The Implementation of Land and Spatial Thematic Geospatial Information Standardization by Optimizing Geospatial Information Policy

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Abstract. Sustainable development is progressing yearly, and geospatial information is used to achieve it. Rapid progress has given rise to much confusion in geospatial information, especially regarding the certainty of existing geospatial data and information. Geospatial information in sustainable development processes, including a range of time- and geography-based monitoring solutions, will help leaders, policymakers, and decision-makers address their challenges and problems. This research examines the content of the Minister of Agrarian Affairs and Spatial Planning/National Land Agency (ATR/BPN) Regulation Number 1 of 2023 regarding institutional governance and the above regulations regarding the standardization of geospatial information. This study uses the document analysis method through an in-depth study of policy text documents regarding geospatial information in the Land and Spatial Thematic Geospatial Information (TGI) policy to optimize the policy for implementing the Land and Spatial TGI. The findings show that this optimization has had an impact, and this could influence the future work plans of the Ministry of ATR/BPN. Based on the impacts, practical solutions are needed to optimize the implementation of TGI land and spatial planning policies. The existence of a TGI implementation policy in the land and spatial planning sector provides an opportunity to accelerate the resolution of overlapping TGI problems that arise in the ATR/BPN ministry sector.

Keywords: land, geospatial information, policy, spatial planning, sustainable development

1. Introduction

Technological developments have an impact on the preparation of public policy [1,2]. As with public policies related to spatial and land planning, there is still the problem of overlapping geospatial information. This problem is a global issue of special concern [3–5] because geospatial certainty is very important in deciding public policy and is also related to investment. Therefore, globally, the International Organization of Standardization (ISO) publishes standardization of product specifications related to geospatial information (ISO: 19131). The hope is that global standardization can support the resolution of geospatial information discrepancies.

Considering the importance of standardizing geospatial information, Indonesia has begun implementing the One Map Policy, issued through the Regulation of the President of Indonesia

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Number 9 of 2016 [6]. The One Map Policy (OMP) is a government policy initially aimed at realizing good forest and land governance to prevent land tenure conflicts in Indonesia. Until now, land conflicts still occur [7,8]; these conflicts occur because of incongruence between land administration and the geospatial information of ministries or other institutions [9].

The One Map Policy will then be revised in 2021 to support the use of geospatial information resulting from the accelerated implementation of the One Map policy, which was originally only for forest and land governance. Now, the One Map Policy is motivated by the many conflicts related to spatial planning [10]. This is due to overlapping geospatial information, which hinders investment in terms of infrastructure development and economic development. This conflict or overlapping occurs because implementing TGI by ministries/agencies does not follow the Basic Geospatial Information carried out by the Geospatial Information Agency [3,4]. Apart from that, there are differences in scale in the production of Geospatial Information on Spatial Planning, so the geospatial information is inaccurate. Therefore, the role of institutional governance in realizing geospatial information standardization is very necessary [6,10].

The Ministry of Agrarian Spatial Planning/National Land Agency (*Agraria dan Tata Ruang/Badan Pertanahan Nasional*, ATR/BPN), which is an institution that provides geospatial information on spatial planning and land, plays an important role in making policies directly related to investment. Therefore, it is important to standardize geospatial information. Based on trust, the strategic plan of the ATR/BPN Ministry (Regulation of the Minister of ATR/BPN Number 27 of 2020), good land governance requires the availability of TGI on land and spatial who are ready to support good land governance with the goal of sustainable development. The embodiment of the standardization of land and spatial geospatial information is realized in the Minister of ATR/BPN Regulation number 1 of 2023 concerning the implementation of Land and Spatial TGI, which regulates procedures for organizing thematic geospatial data and information within the Ministry of ATR/BPN to produce ready data and information used and utilized starting from the stages of production and management to dissemination [9,11].

With the large role of data and information on land and spatial from the Ministry of ATR/BPN and in the context of implementing the Ministerial Regulation which has just been passed regarding the implementation of TGI on land and spatial, this research aims to examine the content of Minister of ATR/BPN Regulation number 1 of the year 2023 regarding institutional governance and the above regulations regarding the standardization of geospatial information. Land and spatial geospatial information need to refer to one geospatial reference, one standard, one database, and one geoportal so that it is hoped that the public who can access this information will receive information that is accurate, valid, and can be shared. In this context, support for the standardization of geospatial information can improve the quality of land and spatial data and information, increasing public trust in land information [2,12].

2. Material and Methods

This research uses the document study method to examine the function of documents as a data source in qualitative research. It discusses document analysis procedures in the context of actual research [11]. As a document method approach, this uses material in the form of regulatory texts related to the standardization of geospatial information. This study focuses on presenting, analyzing, and interpreting the results of a review of juridical documents. The material used in this research uses secondary data as the main data obtained from publication sources, as seen in Table 1.

Table 1. Material in research

No	Regulations	Information
1	Law of the Republic Indonesia Number 4 of 2011 about geospatial information/ Number 6 of 2023 about Determination of Government Regulation instead of Law Number 2 of 2022 concerning Omnibus Law	The highest policy that regulates geospatial information in Indonesia, this policy position has been merged and several revised in the policy regarding Omnibus Law
2	Regulation of the President of Indonesia Number 23 of 2021 concerning Amendments to Regulation of the President of Indonesia Number 9 of 2016 concerning Acceleration of the Implementation of the One Map Policy at the Map Accuracy Level of 1:50,000 Scale	Policies governing the acceleration of the one map policy as a form of solving overlapping maps within ministries/agencies
3	Regulation of the President of Indonesia Number 39 of 2019 concerning One Indonesian Data	Indonesia's one-data policy is a response to the equalization of existing data standards in Indonesia.
4	Regulation of the President of Indonesia Number 95 of 2018 concerning Electronic-Based Government Systems	This policy regulates the government system toward digital transformation with increasingly high technological developments.
5	Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency of the Republic of Indonesia Number 1 of 2023 concerning the Implementation of Thematic Geospatial Information on Land and Spatial Affairs	Policies that apply within the Ministry of ATR/BPN regulate the implementation of geospatial information.

3. Results and Discussion

Sustainable development has developed from year to year, as has geospatial information as one part of realizing sustainable development [2,12,13]. Rapid progress also creates great confusion regarding geospatial information, especially regarding the certainty of existing geospatial data and information. The importance of geospatial information in sustainable development includes a series of time- and geography-based monitoring solutions that will make it easier for leaders, policymakers, and decision-makers to overcome the challenges and problems they face [10,14,15]. Geospatial certainty also makes it EoDB, such as determining geospatial-based investment locations [16,17].

3.1 Principle for Organizing Land and Spatial Thematic Geospatial Information

Geospatial information in Indonesia is starting to be regulated through law number 4 of 2011 concerning geospatial information, and it is explained that users of geospatial information

have the right to know the quality of the geospatial information they obtain and have the right to reject the results of geospatial information that is not of good quality. It is explained that the Indonesian Government must guarantee and notify the quality of geospatial information held through metadata. Even though Law Number 4 of 2011 has been merged into the Law on Job Creation, the rights and obligations regarding geospatial information remain.

In 2016, through presidential directives, presidential regulation number 9 of 2021 concerning the one map policy emerged. The one map policy is a solution to accelerating the resolution of problems of overlapping spatial use and agrarian conflicts [4]. Acceleration One map refers to one geospatial reference, standard, database, and geoportal, which will be a valid and accurate reference [6,10]. Then, in 2021, a revised policy for accelerating one map was published by focusing on adding implementation targets in 24 Ministries/Institutions and 34 provinces and adding 72 new TGI to 156 thematic maps. One map policy activity focuses on compiling, integrating, synchronizing, and sharing data and information through TGI networks [6,18,19].

Three years after the One Map policy was published, the president gave a new direction regarding Indonesia's One Data policy through the Regulation of the President of Indonesia Number 39 of 2019 concerning One Indonesian Data. Indonesia's one data policy is related to the electronic-based government system policy published in 2018 [20]. One Data Policy is related to E-Governance Policy because E-Governance Policy contains a data center or portal that leads to one Indonesian data with data standards, metadata, data interoperability and reference codes [21]. In essence, preparing geospatial information is about geospatial regulations and statistical/textual data so that a one-data policy can support a one-map policy.

[9] shows that the position of geospatial information on spatial planning and land is the priority policy order for resolving overlapping geospatial information. The Ministry of ATR/BPN, as a producer of land and spatial planning data, took the initiative in 2023 to support the acceleration of overlapping resolution through the Minister of ATR/BPN Regulation number 1 of 2023 concerning the implementation of Land and Spatial TGI. This policy is an extension of the policy regarding geospatial information, one map policy, electronic-based government systems and one Indonesian data. The relationship between the Land and Spatial TGI implementation policy and other policies can be seen in Figure 1. and Table 2.

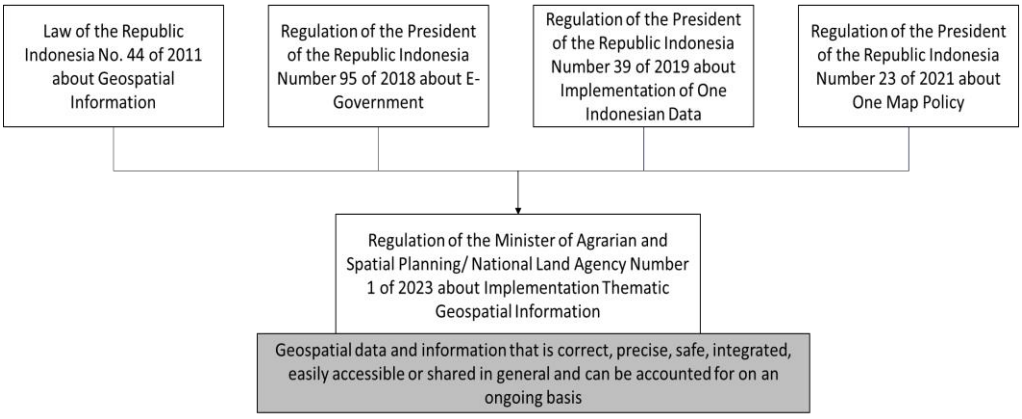

Figure 1. Interrelationships between regulations

Table 2. Relationship between geospatial information regulations in Indonesia and ATR/BPN ministerial regulations regarding the implementation of land and spatial TGI

No	Regulations	Clause	Regulations	Clauses
1	Law of the Republic Indonesia Number 4 of 2011 about geospatial information/ Number 6 of 2023 about Determination of Government Regulation instead of Law Number 2 of 2022 concerning Omnibus Law	Clause 49 (1) IG users have the right to know the quality of the IG they obtain. (2) GI organizers must notify the quality of each GI they organize in the form of metadata and/or data history. (3) IG users have the right to reject IG results that are not of good quality.	Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the National Land Agency of the Republic of Indonesia Number 1 of 2023 concerning the Implementation of Thematic Geospatial Information on Land and Spatial Affairs	Clause 18 (1) Land and Spatial TGI implementation must follow the standards. (2) The standards referred to in paragraph (1) are prepared and determined respectively by: a. Production Unit; b. Management Unit; or c. Dissemination Unit. (3) The preparation of standards, as referred to in paragraph (2) is guided by the following standards: a. within the Ministry; b. in other ministries/government institutions; and/or c. others following regulatory provisions legislation. (4) Standard preparation, as referred to in paragraph may involve related ministries/institutions.
2	Regulation of the President of Indonesia Number 23 of 2021 concerning Amendments to Regulation of the President of Indonesia Number 9 of 2016 concerning Acceleration of the Implementation of the One Map Policy at the	Clause 4 (3) Accelerating One Map Policy implementation consists of 4 (four) activity stages, which consist of: a. Compilation; b. Integration; c. Synchronization; And d. share Geospatial Information data via national geospatial		Clause 22 (1) Compilation, integration and synchronization are a form of monitoring and evaluation in the management process of Land and Spatial TGI. (2) The mechanism for compilation, integration, and synchronization of Land and Spatial TGI activities is listed in Attachment VIII, which is an inseparable part of this Ministerial Regulation.

No	Regulations	Clause	Regulations	Clauses
	Map Accuracy Level of 1:50,000 Scale	information network.		
3	Regulation of the President of Indonesia Number 39 of 2019 concerning One Indonesian Data	Clause 3 One Indonesian Data must be based on the following principles: a. Data produced by Data Producers must meet Data Standards; b. Data produced by Data Producers must have Metadata; c. Data produced by Data Producers must comply with Data Interoperability rules; and d. Data produced by Data Producers must use Reference Codes and/or Master Data.		Clause 24 (1) Collection of TGI as intended in Article 23 paragraph (2) letter a is completed with: a. metadata from TGI that complies with applicable national standards; b. determining data accuracy, which can use a numerical scale or regional administrative boundaries; c. reference code; d. standard documents in the form of norms, standards, procedures and criteria related to the production of Land and Spatial TGI; e. stipulation documents for Land and Spatial TGI that must be determined; And f. other supporting documents. (2) Land and Spatial TGI as referred to in paragraph (1) must meet the following criteria: a. in shapefile format or spatial database; b. include the geographic coordinate system; c. include scale; And d. is the most up-to-date Land and Spatial TGI Clause 28 (1) Verification of TGI as intended in Article 27

No	Regulations	Clause	Regulations	Clauses
				paragraph (2) letter a is a verification activity of supporting documents for Land and Spatial TGI submitted based on the typology and characteristics of Land and Spatial TGI. (2) Land and Spatial TGI Verification as referred to in paragraph (1) is carried out on: a. coordinate system; b. suitability with the elements of the IGD; c. legal aspects; d. attribute consistency; e. topological consistency; f. completeness of metadata; And g. Area Coverage. (3) In carrying out data verification, the Management Unit forms a verification team
4	Regulation of the President of Indonesia Number 95 of 2018 concerning Electronic-Based Government Systems	Clause 2 (1) Electronic-Based Government Systems is implemented with the principles: a. effectiveness; b. cohesiveness; c. continuity; d. efficiency; e. accountability; f. interoperability; and g. security.		Clause 39 (1) Land and Spatial TGI services are implemented using electronic and non-electronic media based on the Land and Spatial TGI management mechanism. (2) Land and Spatial TGI services, as intended in article (1), use the principles: a. simplicity; b. clarity; c. certainty of time; d. accuracy; e. security; f. responsibility; g. latest; And h. ease of access.

3.2 Impacts and challenges of implementing land and spatial TGI

The initial step of the Ministry of ATR/BPN in the policy of implementing Spatial Land TGI is to regulate the concept of standardization of production units, management units and dissemination units, which can be seen in Figure 2. The data collection on types of TGI is included in this policy, with a total of 30 TGIs with the theme of land and 8 TGIs with the theme of spatial [7]. The appearance of the management unit in this policy is an innovation because, historically, the data and information created by the production unit are directly submitted to the dissemination unit without going through a quality management process to ensure TGI products meet the set quality standards.

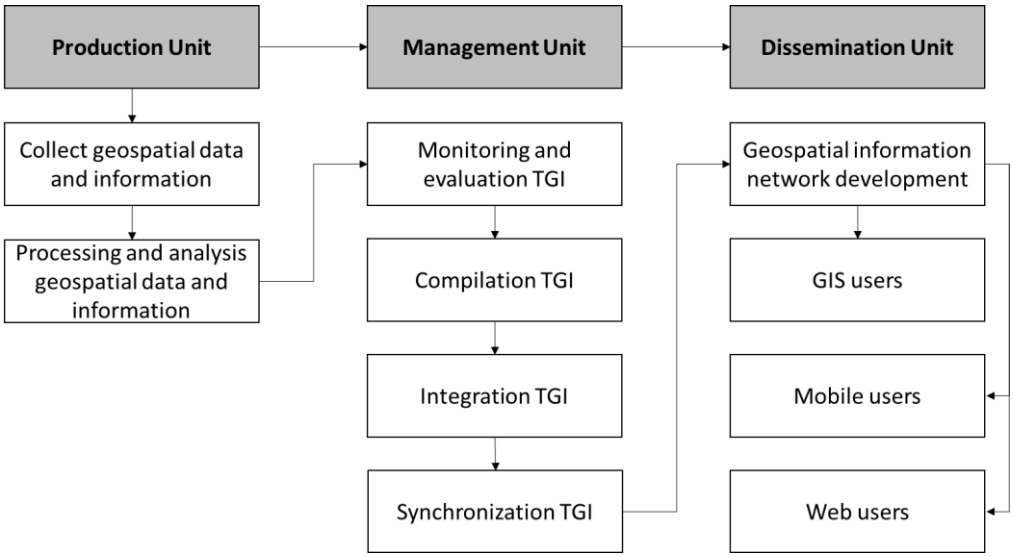

Figure 2. The concept of administering TGI land and spatial

The TGI standardization carried out is a guarantee of quality before the data and information is provided as a service. Investment certainty can be made more accessible if data and information can be appropriately standardized [17,22]. TGI land and spatial services consist of three types of services: publication, interaction and collaboration. The three types of services are accommodated to provide TGI services to various users, ranging from internal ministries, between ministries and institutions, to the community and business actors. The quality of data and land information systems is a challenge to increase the level of EoDB [23] and provide digitization of land and spatial information services as stated in the Strategic Plan of the Ministry of ATR/BPN for 2020-2024 (Regulation of the Minister of Agrarian Affairs and Spatial Planning/Head of the Land Agency National Number 27 of 2020). To reach the EoDB level, land and Spatial information requires 1) There needs to be regulations governing the standardization specifications for Land and Spatial TGI; 2) There is a need for technical instructions for land and Spatial TGI standardization procedures; 3) There is a need to develop a Land and Spatial TGI standardization system.

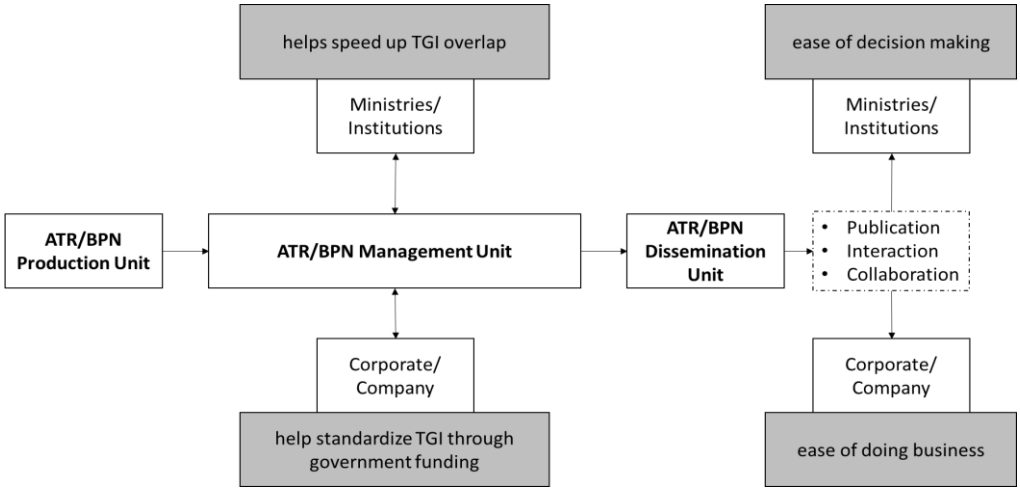

Figure 3. Reflection of TGI land and spatial service process

The existence of a policy for implementing Land and Spatial TGI opens opportunities for accelerating the settlement of TGI overlaps that occur in the ATR/BPN ministries [1,19]. Optimizing this policy is hoped to fulfill legal, product, and system aspects related to Land and Spatial TGI standardization. Responding to the needs of the ATR/BPN Ministry in achieving TGI standardization and making business more accessible, this research summarizes the strategic steps required by the ATR/BPN Ministry in the years to come. Table 3 presents the work that the ATR/BPN Ministry must carry out along with its output and outcomes. Then, institutional governance is very much needed to achieve ideal implementation. Therefore, the Ministry ATR/BPN units must be able to work together. The existence of a standardization policy opens up opportunities for cooperation between ministries/institutions and companies (see Figure 3). Together with ministries/agencies, they can help speed up the resolution of TGI overlaps, and together with companies, they can help standardize many TGIs through government funding.

Table 3. Proposed TGI management program plan for the Ministry of ATR/BPN

No	Description	T 1	T 2	T 3	T 4	*Output*	*Outcome*
1	Standardization of Land and Spatial Thematic Geoportals from Production Units - Dissemination Units					• TGI Land and Spatial Services Standardization Document • Standardized TGI Land	• Improve data quality • Facilitate sharing between ministries/institutions and the community

No	Description	T 1	T 2	T 3	T 4	*Output*	*Outcome*
						and Spatial Geoportal	• Reduce the risk of indications of differences in the presentation of Land and Spatial TGI data • Increase exposure to TGI Land and Spatial services
2	• Enrichment of the Land and Spatial Thematic Geoportal using AI • Developing a monetization service information system on the TGI Land and Spatial service portal					• Trained TGI Land and Spatial Data • Analysis on the fly of AI-based service systems • Creation of automation of land use extraction through CTSRT/aerial photography • Mature monetization service system	• TGI Land and Spatial plays an important role in making precise decisions • Accommodate the needs of the community and business sector in geospatial certainty • Increase the effectiveness and efficiency of time and budget in implementing Land and Spatial TGI

No	Description	T 1	T 2	T 3	T 4	*Output*	*Outcome*
3	• Implementation of Geoportal in Regional Government Collaboration Pilot Project • Integration of Thematic Geoportal with Village Information Systems through regional government cooperation					• Implementation of massive collaboration with local governments • Improvement of Land and Spatial Thematic Geoportal Infrastructure	• Increasing empowerment and literacy of Land and Spatial TGI in the community • Increasing access and direct communication between the center and the regions

4. Conclusion

Geospatial information policies in Indonesia cannot stand alone, but linkages between policies are needed to achieve standardized, valid, and interoperable geospatial information. The flow of standardization of the implementation of geospatial information from the production unit to the management unit and then to the dissemination unit can optimize Indonesia's one map and one data policy. The optimization that has been carried out is a form of interpretation of the policy for implementing TGI Land and Spatial into the Ministry of ATR/BPN work plan so that it is necessary to prepare resources from a technological and human perspective. Effective and efficient resources can accelerate conflict resolution related to geospatial information and can become a national and world model.

The next step after achieving TGI Land and Spatial standardization is developing a system regarding certainty in investment to increase EoDB. The government and the public must implement certainty regarding data, and information has the right to obtain it. Collaboration is a strong pillar to make it happen. The Ministry of ATR/BPN hopes to realize digital transformation through the next three-year program.

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