INDONESIA'S SPATIAL DATA INFRASTRUCTURE (CASE STUDY: BANGKALAN, SAMPANG AND BLITAR REGENCIES)

Hadiyah Rahmawati[1]

[1]Department of Geomatics Engineering, Faculty of Civic Planning and Geo Engineering,
Sepuluh Nopember Institute of Technology, Surabaya, Indonesia
E-mail: diyyarama@gmail.com

Received: January 10, 2023 | **Accepted:** February 30, 2020 | **Published:** February 23, 2023
DOI: 10.12962/j27745449.v3i3.613 | **Issue:** Volume 3 Number 3 2022 | **E-ISSN:** 2774-5449

ABSTRACT

The paper examines the current state of Spatial Data Infrastructure (SDI) in Indonesia, with a focus on identifying strengths, weaknesses, and organizational structures of the national SDIs. This paper aims to inform the design and implementation of a future regional SDI for the local government especially at the Bangkalan, Sampang and Blitar Regency. The evaluation is conducted using a survey with 46 questions, which assess the factors that affect execution the of SDI in the region. The survey is classified according to the five basic components of an SDI: policy elements, institutional elements, human resources, standard elements, geospatial data and information, and technology elements. The results of the survey are analyzed to identify the current state of SDI implementation in the region and to serve as a reference point for future updates. The paper concludes by highlighting the need for technical and organizational solutions to address present problems in the geospatial data management and interoperability in order to fully exploit the potential of geospatial information in decision making.

Keyword: Spatial, Data, SDI, Human Resources

Introduction

Spatial Data Infrastructure (SDI) refers to a framework of technology, policies, standards, and organizational structures that are put in place to manage and share spatial data. Much of Spatial Data Infrastructure theory focuses on explaining a range of policies, technologies, and standards for the efficient collection, management, access, exchange, knowledge, and use of geospatial data at local, global, regional, national, and international. The vision is to build a shared platform with organized geospatial information for informed decision-making in various fields [1,2].

The National Spatial Data Infrastructure (IDSN) has been started since 2007 through Presidential Decree number 85 of 2007 concerning the National Spatial Data Network. Then it changed its name to the National Geospatial Information Network (JIGN), with the issuance of Presidential Decree number 27 of 2014. The main function of JIGN is to provide a mechanism for coordinating and managing geospatial data at the national and regional levels. The practical objective of this initiative is to achieve the effectiveness and efficiency of collecting, accessing and utilizing geospatial data to support geospatial information governance both vertically and horizontally [3].

Furthermore, it is necessary to mention that the improvement of data management, storage, processing, and exchange device is not yet at the level of data production, so the exploitation of geospatial information has not reached its maximum tier. This is why it is urgently necessary to enhance technical and organizational solutions that address the challenges of geospatial data management and interoperability so that users can access, exchange, and use geospatial data efficiently and effectively [1].

In this context, research has been conducted (Paloma M et al., 2019) to use information of geospatial better [4]. Some countries have developed national spatial data infrastructure (SDI) to enhance access, visualization, and integration of their data. In turn, they have to work with other countries to improving regional SDI, enabling better decision-making with regional impact. Furthermore, planning and development are needed as a starting

point in understanding the national HR development level to identify the regional strengths and gaps.

The purpose of this document is to outline the process and outcomes of the initial phase in creating a regional Spatial Data Infrastructure (SDI) for the Indonesia. Specifically, it will assess the status quo of national SDIs in the region and examine their individual components. This evaluation will reveal strengths, weaknesses, and organizational structures of the national SDIs, which will inform the design and implementation of a future regional SDI to provide geospatial data.

Methodology

Methodology for Evaluating the State of SDI in Indonesia

The evaluation objective is to give the regional government an understanding of the current state of SDI application, including its various components. It will also serve as a reference point for forthcoming updates. The evaluation has been broken down into four segments (N González et al, 2013).

Survey

A survey containing 46 questions was created to assess the factors that affect the SDI application in the region, including strengths, weaknesses, and organizational structures, categorized following the five basic components of an SDI, portrayed in the Section. The spatial data infrastructure components are [3]:

- Policy elements: 23 questions.
- Institutional elements: 7 questions.
- Elements of human resources: 13 questions.
- Standard Elements, Geospatial Data and Information: 13 questions.
- Technology elements: 10 questions.

Mechanism to Synthesize the Results

Mechanisms for synthesizing and standardizing the results obtained in each question need to be developed to analyze the results obtained from surveys more easily and have optimal value, both for the development of SDI implementation in general and for each component.

To achieve this, each question was assigned a score based on their answers, avoiding any significant bias. For binary questions (yes or no), 1 or 0 value was assigned respectively. The final score for each of the components was then obtained by both of the regional and local government.

Performance Indicator

Performance indicators are applied to systematize the results obtained through the synthesis mechanism of the results (N González et al, 2013). The survey aims to determine the current state of SDI implementation locally and regionally, allowing for standardized comparison and easy understanding of user results.

To calculate the indicator, the results from each component were combined and then five levels were established to categorize the SDI application status in the region are explained as,

- There is no data
- Developing level
- Operational level
- Optimal level
- Superior level, dedicated to regional/ local governments awarded bhumandhala award.

This indicator can be used to compare future updates of data and also displays the status of the SDI implementation.

Interactive Platform

Geospatial Information Agency was created an interactive platform, which allows the visualization of the performance indicator in the region through a geographical view. The platform displays the level of progress that each regional or local government has made in implementing their SDI, based on the categories established by the performance indicator.

The SDI performance indicator at the regional level results in a final score, which can be displayed in a dynamic graph showing the percentage of progress for the selected government. Additionally, it provides the detailed information about the regional SDI. Performance indicator for each of the selected countries can be accessed: https:// simojang.big.go.id (accessed on 16 January 2023].

Result and Discussion

Result

General Results of SDI Regional Assessment in East Java Province

The survey results were obtained from the input of the simojang application which will be conducted in

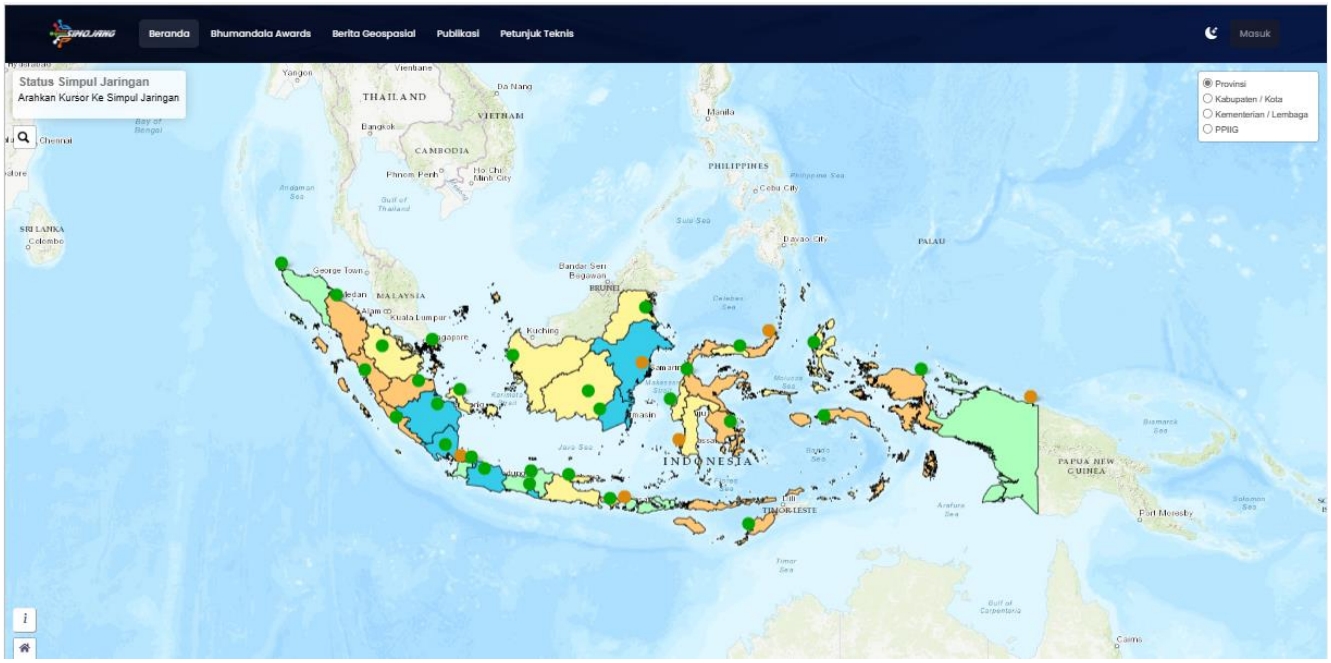

Figure 1. Interactive Platform general view with the associated information available

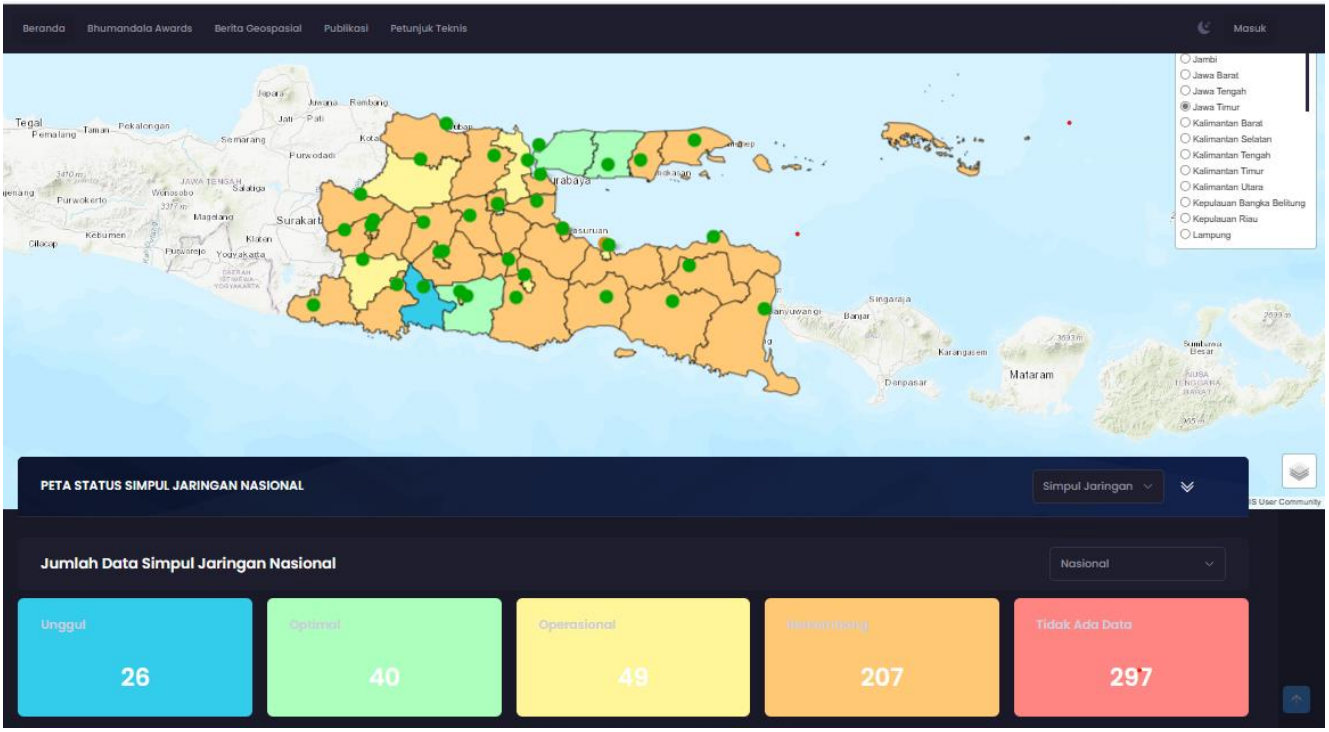

Figure 2. General view of level status of regional IDS

Tabel 1. Result table of the the implementation levels of SDI

ID	Nama	Jenis Simpul Jaringan	Skor Total	Skor Kebijakan dan Peraturan	Kelembagaan	Skor Teknologi	Informasi Geospasial	Skor Sumber Daya Manusia	Status Kinerja	Peraturan	Kelembagaan	Geoportal
143	Kota Tangerang	Kabupaten / Kota	85,75	15	15	19	17,25	19,5	Optimal	-	-	maps.tangerangkota.go.id
229	PURWOREJO	Kabupaten / Kota	52,10	9,5	7,5	14,35	13,75	7	Optimal	Rancangan Peraturan Bu	-	geoportal.purworejokab.go.id
234	SUKOHARJO	Kabupaten / Kota	71,00	13,5	12	18,25	18,75	8,5	Optimal	-	-	pisda.sukoharjokab.go.id
253	KOTA MAGELANG	Kabupaten / Kota	73,50	15	13,5	16,25	13,75	15	Optimal	Perwal Kota Magelang No	-	data.magelangkota.go.idfs_
264	TULUNGAGUNG	Kabupaten / Kota	77,60	14,5	14,5	15,85	22,25	10,5	Optimal	Perbup No 42 Tahun 202	-	geoportal.tulungagung.go.id
287	SAMPANG	Kabupaten / Kota	80,10	13,5	15	18,35	17,25	16	Optimal	Peraturan Bupati No 36 T	-	geoportal.sampangkab.go.id
310	SANGGAU	Kabupaten / Kota	46,10	8,5	9,5	16,6	7,5	4	Optimal	DISELENGGARAKAN OL	-	sanggaukab.ina-sdi.or.id
340	BERAU	Kabupaten / Kota	80,50	15	12,5	17,75	14,25	21	Optimal	Halaman 8-9 Pada Perbu	-	satudata.beraukab.go.id
342	KOTA BONTANG	Kabupaten / Kota	47,35	10	6,5	14,1	10,25	6,5	Optimal	Perkada JIGD Bontang	-	geoportal.bontangkota.go.id
346	KUTAIKARTANEGARA	Kabupaten / Kota	67,00	13	13,5	18,75	12,75	9	Optimal	PERBUP NOMOR 11 TAHI	-	geoportal.kukarkab.go.id
536	KOTA MANADO	Kabupaten / Kota	81,00	15	13,5	19,75	16,75	16	Optimal	Peraturan Walikota Mana	-	geoportal.manadokota.go.id
549	KOTA PAYAKUMBUH	Kabupaten / Kota	74,75	14	14	17,5	16,75	12,5	Optimal	PERWAKO NO. 2 TH 2024	-	geoportal.payakumbuhkota.go.idfs
613	KULON PROGO	Kabupaten / Kota	66,35	9,5	8,5	17,6	15,25	15,5	Optimal	PERATURAN BUPATI KU	-	geoportal.kulonprogokab.go.idfs_
614	BANTUL	Kabupaten / Kota	85,00	15	15	19,25	19,75	16	Optimal	Peraturan Bupati Bantul I	-	data.bantulkab.go.idfs_
566	MUSIBANYUASIN	Kabupaten / Kota	79,00	13	15	18,25	13,25	19,5	Optimal	PERATURAN BUPATI ML	-	geoportal.mubakab.go.id
571	OGANKOMERING ULU	Kabupaten / Kota	84,45	15	14	17,7	19,25	18,5	Optimal	Peraturan Bupati Ogan K	-	ogankomeringulukab.ina-sdi.or.id

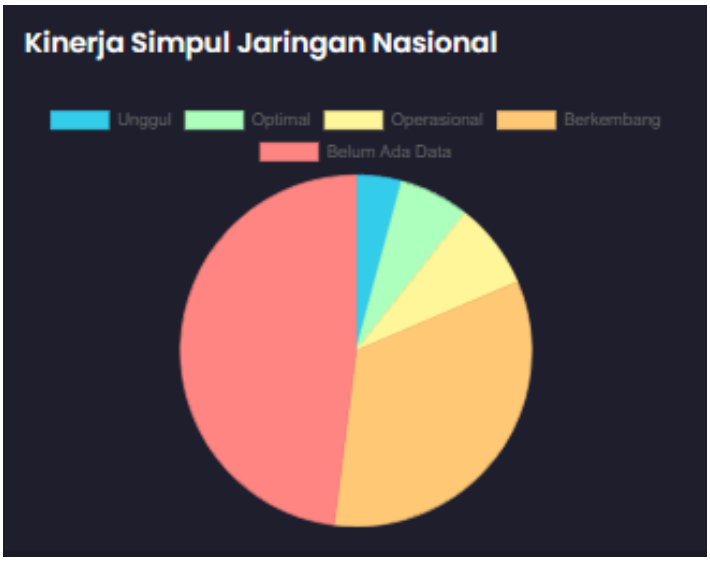

Figure 3. The application levels of a spatial data infrastructure (SDI) percentage.

2022. The survey results of 38 regencies are presented in figure 2.

Following the categories set for performance indicators, there are three Regencies "optimal" status are Bangkalan Regency, Sampang Regency and Blitar Regency; 5 districts/cities with operational status include (Ponorogo Regency, Bojonegoro Regency, Gresik Regency, Probolinggo City & Malang City), some of them are developing. One district that has a superior level is Tulungagung Regency. This is based on the jury's assessment of the bhumandhla award.

None of these regencies do not have data because BIG has installed Geoportals in almost all urban regencies in East Java in 2018 to support the availability of aspects of technological elements in urban regencies. Overall, urban districts in Indonesia: 297 data have not yet filled in HR elements in the application, 207 districts/cities at the developing level, 49 cities/regencies at the operational level. Meanwhile, for the optimal level there are 40 urban districts and for the superior level there are 26 regional governments.

Results for Each Component of the Indonesia SDI (Bangkalan, Blitar & Sampang Regency)

Regionally, the assessment of district/city IDS level mentioned in the previous discussion is based on indicators from the five IDS elements that have been filled out in the network node control form. The assessments obtained in Bangkalan, Sampang & Blitar districts are as follows:

- Regarding the Policy & Regulations component, Blitar and Sampang Regencies have a score of 24, meanwhile Bangkalan District has 22 this is because Bangkalan District does not have a strategic plan regarding the implementation of geospatial information.
- Regarding the Institutional Aspect component, the three districts have almost the same score, 10 for Blitar & Bangkalan Regency, while 12 for Sampang Regency because Sampang districts already have Cooperation with PPIDS (Center for Organizing Spatial Data Infrastructure) which is in the tertiary institution appointed by Geospatial Information Agency.
- Regarding the Human Resources component, the three districts have different values: Blitar (16); Sampang (19); and Bangkalan (15). Sampang Regency has the highest score because it is supported by human resources with a geomatics educational background and has competency certification in the geospatial field.
- Regarding the Technology component, the three districts have scores between 22-25. Technology support in the form of server or cloud provision as well as open geospatial consortium (OGC) standard geoportals.
- In terms of standard geospatial data & information, the three regencies have implemented data according to KUGI (Catalog of Indonesian Geographical Elements) and are supported by the availability of complete metadata.

Discussion

The HR (Human Resources) aspect of the Spatial Data Infrastructure (SDI) in the region is performing well. This is attributed to the fact that a large

number of regencies have personnel in charge of SDI improvement who have received training in geospatial information and have teams that provide training to other organizations. This leads to more personnel at the national level being familiar with the term and the components needed to develop an SDI.

Many regencies and cities with a mechanism for providing geographic information through SDI or Geoportal make the technological aspects of SDI in the regions work well. In addition, having a web service that allows interoperability with other institutions and having devices that meet the national technological needs of SDI also plays an important role.

The Institutional Aspects component has a relatively hight ranking in the region. Many of the existing SDIs in the region are also part of a larger regional or international effort, highlighting the importance of greater collaboration and partnerships for the development of national SDIs. Additionally, a lack of clear definitions for geospatial data infrastructure within many regencies makes it difficult for organizations to fully understand the significance of improving an SDI. However, most of optimal level regencies of SDI doesn't have road map to enhance local SDI.

The standard geospatial data & information is the least developed in the region, with most of operational level of SDI using criterions for metadata, catalogs, and web services. This show most of regencies relatively has implemented ISO for metadata and know the important of it.

Conclusion

In short, the development and application level of a national Spatial Data Infrastructure (SDI) is an indicator of the effectiveness of the accessibility, distribution, and use of geospatial data in a country. Evaluation of SDI implementation in districts or cities in Indonesia is essential to find out the strengths and weaknesses of the region in terms of production and use of geospatial information. Institutional Aspects and components of Geographic Information, Norms, and Standards need more attention in the regions than before. The design of policies and mechanisms that support the production and use of geospatial information at the national and regional levels must be strengthened to enhance this component. Additionally, the use of geospatial criterions is critical to SDI interoperability. The Human Resources and Technology component is relatively well-developed in the region. However, ongoing collaboration among geospatial data-generating organizations and academia and among government agencies and the private sector is essential to sustain its progress. The application of regional SDI is a pretentious project that requires involvement and cooperation from the institutional, academic, and government.

Acknowledgements

The authors thank the Department of Geomatics Engineering, Faculty of Civic Planning and Geo Engineering, Sepuluh Nopember Institute of Technology, Surabaya, Indonesia for their full support of this research.

References

[1] M. Paganini, I. Petiteville, S. Ward, G. Dyke, M. Steventon, J. Harry, F. Kerblat, Satellite earth observations in support of the sustainable development goals, *European Space Agency: Paris, France*. 2018; pp. 4–25.

[2] M. Paganini, I. Petiteville, S. Ward, G. Dyke, M. Steventon, J. Harry, F. Kerblat, Satellite earth observations in support of the sustainable development goals, *European Space Agency: Paris, France*. 2018; pp. 4–25.

[3] Badan Informasi Geospasial (BIG), Panduan Pembangunan Simpul Jaringan, Cibinong, Bogor: Pusat Sistem Jaringan dan Standarisasi Data Spasial, Deputi Bidang Infrastruktur Data Spasial Nasional, 2013

[4] P. Merodio, P. Macarena, A. Ramirez, G. Gabriela, C. Tapia, The America's spatial data infrastructure, International Journal of Geo Information. 2019