto (2002) as well as Sudarsono and Nugraha (2008) where using digital aerial photography makes it easier to identify plots of land in open and orderly areas and create work maps from aerial photo maps, assisting officers in carrying out measurements. Obstacles in identifying photo maps include areas covered by dense vegetation and structures as well as regions witnessing rapid and abrupt changes in detail. According to Alam (2001), errors and accuracy in recognizing land parcels boundaries in aerial photographs are influenced by the scale and resolution of the aerial photographic map, the quality of the aerial photographic map, the clarity of objects on the aerial photographic map and the ability of the human resources who identify the boundaries of the land parcels. According to Gumeidhidta (2017) to identify land parcels boundaries in areas covered by buildings and vegetation, there is an error in interpreting land parcels boundaries. Community engagement is also vital in determining land parcels boundaries, particularly in providing information on land parcels boundaries on photo and field maps (Hutabarat et al., 2023). A complete village mapping activity is an activity that involves the community in inventorying all plots of land in one village, both registered and unregistered. (Aditya, et al., 2015)



The photogrammetric approach, which includes community participation, is the primary method utilised in measurement and mapping activities during integrated physical data gathering activities at the Kudus Regency Land Office. In carrying out the identification, verification and delineation of land parcels boundaries using aerial photo maps, the accuracy is influenced by the scale and resolution of the aerial photo map, the quality of the aerial photo map, the clarity of the land parcels boundary objects in the aerial photos and the ability of those performing the identification. Aside from that, there is the possibility of errors in interpreting land parcels borders when doing participatory mapping activities.

Identification of land parcels boundaries is carried out alongside boundary markers and physical data collection communities by bringing work maps and research maps to the village hall, community hall, or other appropriate locations. The procedure of identifying land parcels boundaries can either be done via printed media or digitally with a mobile or laptop. If the boundaries of the Land Parcels cannot be identified on the Work Map, then Supplement Measurements are taken in the field. Physical data on land parcels is collected for all land parcels, whether registered or unregistered, as well as information on the use and utilization of land parcels.

To make it easier to map K4 land parcels (registered as unmapped), the step taken by the Kudus Regency Land Office is to write a letter to the Village Head to convey the K4 data to the community and must report it to the appointed officer. Apart from that, they also carry out Plotting On The Spot (POS). This Plotting on the spot is an attempt to digitally map the location of registered land parcels whose position is unknown, then the plotting results will show the veracity of the data that land ownership exists in a location based on the information on the certificate. In carrying out the survey and mapping, officers from the Kudus Regency Land Office MASDASIK going door to door in the field. The obstacle that is faced in its implementation is that people are not there because they are working or their whereabouts are not known. The implementation of surveys and mapping in the context of participatory mapping data can be seen in Figure 3 below:



*Figure 3. Socialization or Counseling and Participatory Mapping  
(Kudus Regency Land Office, 20230)*

---

Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) in  
Kudus Regency Land Office (12461)  
Kariyono Kariyono, Zahirullah Zahirullah and Virgo Ereasta Jaya (Indonesia)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all  
Accra, Ghana, 19–24 May 2024

The implementation of the Integrated of Land Survey Parcel Map at the Kudus Regency Land Office is spread across 10 Villages/Subdistricts resulting in complete Subdistricts/Villages. The results of the Integrated LSPM can be seen in Table 2 and Figure 3 below:

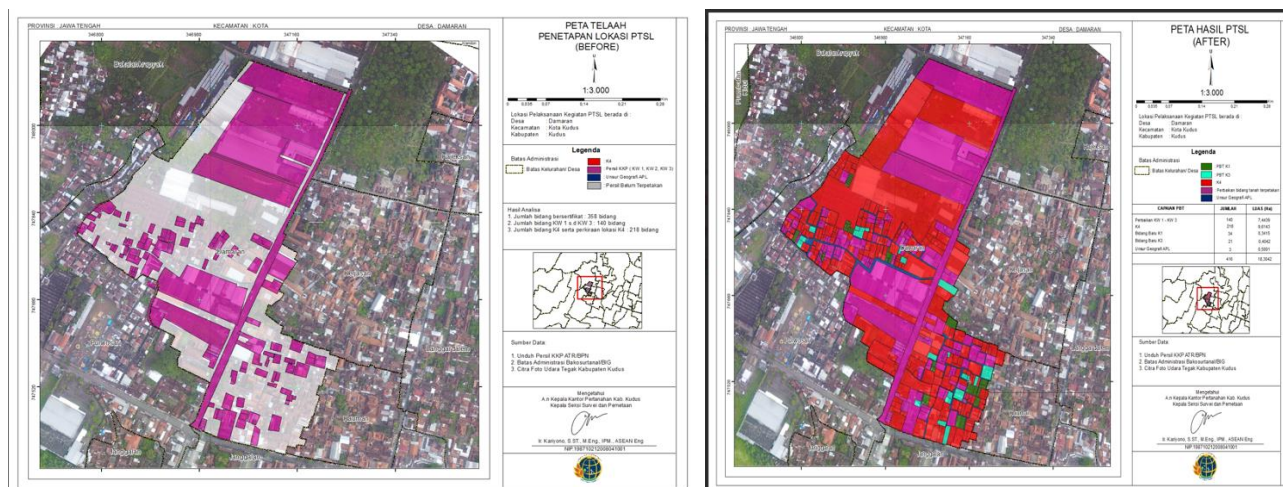


Figure 4. Map of Land parcels Before and After PTSL at Damaran Village, Kudus City Kudus Regency, Central Java (Kudus Regency Land Office, 2023)

Table 3. Result of Number of Parcels in Kudus Regency Land Office in 2023

No	Village Name	Number of parcels	Total Area (Ha)	Kw1-3		K4		Unregistered Parcels		Geographical Elements		K4.2	
				Number of parcels	Area (Ha)	Number of parcels	Area (Ha)	Number of parcels	Area (Ha)	Number of parcels	Area (Ha)	Number of parcels	Area (Ha)
1	Kauman	115	3.03	43	0.96	58	1.84	10	0.318	4	0.13	0	0
2	Kaliputu	1322	54.02	739	16.19	418	32.43	116	2.09	49	3.29	16	0.35
3	Damaran	416	18.30	140	7.44	218	9.61	55	0.75	3	0.5	0	0
4	Tengeles	4340	222	2945	140.88	1068	68.98	321	20.55	6	12.62	66	5.71
5	Hadiwarno	3715	255	2422	154.98	774	66.24	349	24.14	170	10.75	22	2.31
6	Karangbener	5349	420	4301	287.27	613	83.15	0	0	294	24.73	188	12.17
7	Gulang	4,753	455	3,975	383.52	277	31.62	65	5.83	230	21.82	172	30.58
8	Prambatan Lor	5,139	309	3,688	126.13	1042	50.98	164	13.60	245	54.62	66	2.85
9	Langgardalem	665	20.05	368	10.54	167	4.73	125	3.44	5	1.35	8	0.24
10	Purwosari	3883	116.83	2549	68.12	1058	38.14	266	0.59	10	5.14	33	0.84

(Source: Kudus Regency Land Office, 2023)

### 3.2.3 Obstacle and Constraints

The problems faced in the implementation of Integrated of Parcel Boundary Survey and Mapping in Kudus Regency include the implementation of community

Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) in Kudus Regency Land Office (12461)

Kariyono Kariyono, Zahirullah Zahirullah and Virgo Ereasta Jaya (Indonesia)

FIG Working Week 2024

Your World, Our World: Resilient Environment and Sustainable Resource Management for all

Accra, Ghana, 19–24 May 2024

participation, the implementation of mapping and the KKP application, in detail can be seen in table 4 below:

Table 4 Obstacles and Constraint in Implementing Integrated of Boundaries Survey and Mapping at the Kudus Regency Land Office

No	Constraint	Information
1	Society participation	<ul style="list-style-type: none"> <li>▪ Process Public understanding is still low regarding photogrammetric and participatory mapping</li> <li>▪ The appointed masdasik (border marker) cannot manage the whole plot of land at the place</li> <li>▪ People unfamiliar with identifying land parcels boundaries on photo maps</li> <li>▪ The public not present at the location</li> </ul>
2	Mapping	<ul style="list-style-type: none"> <li>▪ The boundaries of land parcels differ from those of rice fields or moorlands</li> <li>▪ The area is covered by land/vegetation so it is necessary to measure supplementation</li> <li>▪ There are still overlapping land parcels (List of overlaps)</li> <li>▪ The unidentified K4 (K.4.2)</li> <li>▪ There is an overlap between LSPM K3 and Certificate (K4)</li> <li>▪ The public wants the merging and splitting of K3 data.</li> <li>▪ Data disparities between the community and in the KKP</li> </ul>
3	KKP application	<ul style="list-style-type: none"> <li>▪ The area that appears in the SPM for improvements to mapped land parcels refers to the land book document, not the newly mapped area, resulting in a discrepancy in the real area.</li> <li>▪ The application is currently undergoing maintenance</li> </ul>

#### 4. CONCLUSION

In order to accelerate land registration in Indonesia, the Ministry of ATR/BPN will organize a Complete Systematic Land Registration. It is envisaged that by 2025 all land parcels would be registered. One of the challenges to implementing PTSL is the quality of the data provided, including the implementation of measurements and mapping is still sporadic, there are gaps and overlaps, and mapped registered land parcels that do not match the actual field conditions. To address this, the Directorate General of Land and Spatial Survey and Mapping produce PTSL Technical Instructions in 2023, which include instructions for collecting Integrated Physical Data using aerial photo maps and mapping surveys using photogrammetric methods. In carrying out the identification, verification and delineation of land parcels boundaries using aerial photo maps, the accuracy is influenced by the scale and resolution of the aerial photo map, the quality of the aerial photo map, the clarity of the land parcels boundary objects in the aerial photos, and the ability of those performing the identification. Aside from that,

---

Integrated Parcel Boundary Survey and Mapping to Accelerate Complete Systematic Land Registration (PTSL) in Kudus Regency Land Office (12461)  
Kariyono Kariyono, Zahirullah Zahirullah and Virgo Eresta Jaya (Indonesia)

there is the possibility of errors in interpreting land parcels borders when doing participatory mapping activities.

Land parcels measuring and mapping activities are carried out comprehensively in the village/subdistrict areas that have been designated as activity locations, both for registered land parcels, improving the quality of registered land parcels that have not been mapped yet, and unregistered land parcels which are carried out systematically in complete groups in one complete village/subdistrict area. In order to accelerate the progress of integrated measurement and mapping the Kudus Regency Land Office conducts a land data census by plotting at the location and going door to door using photo maps, accompanied by MASDASIK and the participation of village/subdistrict residents. The obstacles faced include the low level of community participation, there is still overlap and K4 data that cannot be mapped and the KKP application that can be read is textual data, not spatial data. To overcome these obstacles, it is necessary to provide more intensive outreach to the community regarding photogrammetric methods, there is a need for rules or guidelines for resolving overlaps and K4 that cannot be identified and Pusdatin needs to make improvements to the KKP system. The next obstacle is that there are differences in data on registered land parcels in the Land Office and in the community, the steps taken by land parcels resulting from structuring and repairs are to improve the archives and certificates if the right holder applies during the land registration data maintenance service.

Based on current data, the Kudus Regency Land Office has 12 complete villages/subdistricts out of 132 (10 from the results of LSPM PTSL activities in 2023 and 2 non PTSL villages). It is hoped that the implementation of Integrated of boundaries survey and mapping will result in Kudus Regency being a complete regency maps by 2025. Integrated of boundaries survey and mapping activities will increase the quality of data on registered and unregistered land parcels, assisting in the acceleration of PTSL progress and the realization of complete city/ regency maps in Indonesia.

## REFERENCES

- Aditya, T., Santosa, P.B., Rahardja, U., Istarno, Riyadi, G. (2015). *Laporan Akhir Pilot Project Pembangunan Geospasial Pertanahan untuk Menunjang One Map Policy (Rural)*. Departemen Teknik Geodesi Universitas Gadjah Mada , Yogyakarta collaboration with Ministry ATR/BPN.
- Alam, I. (2001). *Pembumian Bidang Tanah Melayang dengan Peta Foto*. Tesis. Magister Teknik Geodesi dan Geomatika, Institut Teknologi Bandung.
- BPN. (1997). *Peraturan Menteri Negara Agraria/Kepala Badan Pertanahan Nasional Nomor 3 Tahun 1997 tentang Ketentuan Pelaksanaan Peraturan Pemerintah Nomor 24 Tahun 1997 Tentang Pendaftaran*. Jakarta: Badan Pertanahan Nasional.
- Dirjen SPPR Kementerian ATR/BPN. (2023). *Petunjuk Teknis Pendaftaran Tanah Sistematis Lengkap No 3/Juknis HK.02./III/2023*. Retrieved from Jakarta
- Enemark, S., McLaren, R. dan L. C. (2016). *Fit-For-Purpose Land Administration Guiding Principles For Country Implementation*. UN-Habitat.
- Gillingham, P., dan Buckle, F. (2014). *Rwanda Land Tenure Regularisation Case Study. Surrey*. Retrieved [http://dx.doi.org/10.12774/eod\\_hd.march2014.gillingham](http://dx.doi.org/10.12774/eod_hd.march2014.gillingham)
- Gumeidhidta, I.A. (2017). *Analisis Ketelitian Planimetri Orthopoto dengan Memanfaatkan UAV untuk Pembuatan Peta Dasar Pendaftaran*. Tesis. Magister Teknik Geomatika, Departemen Teknik Geodesi, Universitas Gadjah Mada, Yogyakarta.
- Hutabarat, R.H., Swantika,S.P.,Jaya.V.E., Hasibuan,F.,Sijabat,H. (2023). *Integrated Parcel Boundary Survey and Mapping: a Pilot Project to Improve Spatial Data and to Accelerate Complete Systematic Land Registration*. FIG 2023 Orlando,Florida USA, 28 May-1 June 2023.
- Kusmiarto. (2002). *Kajian Penggunaan Foto Format Digital untuk Pembuatan Gambar Ukur (Daerah Datar dan Terbuka)*. Universitas Gadjah Mada, Yogyakarta.
- Ramadhani,S.A.,Sidik,R.,Hasibuan,F., Prabajati.H.H.(2023). *Assessing the Quality of Photo Imageries from UAVs for Cadastral Purposes in Indonesia* .FIG 2023 Orlando,Florida USA, 28 May-1 June 2023.
- Rambaldi, G., Kyem, P. A., Weiner, D., Mbile, P., dan McCall, M. (2005). *Participatory Spatial Information Management and Communication in Developing Countries. In Mapping for Change International Conference*. MCIC, Nairobi.
- Sudarsono, B., dan Nugraha, A. (2008). *Pengukuran dan Pemetaan Kadastral dengan Identifikasi Peta Foto*. *Jurnal Teknik*, 29(1), h. 67–72.
- Kementerian ATR/BPN. (2018). *Peraturan Menteri ATR/BPN Nomor 6 Tahun 2018 Tentang Pendaftaran Tanah Sistematis Lengkap*. Retrieved from Jakarta

## **BIOGRAPHICAL NOTES**

**Kariyono** is Head of Survey and Mapping Section, Kudus Regency Land Office. He holds a BAppSc in Land Administration from National Land College and M.Eng in Geomatic Engineering from Gadjah Mada University. Ir in Engineer profession from Diponegoro University.

**Zahirullah** is Head of Survey and Mapping Division of the Regional Office of the National Agency Central Java Province. He holds a BSc in Geodesy from Bandung Institute of technology.

**Virgo Eresta Jaya** is Director General of Land Survey and Mapping, Ministry of Agrarian Affairs and Spatial Planning/National Land Agency Indonesia. He holds a BSc in Geodesy from Bandung Institute of technology and M.Sc in Land Administration from University of New South Wales, Australia.

## **CONTACTS**

### **Kariyono**

Ministry of Agrarian Affairs and Spatial Planning/National Land Agency Indonesia.

Kudus Regency Land Office

Jl. Mejobo, MlatiKidul, Kudus City, Kudus, Central Java 59319, Indonesia

Tel. +62291 434832

E-mail : [kariyono@bpn.go.id](mailto:kariyono@bpn.go.id) /[kariyono.atrbpn@gmail.com](mailto:kariyono.atrbpn@gmail.com)

Website:[www.atrbpn.go.id](http://www.atrbpn.go.id)