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## The Development of a Procedure Model for Improving Land Data Quality (Case Study at the Land Office of Tulang Bawang Regency)

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**Abstract:** Accurate and up-to-date land data is essential for effective planning, development, and decision/policy making by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency. However, land data does not yet have full data accuracy and reliability, thus weakening the usefulness of the land data itself. This study aims to develop a procedural model to improve the quality of land data. This study began by conducting a data classification method, namely conducting a comprehensive inventory of data in the database and archives of land book documents along with measurement letters. Based on the inventory results, a data adjustment method was then done by aligning data between the database and the archives of land book documents and measurement letters. Finally, a method of improving the quality of land data (data quality improvement) was carried out by improving land data to be better. As a form of supervisory control/monitoring, data verification was carried out on data that had been improved using purposive sampling. The results of this study indicate that the systematic application of this method can produce land data with good data accuracy and reliability. Improving the quality of land data results in complete and accurate mapping, and higher data accuracy, although in one village statistically it has not shown positive data, but with the improvement in the quality of land data, it has increased the accuracy of high and detailed data, as well as increased transparency and accountability to the community.

**Keywords:** *land data quality, land data, improving data quality.*

### Introduction

The land data held by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency must possess accuracy, reliability, and high quality to provide legal certainty and protection to rights holders and prevent land conflicts and disputes. Improving land data can enhance the accuracy and reliability of information related to land ownership and utilization. This is crucial in supporting development, natural resource management, and the resolution of land disputes. High-quality land data can prevent overlapping land disputes (overlap) and provide legal certainty to rights holders. Additionally, accurate land data offers various benefits (multipurpose cadastre), such as land valuation, land use planning, land development, and land registration [1].

**Table 1.** The land data table.

No	Activities	Total	%
1	Valid Land Book	128,614	91.42
2	Invalid Land Book	12,076	8.58
3	Valid Parcel	117,433	83.47
4	Invalid Parcel (Not Yet Mapped)	23,257	16.53
Number of Registered Land Parcels		140,690	

Based on the statistical data from the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency as of December 31, 2023, the number of registered land parcels in Tulang Bawang Regency totals 140,690 parcels. Of these, 128,614 parcels (91.42%) have valid land books, and 117,433 parcels (83.47%) have valid parcels. Consequently, 12,076 land parcels (8.58%) have invalid land books, and 23,257 parcels (16.53%) are still invalid (not yet mapped) in the

registration map within the Land Activities Computerization System (KKP).

The land data, such as valid land books and parcels, still does not fully possess the accuracy, reliability, and quality needed. This shortcoming is due to various factors, including discrepancies between the data in the Land Activities Computerization System database and the archived land book documents and Measurement Letters, changes in actual field conditions, and data entry errors or incorrect formatting. Additionally, there are land books and parcels that remain invalid (not yet mapped) in the registration map within the Land Activities Computerization System, which necessitates prompt and effective follow-up action. If these issues are not addressed, they can lead to legal uncertainty, difficulties in planning, development, and effective decision-making or policy formulation, as well as a lack of public trust in the existing land management system.

One of the steps taken by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency to address these issues is the implementation of the National Strategic Program, namely the Complete Systematic Land Registration (PTSL), by utilizing aerial photo maps (Unmanned Aerial Vehicle) and community participation. To achieve accuracy, reliability, and high-quality land data, efforts are needed to improve the quality of land data at the Tulang Bawang Regency Land Office by developing a procedural model for enhancing land data quality.

The data classification method aims to provide a process for systematically and orderly assigning or grouping data sets. The land data housed by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency encompasses various types and characteristics. By classifying this data, it becomes easier to conduct efficient analysis and processing of land data, ensuring more streamlined and effective management.

The data adjustment method is a process undertaken to correct and align data, ensuring it is more accurate, consistent, and reliable. Following the previous data classification method, discrepancies may arise between the data in the Land Activities Computerization System database and the archived land book documents and Measurement Letters. These inconsistencies often occur due to the incomplete migration of land data from offline records into the Land Activities Computerization System database. This adjustment process is essential to

harmonize the data and enhance its overall quality and reliability.

Inaccurate, inconsistent, and poor-quality land data can lead to negative consequences, such as errors in decision-making and policy formulation, legal and economic risks, and a loss of public trust. By applying the data quality improvement method, data can be significantly enhanced, ensuring its reliability, accuracy, and usefulness concerning land ownership and utilization. This, in turn, helps mitigate the potential negative impacts, promoting more informed decisions, reducing legal and economic risks, and restoring public confidence in land management systems.

Every task or activity naturally requires oversight and monitoring through data verification, especially in the context of improving land data quality at the Tulang Bawang Regency Land Office. Data verification is carried out to ensure that the implementation of land data quality improvements meets all specified requirements, thereby reducing errors or mistakes. This verification process is applied to the data that has undergone quality enhancement using purposive sampling techniques. By doing so, it confirms that the improvements made are effective and that the data is reliable, accurate, and ready for use.

The focus of this research is on developing a procedural model for improving land data quality. This model is enhanced by integrating available and relevant geospatial data into the base map, supported by voluntary community participation [2]. The improvement of data quality is achieved using modern geospatial technology, which facilitates periodic verification of less valid data, thus providing a foundation for the necessary data updates using unmanned aerial vehicles [3]. This research is more specific compared to previous studies by employing a combination of methods: data classification, data adjustment, land data quality improvement, and data verification. These methods collectively contribute to a more comprehensive approach to enhancing the accuracy, reliability, and overall quality of land data. Research flow diagram can be seen on **Figure 1**.

## Method

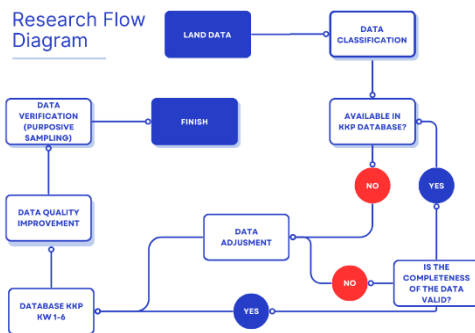


Figure 1. Research Flow Diagram.

### 1. Research Location and Data

This research was conducted in two villages, Bangun Rejo Village in Meraksa Aji District and Menggala Village in East Menggala District. Tulang Bawang Regency is one of the regencies in Lampung Province and was established as a separate regency from North Lampung Regency in 1997. Geographically, Tulang Bawang Regency is located between 105°09' East Longitude to 105°55' East Longitude and 04°08' South Latitude to 04°41' South Latitude. These locations, as shown in the **Figure 2**, were chosen due to their relevance to the study, providing a suitable setting for testing and developing the procedural model for improving land data quality.

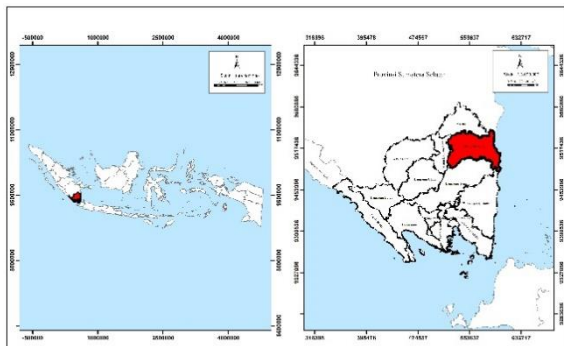


Figure 2. Research Location Map.

Bangun Rejo Village is one of the villages located in Meraksa Aji District, Tulang Bawang Regency, with a total area of 10,350,428 square meters. According to the Tulang Bawang Regency Central Statistics Agency

(2022), the population of Bangun Rejo Village is 2,073 people, consisting of 1,088 males and 985 females, with a population density of 123 people per square kilometer. Based on the statistical data from the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency as of February 1, 2023, the number of registered land parcels in Bangun Rejo Village is 511 parcels. These parcels are categorized as follows: 474 parcels of Quality 1 (KW 1), 9 parcels of Quality 2 (KW 2), 0 parcels of Quality 3 (KW 3), and 28 parcels ranging from Quality 4 to Quality 6 (KW 4-6). The target for the Complete Systematic Land Registration (PTSL) program in 2023 for Bangun Rejo Village is 791 hectares for land parcel mapping and 116 land parcels for land ownership certificates.

Menggala Village is one of the villages located in East Menggala District, Tulang Bawang Regency, with a total area of 28,075,961 square meters. According to the Tulang Bawang Regency Central Statistics Agency (2022), the population of Menggala Village is 3,628 people, consisting of 1,829 males and 1,799 females, with a population density of 81 people per square kilometer. Based on the statistical data from the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency as of February 1, 2023, the number of registered land parcels in Menggala Village is 506 parcels. These parcels are categorized as follows: 295 parcels of Quality 1 (KW 1), 25 parcels of Quality 2 (KW 2), 0 parcels of Quality 3 (KW 3), and 186 parcels ranging from Quality 4 to Quality 6 (KW 4-6). The target for the Complete Systematic Land Registration (PTSL) program in 2023 for Menggala Village is 982 hectares for land parcel mapping and 522 land parcels for land ownership certificates.

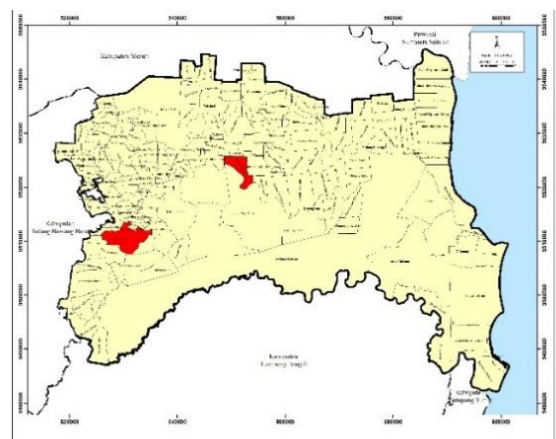


Figure 3. Bangun Rejo and Menggala Villages.

**Figure 3** shows the location of Bangun Rejo Village and Menggala Village in Tulang Bawang Barat Regency.

## 2. Data Classification

Data classification can be viewed as the process of systematically and orderly assigning data sets into distinct classes within a classification system that is mutually exclusive and non-overlapping [4]. Data classification is considered pragmatic if it can respond to higher objectives, such as retrieving specific data sets of interest, rather than merely grouping them based on similarity. This approach addresses hierarchical features or diverse dimensions such as origin, sensitivity, and data usage models, simultaneously aiding in various scenarios such as data access control, monetization, or pricing [5].

In this research, data classification is conducted using the stock opname classification method. Stock opname refers to the physical counting of inventory available in a warehouse, typically carried out to determine the actual quantity owned by a company before the inventory is sold [6]. Stock opname, or inventory inspection, is a crucial task for eliminating inconsistencies between actual assets and the inventory management system, and it is performed periodically at specific locations. Therefore, in the context of this study, stock opname is a physical verification activity aimed at assessing the quantity and condition of land documents stored in archives.

In this stock opname classification, the materials used include land books, Measurement Letters, and registration maps stored in the archives of the Tulang Bawang Regency Land Office. These documents are then classified into four categories: mapping data, textual SU (Measurement Letter) data, spatial SU data, and land book data. This classification involves identifying the completeness of the documents, which will ultimately impact the quality of the data produced.

The more complete the availability of the data, the higher the quality, which is then classified as Quality 1 (KW 1). Conversely, if the data availability is incomplete, the data quality requires improvement and correction. The abbreviation of GS is a situational picture, which is a picture of an activity area in spatial form presented on a large scale according to its purpose. While the abbreviation of SU is a measurement letter, which is a document containing physical data of a land plot in the form of a map and description which is an excerpt/copy

of a land plot image from a registration map. GS and SU are basically the same, GS is a product published in the past, while SU is a product published today.

Spatial GS/SU is situation image data/measurement letter whose image has been entered into the database. While textual GS/SU is situation image data/measurement letter whose textual or information description has been entered into the database. Land book is a document containing legal data and physical data of land that already has rights. The **Table 2** shows outline of the types of land data quality classifications used by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency:

**Table 2.** Types of land data quality classifications.

Data Availability	Data Quality					
	KW 1	KW 2	KW 3	KW 4	KW 5	KW 6
Mapped Land Parcels	√	√	√	x	x	x
GS/ SU Spatial	√	x	x	√	x	x
GS / SU Textual	√	√	x	√	√	x
Land book	√	√	√	√	√	√

## 3. Data Adjustment

Data adjustment refers to the process of timely updating product data to maintain data consistency [7]. It is a key element in overcoming inefficiencies in product information sharing and realizing the benefits of electronic collaboration. Data adjustment is considered essential in electronic collaboration between business partners [8]. Additionally, data adjustment can be defined as the process of modifying data to improve its quality, accuracy, or to meet specific requirements. It is a crucial part of data management and analysis, ensuring that the data is accurate, reliable, and fit for its intended purpose.

Data adjustment is carried out by correcting and aligning the stock opname data of land books, Measurement Letters, and registration maps stored in the archives of the Tulang Bawang Regency Land Office with the database of the Land Activities Computerization System. This process involves ensuring the completeness of documents between the stock opname data and the Land Activities Computerization System database, so that the data in the system is valid and consistent with the archived land book and Measurement Letters documents. For land books and Measurement Letters

from the stock opname that are not yet in the land database, data updates are performed by inputting the land book and Measurement Letters data into the Land Activities Computerization System.

If only the land book is entered into the Land Activities Computerization System, it will be classified as Quality 6 (KW 6). If both the land book and the textual Measurement Letters are entered, it will be classified as Quality 5 (KW 5). If the land book, textual Measurement Letters, and spatial Measurement Letters are all entered, it will be classified as Quality 4 (KW 4). This classification reflects the increasing completeness and quality of the data as more elements are incorporated into the system, with higher classifications indicating more comprehensive and reliable data.

#### 4. Data Quality Improvement

Quality improvement refers to the actions taken to enhance the value of a product for customers by improving the effectiveness and efficiency of processes and activities within the organizational structure [9]. In the context of land data, data quality improvement involves actions to make the data more accurate, reliable, and useful, particularly concerning land ownership and utilization. This is crucial for supporting development, natural resource management, and the resolution of land disputes. Ensuring high-quality data not only facilitates better decision-making but also enhances the overall efficiency and effectiveness of land management processes.

The quality improvement of land data in Bangun Rejo Village, Meraksa Aji District, and Menggala Village, East Menggala District, is applied across all classifications of land data quality, from Quality 1 to Quality 6 (KW 1-6). The enhancement of land data quality in these areas is carried out for land parcels with the following conditions:

1. The shape of the land parcel does not match its topography;
2. The shape of the land parcel does not align with the Measurement Letters;
3. The land parcel does not correspond to the actual conditions on the ground;
4. The land parcel is indicated to be overlapping (overlap) with other parcels;

5. The land parcel is indicated to be not in its true position.

These improvements are essential to ensure that the land data accurately reflects the reality on the ground, thereby increasing the reliability and utility of the data for various purposes, including legal, administrative, and developmental functions.

For land parcels that have already been mapped (plotted), an analysis will be conducted to verify the accuracy of their location, boundaries, and area. Land parcels that have not yet been mapped (plotted) will first be plotted onto the registration map using spatial SU (Measurement Letters) data and/or by delineating the land parcel boundaries on an aerial photo map, involving community participation. For boundary points that cannot be visually identified on the aerial photo map, additional field measurements (supplementary measurements) will be conducted to ensure accuracy. This approach ensures that all land parcels are accurately represented on the map, which is crucial for maintaining reliable land records and supporting effective land management.

#### 5. Data Verification using Purposive Sampling

Data verification is the process of establishing and maintaining high quality data, essential for properly informing database participants and users [10]. In this study, data verification is conducted on land parcels using purposive sampling. Purposive sampling is a non-probability sampling technique where the researcher selects subjects that meet the research objectives based on the researcher's judgment [11]. This method allows for a targeted approach to verification, focusing on samples that are most relevant to the study, ensuring that the data aligns with the research goals and reduces the likelihood of inaccuracies.

In this study, purposive sampling is carried out by selecting samples based on the classification of data quality types, ranging from Quality 1 to Quality 6 (KW 1-6). The minimum sample size used in this research is determined using the following formula:

$$n = \frac{N}{1 + N\theta^2}$$

With:

$n$  = minimum of total sample

$N$  = Total Population



e = margin of error (usually set to 0.05)

## Results And Discussion

The improvement of land data quality will significantly impact the accuracy and reliability of the data, thereby providing legal certainty and protection to rights holders while preventing land conflicts and disputes. Accurate and up-to-date land data is crucial for effective planning, development, and decision-making or policy formulation by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency. The enhancement of land data quality at the Tulang Bawang Regency Land Office is being carried out through the 2023 Complete Systematic Land Registration Program (PTSL). This process involves the development of a procedural model based on the Technical Guidelines provided by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency.

This model aims to ensure that the land data is thoroughly accurate, reliable, and consistent with actual conditions, thereby supporting more effective governance, reducing potential disputes, and fostering public trust in land management systems.

First, a data classification method using the stock opname approach was implemented, which involved conducting a comprehensive inventory of the data in the database and the archived land book documents along with Measurement Letters. The results of the stock opname, which were carried out on the archived land book documents and Measurement Letters at the Tulang Bawang Regency Land Office, are presented in **Table 3**.

**Table 3.** Results of Stock Opname of Land Parcel Quality.

Villages	Database		Stock Opname	
	Land Book	SU	Land Book	SU
Bangun Rejo	511	511	1.217	1.002
Menggala	506	480	517	480

Based on the stock opname data, in Bangun Rejo Village, Meraksa Aji District, a total of 1,217 land books and 1,002 Measurement Letters were found, while the number of land books and Measurement Letters available in the Land Activities Computerization System database is 511 parcels. Meanwhile, in Menggala Village, East Menggala District, the stock opname revealed a total of 517 land books and 480 Measurement Letters,

with the available data in the Land Activities Computerization System database being 506 land books and 480 Measurement Letters.

This discrepancy highlights the need for further data reconciliation and updates to ensure that the database accurately reflects the actual land records available in the archives.

Second, the stock opname data was then subjected to a data adjustment process by matching it with the Land Activities Computerization System database. For land books and Measurement Letters identified during the stock opname that were not yet present in the database, data updates were carried out by inputting these records into the system.

In Bangun Rejo Village, Meraksa Aji District, new data entries included 706 land books and 491 Measurement Letters. Meanwhile, in Menggala Village, East Menggala District, new data entries included 11 land books.

This process ensures that the database is updated and more accurately reflects the actual land records, improving the reliability and completeness of the data available for land management and decision-making.

There were several challenges and obstacles encountered when inputting the stock opname data into the database of the Land Activities Computerization System. These challenges and obstacles include:

- Certificates lacking a Right Number and Measurement Letters Number, making it difficult to integrate data between the land book and the Measurement Letters;
- Certificates without a Right Number and Measurement Letters Number that have already expired;
- Some documents only contain the land book, while the Measurement Letters is not found;

For documents where only the land book was found, the data was still entered into the Land Activities Computerization System database, resulting in a classification of Quality 6 (KW 6). For certificates without a Right Number and Measurement Letters Number, data integration was performed based on the serial number of the blank certificate, resulting in a classification of Quality 4 (KW 4) and Quality 5 (KW 5). This approach allows for the continued use and classification of available data, even when complete documentation is not present, ensuring that the information is as

comprehensive and reliable as possible under the circumstances.

The results of the data adjustment after aligning the stock opname data with the Land Activities Computerization System database can be seen in **Table 4**.

**Table 4.** Results of Data Adjustment after Stock Opname.

Village	Data Adjustment					
	KW1	KW2	KW3	KW4	KW5	KW6
Bangun Rejo	295	25	0	0	830	67
Menggala	474	9	0	3	31	0

Third, the land data quality improvement (data quality improvement) was carried out in Bangun Rejo Village, Meraksa Aji District, and Menggala Village, East Menggala District. The improvement of land data quality was applied across all classifications, from Quality 1 to Quality 6 (KW 1-6).

For land parcels that have not yet been mapped (plotting) and fall under Quality 4 to Quality 6 (KW 4-6), the first step was to plot them onto the registration map using spatial SU (Measurement Letters) data. For land parcels that have already been mapped (plotting) and are classified as Quality 1 to Quality 3 (KW 1-3), an analysis was conducted to verify the accuracy of their location, boundaries, and area.

Improvement of the quality of this data are carried out in conjunction with the Complete Systematic Land Registration program using Unmanned Aerial Vehicle (UAV) technology or unmanned aircraft. The Unmanned Aerial Vehicle System with Terrestrial Direct Georeference is a survey and mapping system that combines terrestrial survey methods and close-range photogrammetry. UAV technology has the characteristics of flying at low altitudes, is adaptive to the environment, overcomes climate conditions such as cloud cover which is always a major problem in satellite imagery and aerial mapping [12].

This systematic approach ensures that all land parcels, regardless of their initial classification, are accurately represented and verified on the registration map, enhancing the overall quality and reliability of the land data.

The results of the land data quality improvement (data quality improvement) conducted in Bangun Rejo Village, Meraksa Aji District, and Menggala Village, East Menggala District, yielded several outcomes, as follows:

#### 1) More Comprehensive and Accurate Mapping

The land data quality improvement (data quality improvement) carried out in Bangun Rejo Village, Meraksa Aji District, and Menggala Village, East Menggala District, resulted in more comprehensive and accurate mapping. The mapping process became more complete due to the migration or plotting of land parcels from old certificates into the Land Activities Computerization System database. This was further enhanced by the Complete Systematic Land Registration (PTSL) program, which registered previously unregistered land parcels, leading to a fully mapped village.

The accuracy of the mapping was significantly improved through the use of Unmanned Aerial Vehicles (UAVs), which provided highly detailed and precise maps. These UAVs captured high-resolution images and data, ensuring that the spatial representation of the land parcels was accurate and reliable, thus supporting more effective land management and planning. **Figure 4** shows the improvement.

**Figure 4** shows the registration map before and after the land data quality improvement. Visually, the figure demonstrates a significant transformation in the registration map following the quality enhancement efforts. In the improved map, the mapping coverage is visibly more comprehensive.

Bangun Rejo Village in Meraksa Aji District



Menggala Village



**Figure 4.** Registration Map Resulting from Data Quality Improvement.

There has been a notable increase in the number of land parcels that were previously unmapped but are now accurately plotted, resulting in a more complete mapping of the area. Additionally, the accuracy of the

registration map has been significantly enhanced due to the combined use of Unmanned Aerial Vehicles (UAVs), which produce highly accurate and detailed maps, and terrestrial observations involving direct measurements and on-site observations. This combination allows for precise analysis of the location, boundaries, and area of each land parcel.

The increase in the number of mapped land parcels in these two villages is not only due to the inputting of data and plotting of old certificate parcels into the system but also because of the first-time land registrations (issuance of new certificates) through the Complete Systematic Land Registration (PTSL) Program. This program resulted in the issuance of 116 new certificates for Bangun Rejo Village and 522 new certificates for Menggala Village, further contributing to the completeness and accuracy of the registration map.

## 2) Higher Data Accuracy

The land data quality improvement (data quality improvement) conducted in Bangun Rejo Village and Menggala Village has resulted in significantly higher and improved data accuracy (statistically). The results of the data quality improvement for land parcel data from the land system database, as shown in **Figure 5**, demonstrate that in January 2024, there was an increase in the number of registered land parcels as well as an enhancement in the quality of data within the Land Activities Computerization System.

This increase reflects the successful integration of previously unregistered land parcels and the systematic improvement of the existing data, ensuring that the land records are both comprehensive and highly accurate. The enhanced data quality supports more reliable decision-making and provides greater legal certainty for land ownership and use.

Nama Wilayah	Buku Tanah	KW 1	KW 2	KW 3	KW 4 (Blokir Internal / Jumlah)	KW 5 (Blokir Internal / Jumlah)	KW 6 (Blokir Internal / Jumlah)	Persentase
Bangun Rejo	1333	425	490	0	0/0	0/351	0/67	68.64
Menggala	1039	1002	31	0	0/2	0/4	0/0	99.42

**Figure 5.** Land plot quality data after improving data quality in January 2024 (Tulang Bawang Regency Land Office KKP data for January 2024).

In Bangun Rejo Village, the number of registered land parcels is 1,333, representing 68.64% of the total, consisting of 425 parcels classified as Quality 1 (KW 1),

490 parcels classified as Quality 2 (KW 2), 351 parcels classified as Quality 5 (KW 5), and 67 parcels classified as Quality 6 (KW 6). The 425 parcels in Quality 1 (KW 1) include 309 parcels that resulted from data quality improvements and 116 parcels that represent first-time land registrations (new certificates) issued under the 2023 PTSL Program.

However, the number of parcels in Quality 5 (KW 5) and Quality 6 (KW 6) remains high and cannot be improved due to the inability to map (plot) these parcels into the Land Activities Computerization System database for the following reasons:

- In the Quality 5 (KW 5) data, there are 351 land parcels that cannot be mapped (plotted) for the following reasons; a) 148 parcels only have archived land books, with no Measurement Letters or analog registration maps found. Even after involving the community and village officials in identifying the data, they were unable to determine the owners of these certificates. b) 203 parcels have both land books and Measurement Letters, but cannot be mapped due to overlapping (overlap) with other land parcels. These issues prevent the accurate mapping and integration of these parcels into the Land Activities Computerization System, making it difficult to upgrade their quality without further investigation and resolution of these conflicts.
- In the Quality 6 (KW 6) data, there are 67 land parcels that cannot be mapped (plotted) due to the following reasons; a) Only archived land books are available for these parcels, with no Measurement Letters or analog registration maps found. b) Despite efforts to identify the data through community participation, including involvement from local residents and village officials, they were unable to identify the certificate owners. These limitations prevent the mapping and integration of these parcels into the Land Activities Computerization System, thereby hindering any quality improvement efforts for these parcels.

In Menggala Village, there are 1,039 registered land parcels, representing 99.42% of the total, consisting of 1,002 parcels classified as Quality 1 (KW 1), 31 parcels as Quality 2 (KW 2), 2 parcels as Quality 4 (KW 4), and 4 parcels as Quality 5 (KW 5). The 1,039 parcels classified as Quality 1 (KW 1) include 517 parcels resulting from data quality improvement and 522 parcels registered for



the first time (new certificate issuance) under the 2023 PTSL Program.

The 6 parcels classified under Quality 4 (KW 4) and Quality 5 (KW 5) cannot be improved in quality due to the following reasons; a) Only archived land books are available, with no Measurement Letters or analog registration maps found. b) Despite efforts to identify the data by involving community participation, including the input of local residents and village officials, they were unable to identify the certificate owners. As a result, these land parcels cannot be mapped (plotted) into the Land Activities Computerization System database, preventing any further improvement in their data quality.

In addition to improving the quality of land parcel data, the land data quality improvement (data quality improvement) also enhances land statistical data, as shown in **Table 5**.

**Table 5.** Ready Electronic Data in January 2024.

Village	Total Land Book	Valid Land Book		Valid Parcels		Ready for Electronic Data	
		Qtt	%	Qtt	%	Qtt	%
Bangun Rejo	1.333	1.218	91,4	954	71,6	775	58,1
Menggala	1.039	1.039	100	989	95,2	1.005	96,7

**Table 5** presents the statistical data taken from the Land Activities Computerization System database as of January 2024. The "ready for electronic data" category refers to land books and spatial data that have been validated and are accurate or complete. In Bangun Rejo Village, the number of valid land books is 1,218 parcels, representing 91.4% of the total land parcels. The number of valid parcels is 954, or 71.6%, and the number of parcels ready for electronic data integration is 775, which constitutes 58.1%. Meanwhile, in Menggala Village, the number of valid land books is 1,039, accounting for 100% of the total parcels, with 989 valid parcels (95.2%) and 1,005 parcels (96.7%) ready for electronic data integration. These figures indicate a significant improvement in the validation and digital readiness of land data, ensuring more accurate and reliable land management processes.

The statistical data for valid parcels and electronic readiness in Bangun Rejo Village, Meraksa Aji District, remains relatively low due to several challenges. Some parcels cannot be validated or mapped because they overlap with other land parcels, and the Measurement

Letters and analog registration maps are missing. Efforts to identify these parcels through community participation, involving both local residents and village officials, were unsuccessful, as they were unable to determine the certificate owners.

Despite the fact that the data for Quality 5 to Quality 6 (KW 5-6) and land statistics in Bangun Rejo Village have not yet shown positive results statistically, the improvement in land data quality has significantly enhanced data accuracy and detail. This process has made it possible to identify problematic parcels, such as those with overlapping boundaries, and prevents the issuance of new certificates for already registered land parcels. This increased accuracy ensures better land management and helps to avoid future disputes.

### 3) Increased Transparency and Accountability

The improvement of land data quality has a significant impact on transparency and accountability in public service delivery. In this context, transparency refers to the extent to which information about land data can be accessed and understood by the public and stakeholders, ensuring openness in the land management process. Accountability relates to the responsibility and openness of those managing and using the data, ensuring that actions taken in land registration and management are clear and justified.

By enhancing the quality of land data, the system becomes more transparent, allowing individuals and institutions to verify land ownership and usage more easily. This transparency helps prevent conflicts, fosters trust in public institutions, and ensures that the land registration process is fair and equitable. Accountability is also improved, as the clearer and more accurate data enables more responsible decision-making, ensuring that officials and land management bodies can be held accountable for their actions.

Improving the quality of land data results in comprehensive mapping and accurate, reliable data. With accurate and reliable land data, public trust in the land services provided by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency, specifically the Tulang Bawang Regency Land Office, will increase. Accurate land data also enhances the speed of public services for the community, ensuring efficient and timely processes. Furthermore, comprehensive mapping and accurate data can prevent land grabbing and land mafia crimes, as there will no longer be any opportunity

for irresponsible parties to register land belonging to others due to the completeness of the mapping system. This level of data integrity significantly strengthens the protection of land ownership and supports better governance in land management.

The enhanced registration maps for Bangun Rejo and Menggala Villages, following the land data quality improvement, are accessible to the public as a demonstration of transparency and accountability by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency, particularly the Tulang Bawang Regency Land Office. Landowners can view and verify their land parcels on these registration maps through platforms provided by the Ministry, one of which is the Sentuh Tanahku application. This app allows landowners to check the accuracy of their land's location and boundaries, offering a convenient and transparent tool for ensuring the integrity of land data.

Fourth, after the land data quality improvement was completed in Bangun Rejo and Menggala Villages, a form of supervisory control and monitoring was carried out through data verification to ensure that the land data quality enhancement met all specified requirements, thereby reducing errors or mistakes. This data verification was conducted using Purposive Sampling, a non-probability sampling technique in which the researcher selects subjects based on their relevance to the research objectives, guided by the researcher's judgment. This targeted approach ensures that the most critical areas of data improvement are thoroughly verified, ensuring the reliability and accuracy of the process.

The data samples selected for verification in Bangun Rejo and Menggala Villages focused on land parcels that had already been mapped, specifically those classified as Quality 1 to Quality 3 (KW 1-3). This targeted verification process ensures that the land parcels in the highest quality categories are thoroughly checked for accuracy in location, boundaries, and area, confirming that the data quality improvement efforts have been successfully implemented and meet the required standards. By focusing on these mapped parcels, the verification process helps to validate the reliability of the enhanced land data.

**Tabel 6.** Data Purposive Sampling.

Village	KW 1		KW 2		KW 3	
	Qtt	Sample	Qtt	Sample	Qtt	Sample
Bangun Rejo	425	206	490	220	0	0
Menggala	1002	286	31	28	0	0

Based on **Table 6**, the sample selection for Bangun Rejo Village consisted of 206 parcels classified as Quality 1 (KW 1) and 220 parcels classified as Quality 2 (KW 2). In Menggala Village, the sample included 286 parcels classified as Quality 1 (KW 1) and 28 parcels classified as Quality 2 (KW 2). For these Quality 1 and Quality 2 (KW 1-2) data samples, verification was conducted to assess the accuracy of the location, boundaries, and area of the parcels. This verification ensures that the land data aligns with actual conditions on the ground, reducing errors and improving overall data reliability.

## Conclusions

The development of a procedural model for improving land data quality in Bangun Rejo Village, Meraksa Aji District, and Menggala Village, East Menggala District, was carried out by classifying data (data classification). This involved conducting a comprehensive inventory of the data in the database and the archives of land book documents and Measurement Letters. Based on the results of the inventory, a data adjustment method was applied to align the data between the database and the archived land book and Measurement Letters documents. Finally, a method for improving land data quality (data quality improvement) was implemented to enhance the land data further. As a form of supervisory control and monitoring, data verification (data verification) was conducted on the improved data using purposive sampling.

The systematic application of these methods resulted in land data with improved accuracy and reliability. The land data quality improvement in Bangun Rejo Village, Meraksa Aji District, and Menggala Village, East Menggala District, produced comprehensive and accurate mapping, with higher data accuracy. Although Bangun Rejo Village has not yet shown positive statistical results, the overall improvement in land data quality led to a significant increase in detailed data accuracy, as well as enhanced transparency and accountability to the public.

The improvement of land data quality in these two villages had a significant impact on the accuracy and

reliability of the data. This has provided legal certainty and protection to land rights holders and helped prevent land conflicts and disputes. Accurate and up-to-date land data is also essential for effective planning, development, and decision-making or policy formulation by the Ministry of Agrarian Affairs and Spatial Planning/National Land Agency.

### Conflicts of interest

There are no conflicts to declare.

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