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## Improving Quality of Land Data Towards Modern Land Administration in The Administrative City of West Jakarta

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### ABSTRACT

*Land data quality plays a pivotal role in advancing modern land administration, impacting both national economic growth and Indonesia's competitive position in the global property index, where it currently ranks 106th in Ease of Doing Business. This research focuses on the need for systematic quality improvements in both physical (spatial) and juridical (textual) land data within the West Jakarta City Administration to address existing data deficiencies. Applying the Driver-Pressures-States-Impacts-Responses (DPSIR) framework, this study investigates key challenges, causal factors, and strategic interventions aimed at enhancing land data quality. In-depth interviews with stakeholders were conducted to elucidate these dynamics and inform the proposed strategies. The findings highlight the successful digitization and validation of 94.52% of 423,189 Land Book records, 69.03% of 494,071 Ownership Rights Plans/Measurement Letters, and the spatial data of 94.68% across 427,569 land parcels, thereby improving the Data Quality Classification (KW) across categories 4–6. This study underscores the critical importance of robust data validation processes in modernizing Indonesia's Land Administration System (LAS), offering valuable insights for enhancing the efficiency, transparency, and reliability of land data, thereby supporting economic development and improving Indonesia's standing in the global property market.*

**Keywords:** Land data quality, implementation strategy, spatial-textual

### ABSTRAK

Kualitas data pertanahan memainkan peran penting dalam memajukan administrasi pertanahan modern, yang berdampak pada pertumbuhan ekonomi nasional dan posisi kompetitif Indonesia dalam indeks properti global, di mana saat ini menduduki peringkat ke-106 dalam kemudahan berbisnis. Penelitian ini berfokus pada kebutuhan peningkatan kualitas data secara sistematis, baik fisik (spasial) maupun yuridis (tekstual), di Administrasi Kota Jakarta Barat untuk mengatasi kekurangan data yang ada. Dengan menerapkan kerangka Driver-Pressures-States-Impacts-Responses (DPSIR), studi ini menginvestigasi tantangan utama, faktor penyebab, dan intervensi strategis untuk meningkatkan kualitas data pertanahan. Wawancara mendalam dengan pemangku kepentingan dilakukan untuk menguraikan dinamika ini dan mendukung strategi yang diusulkan. Temuan menunjukkan keberhasilan digitalisasi dan validasi 94,52% dari 423.189 dokumen Buku Tanah, 69,03% dari 494.071 dokumen Rencana Hak Milik/Surat Ukur, serta data spasial dari 94,68% di 427.569 bidang tanah,

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sehingga meningkatkan Klasifikasi Kualitas Data (KW) di kategori 4–6. Penelitian ini menekankan pentingnya proses validasi data yang kuat dalam memodernisasi Sistem Administrasi Pertanahan (LAS) Indonesia, menawarkan wawasan berharga untuk meningkatkan efisiensi, transparansi, dan keandalan data pertanahan yang mendukung pembangunan ekonomi dan memperbaiki posisi Indonesia di pasar properti global.

**Kata Kunci:** Kualitas data pertanahan, strategi implementasi, spasial-tekstual

## INTRODUCTION

The power of a country is determined by economic strength which influences national activities continuously over a certain period of time (Usman & Bashir, 2022; Zaman et al., 2021). Economic improvement is a positive and strong stimulus to encourage quality human resources (HR), capital volatility, and entrepreneurship, as well as the significance of the productivity of various sectors that have a multiplier effect on financial freedom and population growth at the regional level (Almodóvar-González et al., 2020; Kamal A.L.M & Aboelsoud M.E, 2023; Wen et al., 2023). Gross Domestic Product (GDP) is an indicator of the success of the Indonesian economy, which in 2022 experienced an increase of 3.70% compared to the previous year (Badan Pusat Statistik, 2022; Simanungkalit E.F.B, 2020). Ease of Doing Business (EoDB) is a program organized to provide economic funding for various countries. The ranking of countries portrayed the ease of doing business published by the World Bank as a reference for investors to determine investment. The higher a country's EoDB ranking, the greater the economic turnover in that country (Stienen et al., 2021; Tresna et al., 2019). The EoDB survey determined that Indonesia was ranked 106th out of 190 countries regarding the property registration index, which makes Indonesia a less attractive investment destination compared to other countries (Aditya et al., 2021; World Bank, n.d.). The World Bank manages a review for all indicators every year including the convenience of the land sector which assesses the time, procedures, costs, and quality of land registration and land information services (Aditya et al., 2021; Indrajit et al., 2021). The government is attempting to change in order to improve service accessibility (Sari, 2021), land management with spatial integration promotes a city's economic development (Surya et al., 2020), and digitization of government facilitates government movements (Rojul Huda & Yunas, 2016).

The Ministry of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) has prioritized five Land Offices in Jakarta Province to become EoDB centers to support infrastructure, facilities, and utilities (PSU) as well as competent Human Resources (HR) qualifications (Mujiburohman D.A, 2021), and increasing the performance of the public sector (Eka Nur Rofi et al., 2021). The West Jakarta City Administration Land Office as a land agency has a vision and mission that is in line with EoDB, namely aspects of world standard land management; bureaucratic reform of leadership and all levels for land services and public services; improving the quality and validity of land data; utilization and use of the Computerized Land Office (KKP) system towards digital transformation.

The society of Jakarta responded positively to the electronic certificate service (Purbawa et al., 2023), e-governance has emerged as an urgent issue in Indonesia's bureaucratic transformation (Wargadinata et al., 2022), as well as dealing with land problems and preventing land mafia. EoDB support described from the property ownership sector has an impact on the country's economic growth (Ahmed et al., 2023). This was proven by the results of interviews in 2023 that the West Jakarta City Administration Land Office generated a major contribution to economic transactions and money circulation in 2022, namely Non-Tax State Revenue (PNBP) of IDR 82.1 billion which supports the country's economic activities; Mortgage Rights (HT) value of IDR 24.3 trillion through credit activities in economic development; sale and purchase transaction value of IDR 17.8 trillion as Income Tax Revenue (PPh) and Land and Building Rights Acquisition Fee (BPHTB); and a BPHTB value reach IDR 1.3 trillion.

EoDB assesses the quality of the land administration system based on infrastructure capacity, geographic coverage, information transparency, land dispute resolution, and equal access to land rights (Djankov et al., 2022). Currently, the Land Office implements the assessment through 63 types of applications including electronic services that have been implemented, namely electronic HT and removal of Dependents Rights (Roya) services as well as electronic land information services, namely Land Registration Certificates (SKPT), checking certificates, and Land Value Zone reports (ZNT). Furthermore, various service innovations have been implemented, namely the Homecare Service and West Jakarta Inter Certificate (JAS) providing file pick-up and delivery services to the applicant's residence for the categories of direct or unauthorized applicants, elderly, sick and disabled; Inter-Decree Letters (Tarsan) provides services for inter-Decree Letters (SK) requesting rights; Command Center is an information and complaint service, textual and physical validation, file information of Complete Systematic Land Registration (PTSL), and Whatsapp blast. The effort focuses on getting closer to the community in an informative and proactive manner; as well as land acceleration services consisting of changes in Freehold (HM) to Building Rights/Use Rights (HGB/HP), transfer of rights, Roya, changes in rights to HM d" 600m<sup>2</sup>, field measurements in the context of granting HP to government agencies. The complexity of land activities should be balanced with the maturity of data quality in the Land Administration System (LAS) for the protection of Land Rights (HAT) and property ownership as well as investment and business progress (Indrajit et al., 2019).

Improving the quality of computerized land data was launched in 1997 using an application called Land Office Computerization (LOC), replaced by the Standing Alone System (SAS) application, and finally Land Office Computerization (KKP) which can unify physical and textual data in developing geospatial information. land coordinate system based (Iskandar et al., 2019; Mustofa F.C, 2020). The transformation of land documents to apply digitization has been intensively carried out since 2010 until now by the Ministry of ATR/BPN and all its staff at the city/district level (Fitrianingsih et al.,

2021). Digitization of physical data and information requires accuracy and precision regarding area, shape, direction, and coordinates, while textually it requires good and correct filling in of the data and information qualifications listed in the Land Book (BT) and Title Plan/Measurement Letter (GS /SU). Of course, digitized land data migration provides stronger HAT protection as well as easy, effective, and efficient land financing which has a positive impact on the ease of business regulations, economic improvement, and support for the Sustainable Development Goals (SDGs) 2030 (Kusmiarto et al., 2021).

Previous studies have observed the quality of land data in various land offices including the complete systematic land registration (PTSL) clusterization, namely cluster 1 (K1), cluster 2 (K2), cluster 3 (K3), and cluster 4 (K4) into land geospatial information, the process of transmitting all documents from the trust office to the definitive office, as well as field surveys in collecting land data to complete villages at the West Maluku Land Office (Artika & Utami, 2020); readiness of electronic certificates at the Semarang Regency Land Office through data quality by evaluating the number of land parcels based on Data Quality Classification (KW), the number and percentage of documents (fill list of 208, BT, and GS/SU) that have been digitized, as well as the quality of Measurement Title (GU) from various types of measurement activities (Suhattanto et al., 2021); essential spatial migration activities in the K4 sector, namely KW 1-6, which previously used analog data to KKP-based digital data as a support for the success of PTSL activities and improving the expansion of the Banyuasin Regency area (Dewi et al., 2022); and improving the quality of independent land data (PKDPM) through the stages of internal office preparation, inventory and stock taking, digitization and re-checking of documents, as well as physical and juridical data census on land ownership. The performance of PKDPM activities is the main key to resolving land disputes and conflicts regarding overlapping, inheritance boundaries and land ownership disputes at the West Manggarai Land Office (Teku et al., 2022).

Based on the study, there was a tendency for theoretical concepts to be unrestrained without equal attention to the problems of data quality practitioners in land offices that have different country contexts. The description of the quality of land data is limited to the aspects of physical data or juridical data that should be tied into one land study. On the other hand, the phrase of data quality is prone to mislead the great impact on the land institutions in the future. This research aims to address the land data quality challenges in West Jakarta that hinder efficient land administration and economic development. The author of this study describes a complete and straightforward analysis of the implementation of the quality of physical and juridical land data at the West Jakarta City Administrative Land Office. This activity begins with improving and updating data through validation and revalidation processes as well as scanning valid or invalid documents into the KKP system. Continued with the process of activities, types of problems, and solutions in improving KW 4-6 textually related to double rights numbers,

changes to rights, BT, Parcel Identification Number (NIB), and GS/SU. Spatially, the same process was discussed regarding field mapping of GS/SU, GU, BT, Cadastral Map (PP), and photogrammetry and continued with block adjustments to the land parcel. To combine the dynamic process of land data quality, the Driver-Pressure-State-Impact-Response (DPSIR) method developed by the European Environment Agency (EEA) is applied with the ability to bridge procedural, analytical, and policy aspects in a multi-disciplinary and practical approach (Carnohan et al., 2023; Quevedo et al., 2023). Using the DPSIR framework, this research identifies key factors and proposes actionable strategies for improving land data quality.

## RESEARCH METHODS

The Administrative City of West Jakarta is the targeted research location covering an area of  $\pm 129.54$  km<sup>2</sup> consisting of 8 sub-districts and 56 sub-districts. The population is 2,589,589 people with a density of 19,991 people/km<sup>2</sup>. Trade, information and communications, and construction control are the largest sectors. Uniquely, 39.83% of public transaction expenditure is for housing and household facilities, which makes the land agency play an important role in West Jakarta (Badan Pusat Statistik, 2023). This research is based on a qualitative descriptive method to describe the actualization of improving and accelerating the quality of land data (Nugraheni et al., 2021). Determining informants was carried out using a purposive sampling technique to select relevant and interesting individuals through in-depth interviews to obtain comprehensive land quality data and information (Jadesola Ololade et al., 2023; Morales et al., 2022). The targeted informants come from the Rights Assignment and Registration Section and the Measurement and Mapping Section, totaling 15 people, namely: (i) 4 structural officials from both sections; (ii) 3 people who carry out juridical data inventory; (iii) 3 people who carry out digitization and textual validation of juridical data; (iv) 2 people who perform land parcel measurements in the field; and (v) 3 people who carry out land parcel mapping for digitization and physical validation of spatial data. Literature studies were also carried out as references and input for various perspectives on the quality of land data in various regions of Indonesia.

According to Rijali A (2018), data analysis was carried out in three stages, namely reducing the results of interviews with informants, presenting them in the form of tables, diagrams, and descriptions, and drawing conclusions from the findings of the dynamics of implementing the quality of physical and textual data on land plots at the West Jakarta City Administration Land Office. The analysis in this research produces two results: the strategic implementation of land data quality and the results of digitalization and KW improvement. Discussion is also conducted to understand the informants' perspectives through the DPSIR framework. This framework has become one of the best methods to



identify dynamic steps capable of bridging procedural, analytical, and policy aspects across multidisciplinary sciences and practitioners (Qu et al., 2020). There are five main questions in this research: (i) factors that are the drivers of the initiation of digitalization activities and improvement of land data quality; (ii) pressure factors that accelerate the change towards digitalization and improvement of land data; (iii) the current state resulting from these activities in The West Jakarta City Administration Land Office; (iv) the impacts felt from the acceleration of land data digitalization activities; and (v) responses from stakeholders to comprehensively improve the quality and quantity of land data.

## RESULTS

### Strategic Implementation of Land Data Quality

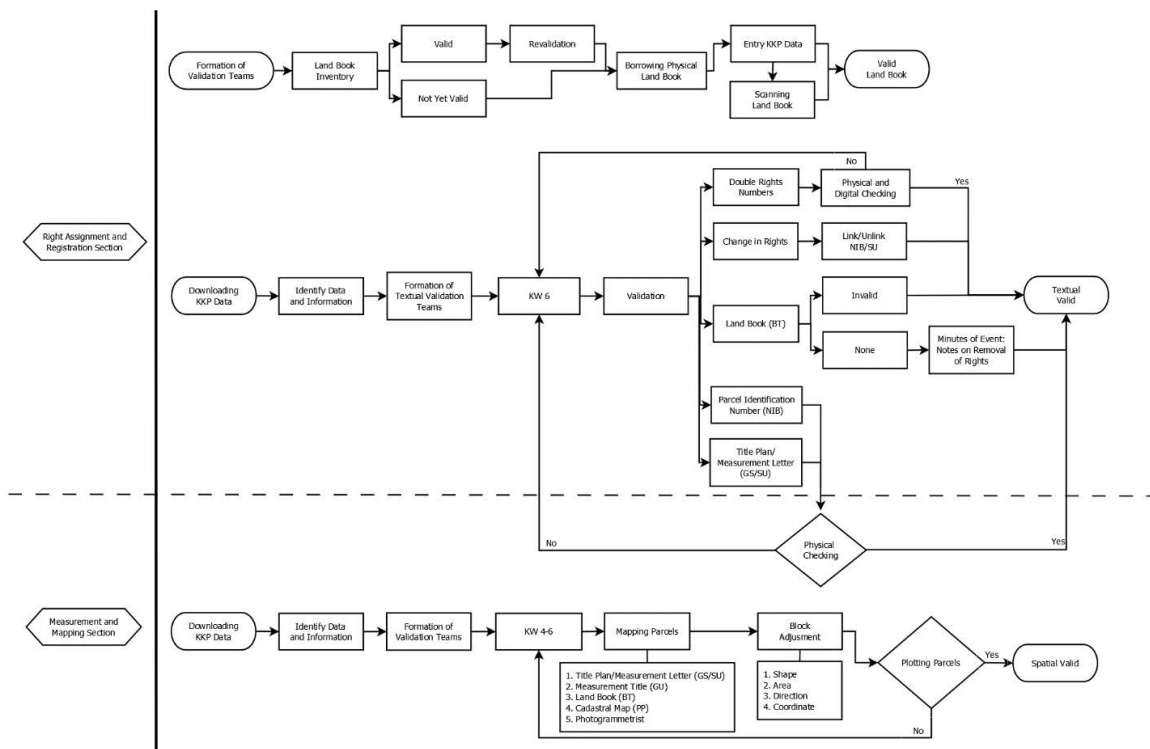
Figure 1 shows the implementation of physical and textual data quality. It includes all BT, GS/SU documents spatially and textually, as well as land area at the West Jakarta City Administration Land Office. The ATR/BPN Ministry encourages to increase KW 4-6 towards KW 1-3, so that all data is validated physically and electronically (Interview Results, 2024). The quality of land data is formed into 6 categories with 4 classifications, namely (i) KW 1 already has mapped land plots, spatial GS/SU, textual GS/SU, and BT; (ii) KW 2 already has mapped land plots, textual GS/SU, and BT, but no spatial GS/SU; (iii) KW 3 already has mapped land plots and BT, but there is no spatial GS/SU and textual GS/SU; (iv) KW 4 already has spatial GS/SU, textual GS/SU, and BT, but there are no mapped land plots yet; (v) KW 5 already has textual GS/SU and BT, but there are no mapped land plots and spatial GS/SU; and (vi) KW 6 already has BT, but there are no mapped land plots, spatial GS/SU, and textual GS/SU (Handono et al., 2020; Mawadah et al., 2021). The initial focus of the project was on digitizing all BT documents in 2015 by 20 Land College students, then by third parties, and finally carried out again in 2021 by 15 land office employees. The BT inventory is checked on the KKP data system regarding the number of BTs that have been validated and have not been validated, with the first activity prioritizing BTs that are not yet valid to immediately complete the data filling in the KKP. BT filling is carried out per document batch systematically, sorted by year, number, and sub-district by borrowing a physical BT document. Physical scanning of the BT is also carried out and indexing continues to combine the results of all sheets into 1 file which is uploaded to the KKP as an indicator of data quality. Filling in BTs that are not yet valid has been completed, the focus is on revalidating BTs that are already valid as a form of re-checking the correctness and completeness of data in the KKP. This activity is similar to BT data arrangement which is not yet valid. The difference is that if BT already has softcopy scanning results, there is no need to scan repetition on the BT document.

The second activity is to download KW 6 data at the KKP and do inventory data and information about the land scope. The data is based foundation to coordinate implementation time, initial quantities and targets, materials and equipment, administration, as well as human resource needs to form a textual validation team (Interview Results, 2024). Overall there are 5 problems in KW 6 validation including, (i) there are double rights numbers which are caused by differences in BT digital rights numbers on the KKP and the BT physical data. These create the same rights number on the KKP to being used by 2 BTs from the physical evidence, so there are numbers rights of one BT that are not registered or used by other BTs in the KKP; (ii) changes of rights on BT that have been issued before the implementation of quality improvements that require a link/unlink process between BT with NIB numbers and/or GS/SU numbers; (iii) invalid BTs, such as master certificates from land partition and physical BTs without an official rights deletion report, this case addresses when the physical BT document is found or there is a request from the rights holder to activate the BT; (iv) NIB are not connected to the BT number's need to be followed up by a physical check of GS/SU spatial by the Measurement and Mapping Section, and (v) GS/SU numbers that are not connected to the BT numbers also need to be followed up by a physical check. If the NIB or GS/SU number is not found and cannot be linked to BT, it will remain in KW 6. Of course, filling in the physical attributes of BT in the KKP is very important as a form of comprehensive, complete and high-quality textual validation.

The third activity noticed spatial improvements to land areas that have not been captured and floated by the maps that were included in the KW 4-6. Land parcels of KW 4-6 can be downloaded the same as before through the KKP system. Identification of data and information is needed to determine the number and distribution of KW 4-6 land area. The availability of image base maps collected from GeoKKP, PP, regional administrative boundaries per sub-district, physical documents for GS/SU and GU, as well as the complexity of work maps for decision making (Interview Results, 2024). The next activity continued with forming a data quality team to determine the division of work areas, implementation time, daily targets, and quantity/quality of human resources for field mapping. This activity began in 2017-2019, carried out by 10 third parties and continued in 2019 until now by 8 land office employees with a daily target of 50 fields. Mapping of land plot is conducted through: (i) physical borrowing of GS/SU archives and/or softcopy scanning by identifying the name of the owner and NIB of neighboring boundaries, rubber sheet of the area and shape of the land plot, as well as information on the address of the land listed; (ii) physical GU in the archives by checking the measurement figures for each side and diagonal, plane coordinates, plane attachments to important/fixed places, situation plans, as well as road/alley/irrigation/other descriptions; (iii) physical or softcopy BT scanning through recognition of the name and address of the

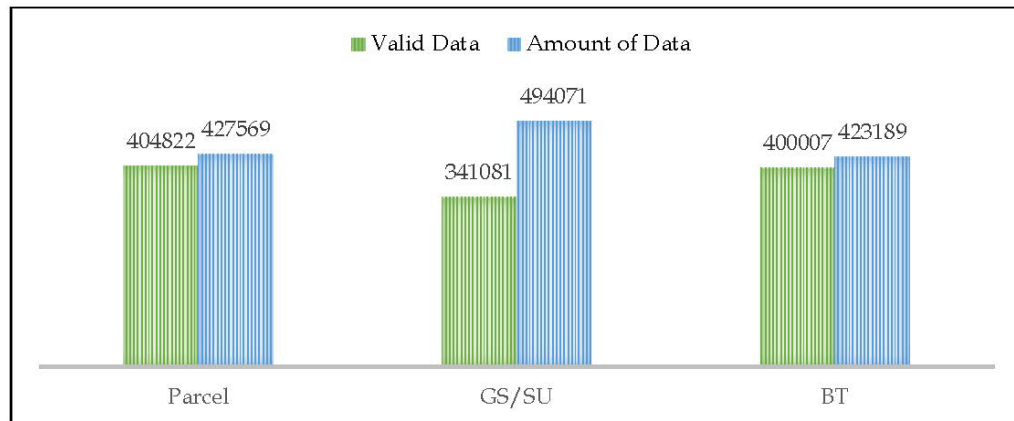
land plot owner; (iv) PP KKP and softcopy PP analogues that pass the rubber sheet process can be used as a reference for land area published in previous years where the mapping has not used GIS software, whether the results are measured by the land office or regional office through identification of subject identity, shape, area, direction, and the location of the object; and (v) the four methods mentioned require photogrammetry as a basic reference in facilitating mapping of land area that displays existing conditions more precisely using satellite imagery and street view.

Block adjustment was the next activity that carried out starting with determining the verified Cadastral Base Map (PDP) throughout the area. This activity is completed per sub-district and prioritizes the division of blocks that have KW4-6 land area, then continues with blocks that do not have KW 4-6 plots (Interview Results, 2024). All plots of land are systematically modified and improved in shape, direction, area and position/coordinates. The geometry of the shape and direction parcel between PP with GS/SU and GU should be similar with notice components related to the number of sides they have, the distance in length, width and diagonal, as well as the angle size of each side. Calculation of area leveling through the LSA/affine/similarity process is based on the land parcel tolerance provisions, namely  $d''$  5% of the area between PP and physical as stated in GS/SU and BT. The suitability of position and coordinates requires observing the 2 bordering neighbors contained in the PP, while for those who do not have certified neighbors, the block tie points/control points and authentic points in the field are reviewed based on the available physical data of GS/SU, PP or GU. The leveling results are considered appropriate for unifying all land areas on the work map. The plotting process using GeoKKP in AutoCAD software begins with the standardization stage of the land layer on the side of the field and NIB, followed by topology to determine whether it is clear and clean or whether overlaps and gaps are still found. The final stage is the integration and/or link of physical data via the rights number, GS/SU number, and NIB on the PP to spatial validity.



**Figure 1. Data Quality Implementation Scheme The Results of Digitalization and Improvement of Land Data Quality**

The West Jakarta City Administration Land Office implemented digitization to support the quality of land data as shown in Figure 2. In 2023, the number of BTs is 423,189 with digitized data of 400,007 (94.52%), there are still 23,182 (5.48%) BTs that have not been digitized; the number of SUs is 494,071 with digitized data of 341,081 (69.03%), there are still 152,990 (30.97) SUs that have not been digitized; The number of land area is 427,569 with validated data of 404,822 (94.68%). There are still 22,747 (5.32%) land areas that have not been validated. BT and SU have not been digitized because the physical documents are not available in the archives, especially old products such as adjudication. Land areas that are not valid occur as the biggest challenge in indicating the discovery of areas resulting from old measurements that overlap with adjacent neighboring plots. According to Wulan et al (2022), the results of land archives through scanning activities need to undergo an authentication procedure, namely the identical similarity of information attributes in the original document and the copy. This has been implemented by the land office which is not limited to uploading softcopy data of archival documents, but also filling in all the physical attributes of archives into digital documents in the BT and GS/SU textual data. The document collected from the KKP and spatial data through field plotting land using GeoKKP which is directly connected to the PP within the KKP.



**Figure 2. Land Data Quality Graph**

Figure 3 indicates KW data starting from June 2021 to March 2023. The time frame starts in June 2021 because the Ministry of Maritime Affairs and Fisheries began to inventory KW in that year and at 6-month intervals to find out when the significant increase will be implemented. The merger of KW 1-3 and KW 4-6 data is due to the KKP dashboard releasing the number of classifications. In June 2021, the number of KW 1-3 was 383,468 and KW 4-6 was 19,492. The actual acceleration of KW is in the number of KW 1-3 to 397,435 and a decrease in KW 4-6 to 13,678. This activity continued in June 2022, the number of data for KW 1-3 was 408,378 and KW 4-6 was 8,571, then in December 2022 KW 1-3 was 421,072 and KW 4-6 was 2,910. The latest data for March 2023 obtained a total of 423,228 KW 1-3 data and 1,863 KW 4-6, meaning that from 2021 to 2023 there was an escalation of KW 1-3 data of 39,760 and a depreciation of KW 4-6 of 17,629 or an increase in KW 4-6 towards KW 1-3 reached 90.44%. The success of this activity was due to the cooperative attitude and elaboration of all levels of structural, functional and PPNPN officials regarding the strategy for implementing land data quality (Interview Results, 2024).

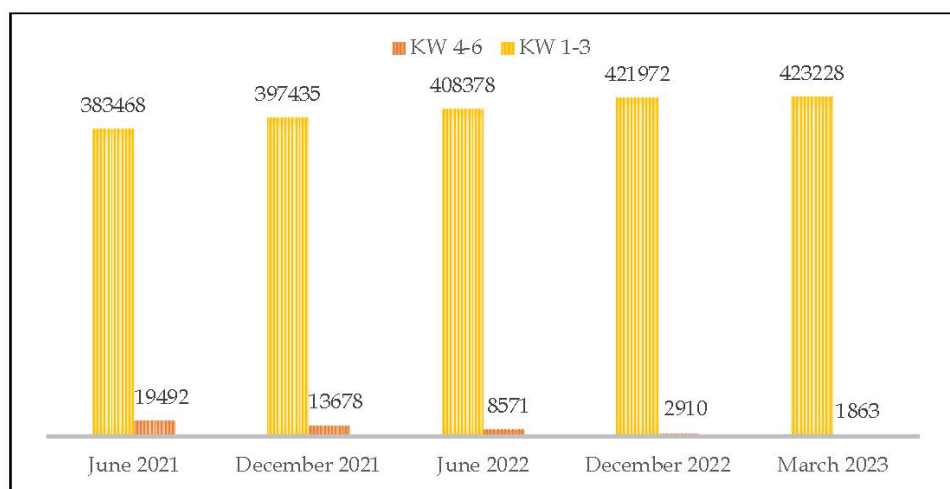
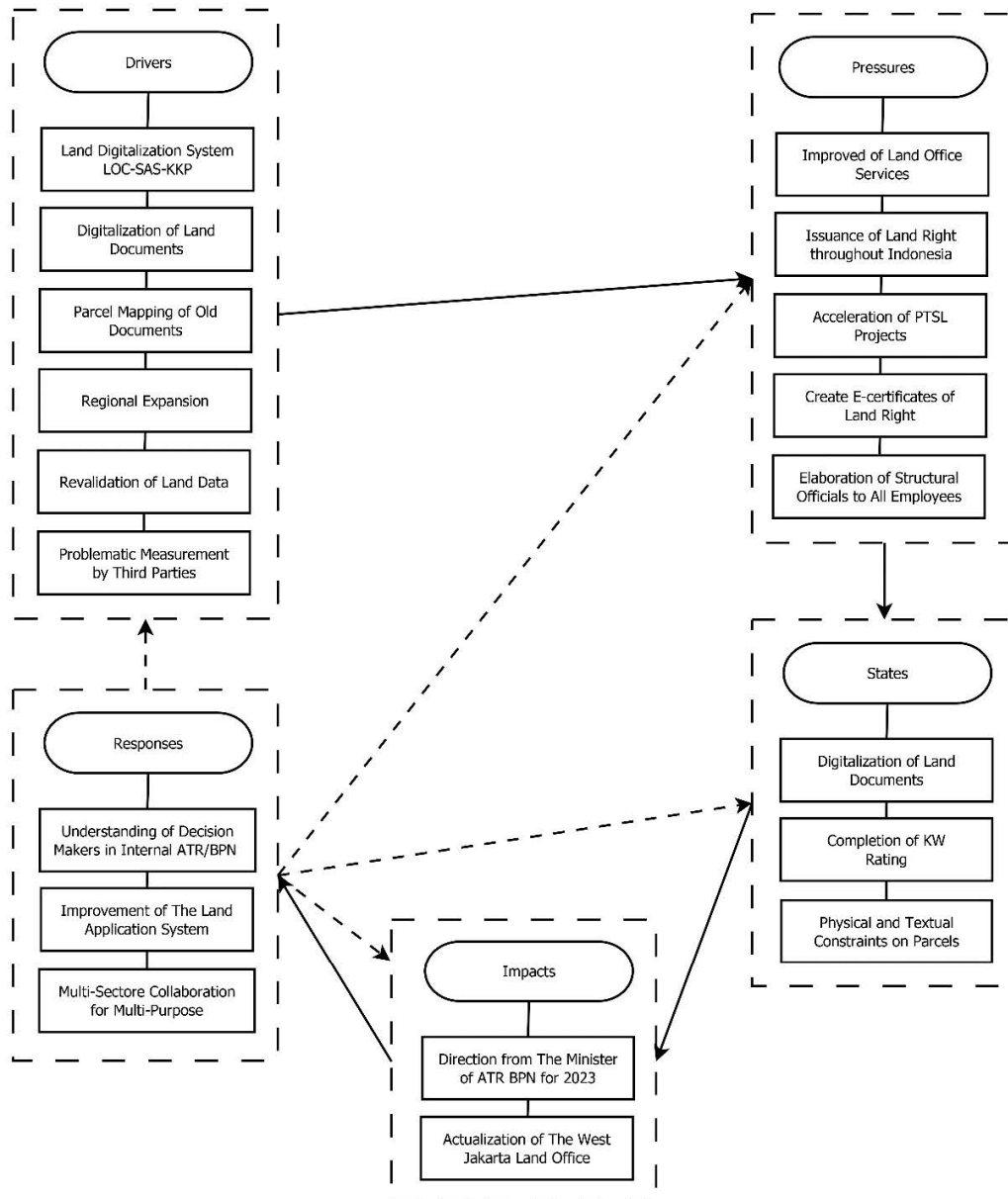


Figure 3. Data Quality Classification (KW) Completion Graph

## DISCUSSIONS

### Dynamics of Data Quality Improvement Implementation

Drivers in the scope of dynamic improvement of quality data are the driving factors that caused problems in the past and develop change for social, economic and environmental improvements (Salim et al., 2023). The initiation of improving and accelerating the quality of land data began when the digitization era of integrated physical and juridical land data through the LOC application developed into SAS and finally KKP. Data conditions emerge when the completeness of the textual information on physical BT and GS/SU data is not yet in line with the digital information in the KKP, such as incomplete BT recording, attributes filled with strips, and physical scanning containing blank/white documents. However, the physical land parcels have differences between the registration map downloaded by the KKP and the working maps found by the mapping team in the inventory of old certificates. The identification and delineation of old parcels had problems regarding measurement results and registration maps were still locally coordinated, and the physical condition of registration maps was outdated which makes scanning and digitization difficult. The regional administrative expansion caused several challenges to land data management with the digital approach today. For instance, the change of rights number was not followed by the number of SU. Furthermore, regional expansion without conducting precise and accurate administrative boundary surveys increases migration errors on these land plots.



**Figure 4. DPSIR Analysis for Land Data Quality**

The condition of object matter is not the only challenge, problems from the subject matter are also a profound obstacle to the quality of land data. Textual revalidation of land parcels occurs when validation is carried out by third parties with a lack of integrity to complete information in the KKP. Time factors, targets, and memorandum of understanding agreements are classic arguments for prioritizing quantity over quality. Third-party errors were revealed in the physical measurement results. The third-party did not consider the PSU access that should have been removed from the land plot as

well as the photogrammetric measurement alibi. The photogrammetric measurement is only a digitization of the neighbor land boundary downloaded from KKP and the physical boundary that appeared on the aerial image/photo which was different from the existing physical boundary land plot in the field. Third-party issues were also discussed by Irawan & Wulansari (2020), namely supervision of measurement results outlined in GU and PBT, technical guidance regarding field data collection and studio processing of land plots, as well as a sense of responsibility for the correctness of the data. This is a common thread in decision-making by structural officials and their staff regarding all land plots, of course, it has an impact on file arrears due to services outside the Standard Operating Procedures (SOP) time limits, indications of land disputes, conflicts, land cases, and accusations of land mafia which questioning the trust of the office land.

Pressures are defined as tension or pressure factors that drive human activities to transform and adapt to surrounding conditions (Sampath et al., 2022). The West Jakarta City Administration Land Office experienced an increase in land service application files: a) in 2021 there were 68,101 files, b) in 2022 there were 93,740 files, and c) in 2022 there were 93,647 files with the 5 highest service requests, namely checking certificates, transfer of sale and purchase rights, HT, Roya, and HAT changes. President Jokowi's latest direction urges the ATR/BPN Ministry to complete all certified Indonesian land areas no later than 2025. The intensity of this directive has an impact on accelerating and increasing targets for the land area through PTSL activities to carry out data collection, registration, and measurement of land to complete at the districts/cities level. The complete meaning of land is that all land areas have cadastral and legal elements with a fit-for-purpose (FFP) approach towards a comprehensive land information system (Martono et al., 2021). This encourages the reason to provide e-certificates through an electronic system in the form of electronic documents towards accelerating digital-based land archives and documents, escalating Indonesia's EoDB ranking, increasing digital-based and/or non-face-to-face land services, as well as transparency and efficiency of the land bureaucracy. These various external pressures lead to the crucial improvement of land quality and put internal pressure to the agrarian office to elaborate on structural officials to support the improvement. In terms of human resources, employee capacity has been increased through KKP training, training for measuring and mapping officers, as well as the formation of physical and textual validation teams. In terms of object management, scanners, and electric vertical archive storage are provided as a responsive step to store and protect physical documents.

State is defined as a change that is currently occurring as a consequence of drivers and pressures in the environment (Hajra et al., 2023). The progress of the activity has various challenges. Rectification of land area with local coordinates (before national coordinates were realized in 2004 by ATR/BPN Ministry had an obvious problem namely overlapping the measurement results of old land area with new land area. The



measurement instruments previously used theodolites and now GNSS. The two instruments have differences in terms of effectiveness, precision, and accuracy. The differences affect the field operations were much more difficult in the past which influenced the quality of the measurement results. This results in the shape and area of the land being different from the physical field data in the current condition. The number of KW 4-6 is identical to the number of BT. The mapping officers are responsible to the physical inventory of GS/SU and GU, although there are difficult locations to find and are considered floating areas. The next challenge questioning the existence of Dutch Land Rights where they have legal proof of ownership but did not control the land. The case is an obstacle for people who utilized the land for more than 20 years.

Land regulations that fail in *lex superior derogat legi inferiori* compared to civil and criminal regulations are also an obstacle to land decision-making because the regulation could not protect the land office employees. The block adjustment activity raises new debates regarding the dissimilarity of the physical area of the land with the textual area. When land validation is carried out with an area tolerance of d" 5%, changes to the BT and GS/SU, textual numbers should be followed, which currently cannot be applied because the changes to the physical area of archives are only known internally by ATR/BPN. However, changes in the size area of physical documents will provoke bias among the public with the assumption that "how can the measurement results different even though it is measured by the ATR/BPN", "the certificate does not guarantee legal certainty that can change the land area", and "there is a land mafia game with changes to the area that has been stated on a certificate" (Interview Results, 2024). Furthermore, the problem of neighboring physical boundaries of validated areas is sometimes different from the textual physical documents of BT, so this problem is not limited to land digitization, but also the validity and quality of physical document information that becomes a reference for Land Disputes, Conflicts, and Cases (SKP) activities, land acquisition, return of boundaries, and replacement certificates. proposed by the community.

Impact is defined as a manifestation of the effects of current conditions (Federigi et al., 2022). Land office services have had the biggest positive impact from land data quality activities. Land services provide convenience for human resources in analyzing file requests, controlling card arrears, and accelerating land service SOPs. Of course, this data quality activity contributes to the direction of the Minister of ATR/BPN at the 2023 National Working Meeting (Rakernas) regarding the launch of 7 priority services, accelerating PTSL towards certification throughout Indonesia in 2025, electronic BT, electronic transfer of rights (buying and selling), certificates el BMN, reducing face-to-face queues, and eradicating the land mafia through the Computer Security Incident Response Team (CSIRT), all of which support increasing investment through digital transformation and legal certainty in the land and spatial planning sector.

The progress of various superior activities in the West Jakarta City Administration Land Office has contributed to the direction of the Minister of ATR/BPN, namely 7 priority services (certificate checking, SKPT, electronic HT, manual and electronic Roya, transfer of rights, registration of SK, and change of HGB/HPL to HM) have been implemented through the innovation of 6 accelerated services. Accelerating PTSL through innovation in land registration for the first time is regularly included in PTSL through the collaboration of mayors, sub-district heads, and village heads. BMN e-certificates are assets of the DKI Jakarta Provincial Government through a cooperation agreement with the West Jakarta City Government, the District Attorney's Office, the West Jakarta Police, and the Corruption Eradication Commission (KPK). The effort of preventing and resolving land conflicts and eradicating land mafia was implemented through four pillars of synergy with law enforcement officials, judicial institutions, West Jakarta City Government, and BPN. The entire ATR/BPN agenda shows the urgency for valid and high-quality land data towards comprehensive electronic-based land.

The digitization of land data plays a crucial role in medium and long-term plans for internal land institutions. This process begins with behavioral transformation and progresses to organizational change and the organization's ongoing dedication to innovation (Naibaho, 2021; Supriyanto et al., 2021). The advantages of digitized data quality are described as follows. First, storing physical certificate data does not require a large space. Second, the digitization of archives in the form of BT, GS/SU, GU, and supplementary files avoids human error and force majeure such as fire, flood, earthquake, and others. Third, anticipation of physical damage to documents. Fourth, convenience and efficiency in finding documents. Fifth, budget savings in terms of HR and PSU. Sixth, address arrears and loss of files due to human error. Lastly, flexibility in restoring, backing up, and updating land information data.

Next, is the response aspect. The response is interpreted as the implementation of actions and tactics by stakeholders to overcome challenges from the previous 4 elements and hope the environment improves in the future (Xi et al., 2023). Internally, land agencies (central, provincial, and city/district) accommodate input and notes for improvement. Implementation of land adjustment through the LSA/affine/similarity process of land parcels which allows changes in shape, area, direction, and coordinates that have fewer differences from the physical document and maintain the area of the new certificate compared to the old certificate. The certificate is a legal product that, if problems arise from block adjustment activities, will affect land officials involved in processing physical and textual data. Policies and technical instructions have been developed for the preparation, planning, and implementation of this activity. The Ministry of ATR/BPN is expected to realize technical instructions regarding the completion of SKP from data quality activities and regulations related to legal protection for employees who work with integrity in all their activities.

The diversity of base maps utilization (Google Earth satellite imagery, Bing, Quickbird, aerial photography, etc) in various land office institutions raises a problem related to shifting and overlapping land area at the borders between districts/cities. The ATR/BPN Ministry should firmly determine one base map policy for all land offices and regional offices, so that improving the quality of physical data is not limited to block adjustments, including one coordinate system policy. The idea of one-map policy development has various components: institutional organizations, regulations and policies, database standardization, geoportal information systems, and human resources (Pinuji, 2016; Prasetyawati, 2021). Moreover, forum group discussion about map policy is necessary conducted within internal ATR/BPN to mediate the intellectual recommendation. In reality, land accuracy is challenging to align with block adjustment, especially to support regional land completion policy. Stakeholders need to collaborate through a Memorandum of Understanding to provide a greater positive contribution.

In the system, there are records of improvements and input for now and in the future. The Sloka application created by the Center for Data and Information on Land, Spatial Planning and Sustainable Food Agricultural Land of the Ministry of ATR/BPN should be able to identify all land plot information and problems occurring in the KW 4-6 plot, such as the physical and textual area that is not within tolerance rate, BT, GS/SU, and GU softcopies have not been uploaded, BT notes have not been filled in, etc. If the Land Office needs KW 4-6 data, it must ask Pusdatin, but the data has not been inventoried of land parcels included in KW 4, 5, or 6. In fact, the Sloka application can analyze problem indicators per file, which should be practiced on 4-6 KWs simultaneously.

The Data Centre in ATR/BPN Ministry can attain quality control programming regarding BT and GS/SU textual attributes in the KKP to identify data entries that only have stripes (-), blank BT and GS/SU, and others. The use of artificial intelligence greatly supports the land offices at the basic level without re-analyzing the indications of KW 4-6 problems and is more targeted in taking resolution actions. The choice creates efficiency and effectiveness of time, energy, and thought in activities to accelerate data quality. The KKP application should have automatic locking of the land area if the validated physical and textual data of good quality. This situation avoids changes to the position, shape, area, and coordinates of valid land areas. Through the activity, the future mapping section only corrected the invalid land area. Regarding automatic locking, it is necessary to add a land-freezing feature to land acquisition locations to avoid land mafia games through buying and selling transactions that increase land prices. This automatic locking avoids the misappropriation of valid land data unless there is a legal request.

Stakeholder collaboration leads to land resolution in various regions of Indonesia, for instance Land Redistribution, Land and Space Thematic Mapping (PTPR), PTSL, Land Consolidation, public services, Land Acquisition, and SKP projects (Supriadi, 2018;

Nurcahyo et al., 2019; Susanto, 2019; Nayoan & Prasetyo, 2020; Nur & Sarwadi, 2021; Suprojo et al., 2021; Triandaru L et al., 2021). For this reason, more advanced activities are needed through pentahelix collaboration by connecting strategic programs between government, society/communities, academics, business practitioners/entrepreneurs, and media/environment to create products and services to enhance sustainable development (Mastika et al., 2023; Romero-Rodríguez et al., 2020). Pentahelix's collaboration through "Land Validation Movement" research is an innovation to identify and inventory land that is registered but unmapped in KW 4-6 areas, followed by unregistered land, and finally registered and mapped land based on societies volunteering. To obtain multi-purpose for multi-sectors, this movement establishes cross-sectoral collaboration through a Memorandum of Understanding (MoU) with Villages/Kelurahan. For the financing, the institution could collaborate with the village government which is regulated based on Minister of Home Affairs Regulation Number 20 of 2018 concerning Village Financial Management, Article 16 and Article 17 paragraph 1, that village government administration support activities in the land sub-sector as well as Article 16 and Article 17 paragraph 2, that the implementation of village development needs to notice the sub-sectors of public works and spatial planning (Kementerian Dalam Negeri, 2018).

## CONCLUSIONS

The escalation of the economy is a positive and strong stimulus for the country's power to support the productivity of various sectors. Ease of Doing Business (EoDB) is a program organized by the World Bank to determine the ranking of countries in terms of ease of doing business. The EoDB survey determined that Indonesia was ranked 106th out of 190 countries regarding the property registration index, namely land and space as the main factors in the domain of business and economic activities. The Ministry of ATR/BPN appointed five Land Offices in Jakarta Province to be the EoDB locus. The West Jakarta City Administration Land Office as a land agency has a vision and mission that is in line with EoDB namely: management activities, bureaucratic reform, digitizing land data, electronic-based public services, and handling land SKP. The West Jakarta City Administration Land Office has realized 63 types of applications including electronic-based services and various land service innovations.

The complexity of land activities should be balanced with the maturity of the quality of land data as the foundation of the Land Administration Domain Model (LADM) which is based on aspects of the legality of subjects regarding land objects and the geospatial/geometric components of land parcels. International standards also believe that the availability of complete cadastral data for land infrastructure systems comes from spatial data collection activities. For this purpose, land data quality has three major activities, namely validation/revalidation and digitization of BT, improving the textual quality of

land archives, and improving the physical quality of land parcels. The digital transition towards electronic evidence can comprehensively complete land interoperability. The outcomes of this activity constitute the primary focus of data, information, and land data administration in a systematic, lawful, and sustainable manner inside the Land Administration System (LAS). This research demonstrates the effectiveness of comprehensive digitalization and validation processes in improving the quality of land data. Future research should investigate the long-term impacts of these improvements on land administration efficiency and economic development.

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