Logic Modeling for NSDI Implementation Plan
A Case Study in Indonesia

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Abstract: The importance of sharing and reusing geographic information for national development programs has led many countries establishing National Spatial Data Infrastructures (NSDIs). Indonesia is one of the early adopters of NSDI which begun the initiative in the 1990's. Some achievements have been made; nevertheless, there are also constraints of NSDI implementation identified by the stakeholders. Considering recent improvement in geospatial technology that has changed the landscape of NSDI into more user-driven location services, NSDI coordinator needs to compose a comprehensive framework that integrates requirements and detailed activities as the realization of strategies. This paper presents a strategic planning using logic model, incorporating components of the NSDI in Indonesia including policy, institutional arrangements, technology, standards and human resource issues. A logic model visualizes systematic programs and connecting related activities with the projected outcomes. The model started with the identification of requirements through in-depth interviews and documents study to provide insight for NSDI implementation. Subsequently, it determines intended impact and outcomes, analyses activities, defines expected outputs from NSDI initiative and identify the resources for the operation. Our proposed model can be useful for the implementation of NSDI particularly for countries that do not have strategic management yet or are considering improving it.

1 INTRODUCTION

Realizing benefits of sharing and reusing geographic information for supporting national development programs has led many countries establishing National Spatial Data Infrastructures (NSDIs) for the past 25 years. Basically, NSDI is a framework of technology, standards, policy and collaboration of different institutions to provide access, exchange and utilization of spatial data at the national level (Rajabifard et al., 2003). From the initial aims to reduce data duplication and improve access to geospatial data, NSDI applications nowadays have played significant role in the decision making process. Examples can be found in the area of cadastral services (Borzacchiello and Craglia, 2013), disaster risk management (Molina and Bayarri, 2011) and urban planning (Poorazizi et al., 2015).

Despite of its potential benefit in supporting national development programs, scholars have found that NSDI implementation has several obstacles. Crompvoets and Bregt (2007) and Van Oort et al. (2009) identify a declining trend of national geoportal ─ key product of an NSDI ─ due to the fact its functionalities do not meet the expectations of the geospatial community. In addition, although NSDI initiatives mostly originated from the government agency, not all of decision makers share the same awareness. This lead to the lack of cooperation and sharing information with other institutions (Janne & Lorkhamyong, 2015). Another problem is related to the insufficient funding for the implementation and maintenance of an NSDI (Ayanlade et al., 2008).

The difficulties recognized above shows that successful implementation of an NSDI depends on not only from technical aspect but also financial and institutional efforts. NSDI development also involves dynamic negotiations and arrangements between different actors, which considered as the complexity of SDI initiatives (De Man, 2006). Therefore, in order to overcome these problems NSDI coordinator requires a comprehensive framework for its implementation that incorporates requirements and detailed activities as the realization of strategies. This paper presents a strategic planning using logic models for each component of NSDI including policy, institutional arrangements, technology, standard and human resource issues, with a case study in Indonesia.

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The paper starts with an overview of NSDI development in Indonesia and describes chronological milestones that have been achieved. A brief literature review of the logic models then presented in the next section. Subsequently, the proposed methodology to develop program logic models for NSDI implementation is explained.

2 NSDI IMPLEMENTATION IN INDONESIA

Indonesia was considered as one of the eleven countries who adopt the first generation of NSDI (Masser, 1999). The NSDI development was initiated in 1991 by a first group meeting called SIGNas (Sistem Informasi Geografis Nasional/National Geographic Information System) Forum among different government agencies with the agenda to identify the availability of Geographic Information System (GIS) data and avoid data duplication (Lilywati and Gularso, 2000). The National Coordinating Agency for Surveying and Mapping (Bakosurtanal) organized the meeting and continued in the next few years by discussing various related topics. One of them is the introduction of National Geodatabase, which was discussed in the third meeting in 1997 (Matindas et al., 2004).

The formal declaration of NSDI was defined in the National Coordination Meeting of Survey and Mapping in 2000 with the term "Infrastruktur Data Spasial Nasional" (IDSN). The objective is to provide good quality, easily accessed and integrated spatial data for national development (Bakosurtanal, 2008). Since then, efforts and activities to develop NSDI have been conducted. The milestones of NSDI development in Indonesia described in term of legal, organizational aspect and technical issue is presented in Figure 1.

Enactment of the Geospatial Information Law in 2011 is the main foundation of NSDI development in Indonesia. One of the law's goals is to ensure the availability of, and access to, accountable geospatial information. In order to achieve this, geospatial information infrastructure needs to be established which incorporates five pillars: policy, institutional arrangements, technology, standards, and human resources. With the enactment of this law, Bakosurtanal was also transformed into Badan Informasi Geospasial (BIG) as the national agency organizing geospatial information. As part of the application of Geospatial Information Law, the Indonesian government initiated the 'One Map Policy' in 2015 and publish a presidential decree on the next year to accelerate its implementation. One Map Policy aims to tackle overlapping thematic maps among institutions so there shall only one base map to be used as reference by other government agencies (Tim Percepatan Kebijakan Satu Peta, 2017).

In the organizational aspect, NSDI Secretariat was established two years after the declaration as a working body to plan and manage all NSDI meetings, agreements, and recommendations (Matindas et al., 2004). The members are representatives from government institutions, and universities. To date, the secretariat is chaired by the Deputy of Geospatial Information Infrastructure from BIG.

Institutional arrangement of Indonesia NSDI is defined by the Presidential Decree No. 27/2014, which replaced the previous one issued in 2007, about the National Geospatial Information Network.

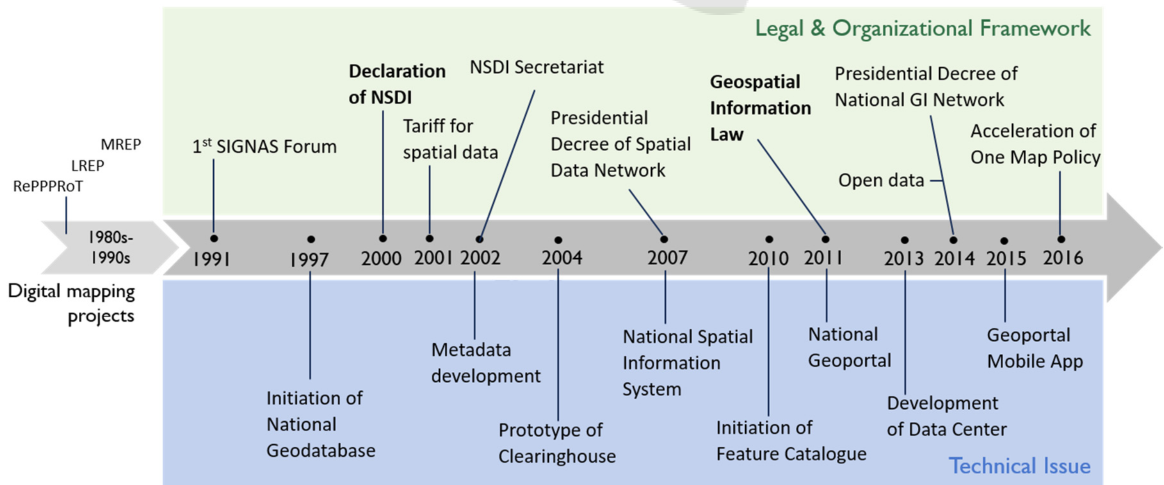

Figure 1: Chronological milestones of NSDI development in Indonesia.

According to the decree, the actors for geospatial information sharing are called network nodes (Simpul Jaringan), which are classified into central and local network nodes. Central network nodes include ministries and national government agencies while local network nodes consist of provincial, municipal, and district governments. Each node has responsibility in the collection, maintenance, update, exchange and dissemination of specific geospatial data. These nodes have their own clearinghouse unit and should connect to the national geoportal.

After the year 2000, the implementation of NSDI has undergone some changes in the technical aspects. A Clearinghouse, typical evidence of the first generation of SDI, was developed in 2004 as a continuation of metadata development. Federal Geographic Data Committee (FGDC) standard was adopted and metadata servers were connected in a distributed network to display information about the digital maps (Puntodewo and Nataprawira, 2007).

The national geoportal, namely Ina-Geoportal (http://tanahair.indonesia.go.id), was launched in October 2011. The portal facilitates geospatial data access and sharing between government institutions. It utilizes web services – the main technological indicator of the second SDI generation – to retrieve maps provided by data providers and re-use it to create thematic data services. Data center was also settled since 2013 to support the operational of Ina-Geoportal (BIG, 2014). Moreover, the increase use of smartphones has triggered the development of mobile version of Ina-Geoportal in 2015 (BIG, 2015a).

In term of standards, the Geospatial Information Law defines standards for five aspects of geospatial information: geospatial data acquisition, information processing, storage and security, information distribution, and information usage. These standards can be in the form of national standards (Standar Nasional Indonesia/SNI) or technical specifications. BIG has initiated the development of national standards since 2000 and had already produced 60 SNI (BIG, 2015b). BIG also developing technical specification, which stipulated by a decree of the head of BIG. For example, Indonesian Geospatial Reference System description named SRGI2013.

Advancement of spatial technology and the Internet have changed the landscape of NSDI. Harvey et al. (2012) argued that future NSDI will be influenced by the growing use of mobile computing and crowdsourcing, thus lead to the need to integrate various types of data. This means that the aims of an NSDI may not only for sharing and integrating data from static sources but also producing new information and allowing a user to interact dynamically with the data providers. Consequently, NSDI implementation in Indonesia should consider such condition and an inclusive strategic management is required for its effective functioning.

3 LOGIC MODEL REVIEW

3.1 Definition of Logic Model

Logic model is one of the methods that can be used in developing design, plan, and evaluation of a project. It presents a systematic and visual way of the connections between resources, planned activities and its expected results (W. K. Kellogg Foundation, 2004). Logic model offers the strategic means to critically review and improve project's implementation. Additionally, logic model can illustrate parts of or whole systems and clarify complex relationships among them.

3.2 Benefits

Knowlton and Phillips (2013) identify several benefits of using logic models as follows:

- Develop common understanding among stakeholders;
- Document and emphasize explicit outcomes;
- Recognize important variables for the evaluation purpose.

3.3 Types and Components of Logic Model

Logic model can be distinguished into two types: theory of change and program (Knowlton and Phillips, 2013). The difference between them is on the level of detail and use, although both represent the same logic.

A theory of change logic model presents conceptual view of how the project will "do and get". It simply displays the big picture of the project using limited information. A basic theory of change logic model consists of two elements: strategies and results as illustrated in Figure 2. Strategies reflect a choice of optimal actions to achieve intended results.

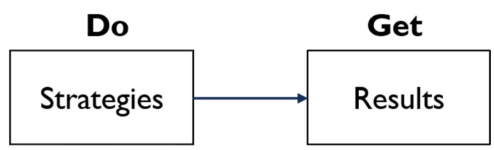

Figure 2: Theory of change model (Adopted from Knowlton and Phillips, 2013).

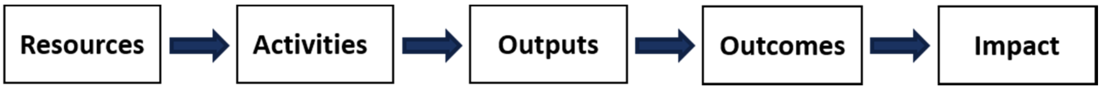

Figure 3: A basic program logic model (Adopted from W. K. Kellogg Foundation, 2004).

A program logic model describes a more detailed map of the project from start to finish. Strategies are broken down into resources, activities, and outputs whereas results reflect the sequence of outcomes over time through impact. It displays the elements that are most critical in establishing and operating a project. Key components of a program logic model is presented in Figure 3 and explained as follows:

Resources or *inputs* are something that available or needed to conduct activities. They can include financial, human, or organizational aspect.

Activities specify the particular actions that will be delivered as project implementation. Generally, they are related to deliberate events, tools, process or technology.

Outputs are the direct products of project activities. They are usually quantified and described in targets, level of functioning or type of services to be achieved by the project.

Outcomes define what kind of changes expected to happen as a result of the project. Some examples are specific changes in awareness, knowledge or behavior. Outcomes may be divided based on time periods into short, intermediate, and long term.

Impact is the ultimate change arising in organization, community or system. Sometimes it reflects the intended project's vision or goal.

The rational of logic models follows "if-then" statements, which connect all parts of the project. From left to right it can be read, "If we have the following resources, then we can deliver these activities. If we accomplish the planned activities, then we can produce intended outputs. If we have these outputs, then certain changes will be happened in organization or community," and so on.

The purpose of this study is to provide comprehensive strategic directions and action plans for NSDI coordinator, hence a program logic model is used.

4 DEVELOPING NSDI LOGIC MODEL

4.1 Problems and Requirements Identification

The practical development of a program logic model generally starts with one or more information discovery process such as interviews, observations or documents study (Knowlton and Phillips, 2013). NSDI stakeholders' point of view is necessary to be captured for understanding more about its current implementation. Stakeholders might influence the effective functioning of NSDI or affected by it. This research identifies problems of NSDI implementation and requirements of future NSDI from the perspectives of government institutions, private sectors, and academia.

Semi-structured interviews were conducted in June and August 2017 for data collection. The familiarity of the authors with the NSDI initiative in Indonesia helped them to find appropriate individuals that have experience, knowledge, and role in its implementation. Overall, there were 18 participants of the interviews, in which eight of them represents government agencies, seven are working at private companies, and the rest are from academic institutions. They included SDI coordinators at ministries and local governments, a key technical NSDI manager, a representative from data providers, a director of GIS department, a web mapping solution provider, and an SDI research coordinator. The three main questions asked to them are *"What are the problems and challenges of NSDI implementation?", "What kind of data and services should be provided by NSDI?",* and *"How is your expectation for future NSDI?".*

A wide variety of problems occurred in NSDI implementation were mentioned in our interviews. The most frequent answer is the lack of human resources that have capability in GIS field. This shortfall is recognized mainly by government institutions where employee rotation often occurs. The number of staff who have ability to manage geospatial information and operate geospatial server to publish map services is also limited. The second major problem is low participation of the NSDI network nodes, thus resulting a small number of datasets accessible in Ina-Geoportal. According to the interviewee, low participation may caused by the lack of awareness of NSDI benefits or there is a reluctance to share geospatial data. Other difficulties identified by the respondents are include large-scale dataset availability, geoportal Issue, financial aspect and Information and Communication Technology (ICT) infrastructure. Table 1 summarizes the problems stated by interviewees from Public (Pu), Private (Pr) and Academic (Ac) institutions, together with the number of times they were stated.

Table 1: Problems of NSDI implementation and the number of times stated by different type of institutions.

Problems of NSDI	Type of Institutions			Sum
	Pu	Pr	Ac	
Lack of skilled human resources	5	3	2	10
Low participation from the NSDI network nodes	3	1	1	5
Insufficient large-scale maps	1	1	2	4
Limited functionality and reliability of the Ina-Geoportal	1	2	1	4
Low spatial data quality	1	2	1	4
Limited Internet and ICT infrastructure	2	2	-	4
Absence of operational guidance	1	2	-	3
Limited funding	1	1	-	2
Low adoption of GIS technology	1	1	-	2
Lack of standards implementation	-	2	-	2

Most interviewees stated that they require large-scale fundamental datasets to be provided by NSDI. Its availability will be important as the base map to generate other thematic datasets such as urban planning and public utility management. Meanwhile, the majority of respondents from business sector need socio-economic data that represents population distribution and other commercial information. Although the data can be obtained at Central Bureau of Statistics, it will be more useful if the data is in the form of geospatial services and can be integrated with other applications. Some of the respondents also considered Real-time data from weather or environmental sensors is essential particularly to support early warning system. Other data or service requirements for future NSDI implementation are presented in the Table 2.

Table 2: Data/services required by different type of institutions and the number of times stated.

Required data/services	Type of Institutions			Sum
	Pu	Pr	Ac	
Large-scale fundamental datasets	6	2	1	9
Socio-economic data	-	4	-	4
Real-time weather and environment data	2	1	1	4
Point of Interest (POI) data	-	2	1	3
Disaster risk information	1	1	1	3
Land parcels	1	-	1	2
Spatial planning	1	1	-	2

Different expectations of future NSDI were expressed by the interviewees. In general, they expect to have more geospatial data and applications. They believe NSDI should be able to provide good quality spatial data in term of resolution and completeness as the basis for added-value information creation. Some of the respondents consider future application of NSDI will be integrated with different types of data to support geospatial analytics, which is important for

Table 3: Expectations of future NSDI from users' point of view.

Type of Institutions	Expectation
Local government	• NSDI can handle and integrate in situ data which is collected by sensor networks • NSDI should encourage creation of location-based mobile applications • NSDI should support the provision of geospatial data
National government	• Access to high-resolution spatial data will be more easy and reliable • Integrate various thematic maps and data formats produced by network nodes • The development of NSDI should be sustainable, not a partial project
Private sector	• NSDI should provide geo-services applications for general user and developer • Improve the quality and reliability of geospatial data • Future NSDI should drive the development of geospatial industry in Indonesia
Academia	• NSDI should increase data coverage and geo-services in remote area • NSDI should promote value-added creation of geospatial data that stimulate innovation • NSDI will increase the awareness of decision makers

decision makers. Table 3 presents the detailed expectations of future NSDI categorized by type of institutions.

4.2 NSDI Logic Model

The identification of problems and requirements from previous section gives significant insight for NSDI implementation. Together with other evidences collected from formal documents such as regulations, annual reports, and BIG's strategic plan, they are used as key information sources of the NSDI logic model.

The creation of NSDI logic model begins by determining the intended ultimate goal. Based on the declaration of Indonesia NSDI in 2000, its objective is to deliver good quality, easily accessed and integrated spatial data to support national development (Bakosurtanal, 2008). However, based on the expectation of users, future NSDI should not limited to only support governmental development programs but also accessible to citizens and businesses. They expect geospatial information commonly available and can be consumed by handy applications to fulfill their needs. This also complies with one of the purposes of Geospatial Information Law, which is to encourage geospatial information usage in various aspects of community life. Therefore, the proposed final impact is to achieve geospatially enable society, a term introduced by Steudler and Rajabifard (2012) to describe the desired condition.

The next step is to define outcomes of NSDI implementation. We parsed the expected outcomes by time increments into short, intermediate, and long term. Short-term outcomes are planned to be realized in 1 through 3 years, intermediate-term outcomes 4 through 6 years, and long-term outcomes in 7 through 10 years.

Short-term outcomes are related to changes in the aspect of geospatial data quality, awareness of the NSDI benefits, and knowledge of geospatial information. The geospatial data quality here is also including the completeness and coverage of the large-scale maps that urgently required by stakeholders. If data quality can be improved then the intermediate-term outcome expected is the decision-making process will be better. Additionally, increased awareness will result in better participation from network nodes and partnerships among stakeholders, as well as increased knowledge produce improved skill and technology adoption. If we accomplish these three intermediate outcomes, then the change in national development and geospatial industry hopefully will be secured in the long term.

Subsequently, we have to identify all the activities required to generate the outcomes. There are six main strategies proposed: mapping activities, One Map implementation, improving data access and sharing, promoting geospatial community, capacity building activities, and developing NSDI practices. Each of these strategies will produce outputs that collaboratively resulted in the model's outcomes.

The purpose of mapping activities is to produce large-scale topographic maps that most users required. These basic maps then are used as the foundation of developing thematic maps produced by a variety of institutions. With One Map implementation, problems in overlapping land status for instance, can be tackled and the integrated thematic maps will increase the quality of geospatial products. Moreover, research outputs from the capacity building activities may also support the improvement in terms of accuracy of the products.

An enhanced geoportal platform is the main output of improving data access and sharing activities. It is expected to have more functionalities and support marketplace for the private sector to stimulate innovation. We also believe participation from group of users that sharing similar interest in geospatial information is need to be raised. Activities to promote geospatial communities should be determined in order to encourage them creating Location Based Service (LBS) applications and participating in adding Point of Interest (POI) database. This initiative will require support from business sector and academia. If the geoportal is running well and provide useful applications, then the awareness of geospatial information benefits will be increased for decision-makers and general users as well.

Capacity building activities can be related with the human, technological, and institutional aspects. As discovered in the previous subsection, it is important to overcome insufficient skilled human resources in GIS field. BIG has established collaboration with 13 universities as the Center of Spatial Data Infrastructure Development (Pusat Pengembangan Infrastruktur Data Spasial/PPIDS) (BIG, 2015a). However, the partnership should be strengthened to produce not only qualified personnel but also conduct valuable research in geospatial information area. In addition, formulation of competency standards are also required to guarantee the quality of the workforce.

One of the problems identified in NSDI implementation is the absence of operational guidance. Local governments expect that best practices of NSDI in terms of technical and institutional issues are available. For example,

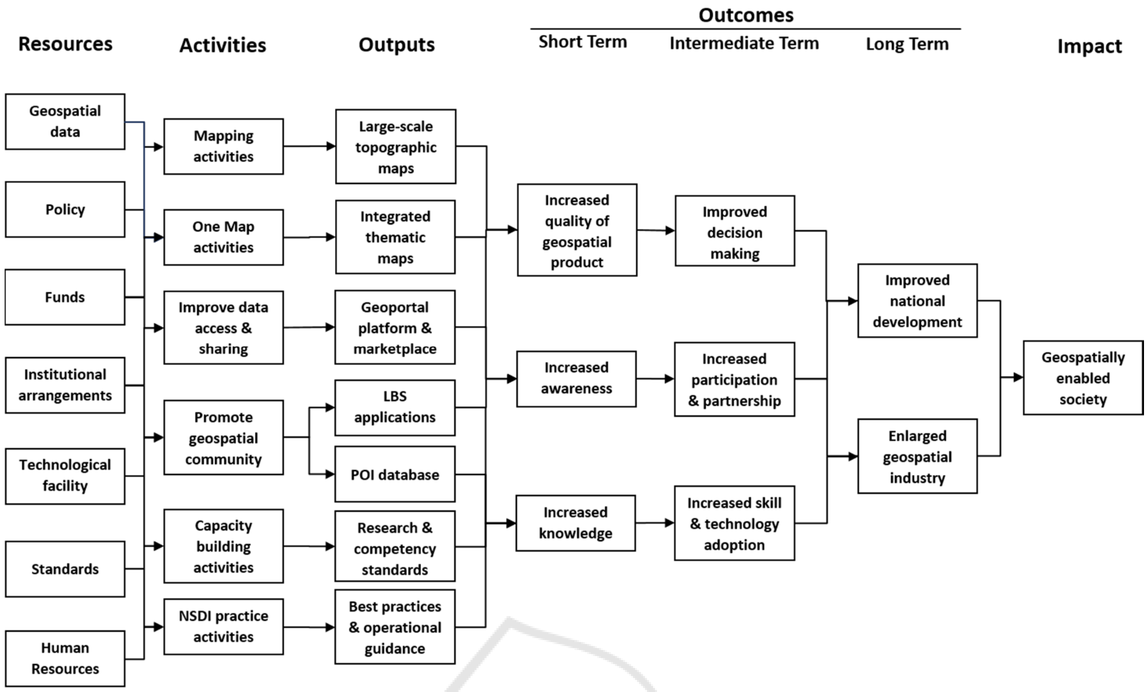

Figure 4: NSDI Logic Model.

practical guideline is needed in setting up a clearinghouse and data sharing management with other agencies. NSDI Practices activities aims to provide such documents and assistance in order to increase the knowledge of NSDI stakeholders.

The final step is to determine resources for the effective NSDI operation. We distinguished seven inputs including geospatial data, policy, funds, institutional arrangements, technological facility, standards, and human resources. In case of Indonesia, most of them are already available because the NSDI initiative has been started more than two decades ago. For example, the basic policy for NSDI is described in the Geospatial Information Law and further arranged by government regulation or presidential decree. Nevertheless, some efforts need to be expanded particularly for geospatial data and funding.

The complete NSDI logic model is presented in Figure 4. It visualize relationships between elements in the road map from the planned strategies to the intended results. This model can also promote alignment and synergy in conducting activities among NSDI stakeholders.

4.3 Detailed Activities and Outputs

The NSDI Logic Model describes an overview of the strategic directions for NSDI implementation. Nonetheless, it can be breakdown to provide a more detailed view of the activities and intended outputs.

In Figure 5, we show the detail within the mapping strategy. It consists of five key activities: GCP measurement, Ortho-image processing, develop Positioning Infrastructure, Geodatabase updating and LIDAR processing. The target is to produce numerous large-scale topographic maps which important for generating thematic maps. Each activity has a quantified output to be delivered. For example, number of Ground Control Points (GCP) is the objective of the GCP measurement that required for making ortho-rectified satellite images. This closer picture of operations can be helpful in creating the action plans.

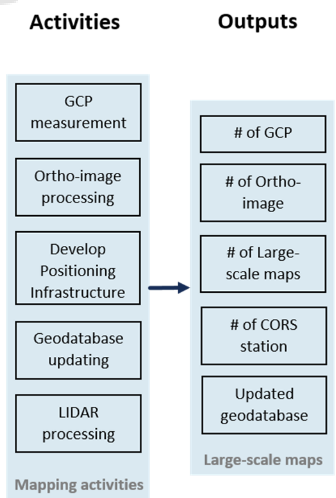

Figure 5: Detailed mapping activities and their outputs.

5 CONCLUDING REMARKS

Indonesia has underway an evolution in developing NSDI. Several milestones in term of legal settings, institutional arrangements, standardization and technological issues have been delivered. However, it is evident from stakeholders' perspective that problems still occur particularly in providing skilled workforces and abundant large-scale maps. Trends of latest geospatial technology and users demand has changed the NSDI ultimate goal into geospatial information usage in various aspects of the general public life. To realize this geospatially enabled society, we propose the NSDI Logic Model as a comprehensive and visible strategic direction.

Our work contributes to providing a scientific management tool for implementing effective NSDI. With this model, well-planned actions and their expected results can be generated as well as communicating a common understanding to NSDI stakeholders. Future works will be to validate this model with key players and determine outcome-based indicators for the successful of NSDI implementation.

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REFERENCES

Ayanlade, A., Orimoogunje, I. O. O., & Borisade, P. B., 2008. Geospatial data infrastructure for sustainable development in sub-Saharan countries. *International Journal of Digital Earth.* Vol. 1:3, 247-258.

Bakosurtanal, 2008. Pedoman Penyelenggaraan Infrastruktur Data Spasial Nasional.

BIG, 2014. Annual Report 2014.

BIG, 2015a. Annual Report 2015.

BIG, 2015b. Katalog Standar Nasional Indonesia Penyelenggaraan Informasi Geospasial.

Borzacchiello, M. T., Craglia, M., 2013. Estimating benefits of Spatial Data Infrastructures: A case study on e-Cadastres. *Computers, Environment and Urban Systems.* Vol. 41(0): 276-288.

Crompvoets, J., Bregt, A., 2007. National spatial data clearinghouses, 2000-2005. *In Onsrud, H. (Ed.), Research and theory in advancing spatial data infrastructure*, ESRI Press. Redlands, California.

De Man, W. H. E., 2006. Understanding SDI: Complexity and Institutionalization. *International Journal of Geographical Information Science*. Vol. 20(3): 329–343.

Harvey F,. Iwaniak A., Coetzee S., Cooper, A. K., 2012. SDI Past, Present and Future: A Review and Status Assessment. *In: Spatially Enabling Government, Industry and Citizens: Research and Development Perspectives*, edited by A. Rajabifard and D. Coleman. GSDI Association Press, Massachusetts, USA.

Janne, S., Lorkhamyong, K., 2015. Establishing Sustainable NSDI: Combined Technical and Institutional Approach. *FIG Working Week*. Sofia, Bulgaria, 17-21 May 2015.

Knowlton, L. W., Phillips, C.C., 2013. The Logic Model Guidebook, SAGE Publication, Inc. Thousand Oaks, California, 2nd Edition.

Lilywati, H. and S. K. Gularso (2000). SIGNas sebagai Landasan Informasi Spasial untuk Menunjang Manajemen Pembangunan. *Komputasi dalam Sains dan Teknologi Nuklir XI*. Jakarta, BATAN: 15-37.

Masser, I., 1999. All shapes and sizes: the first generation of national spatial data infrastructures. *International Journal of Geographical Information Science*. Vol. 13. pp. 67–84.

Matindas, R. W., Puntodewo and Purnawan, B., 2004. Development of National Spatial Data Infrastructure in Indonesia. *Proceedings from FIG Working Week*, Athens, Greece, May 22-27, 2004.

Molina, M., Bayarri, S., 2011. A multinational SDI-based system to facilitate disaster risk management in the Andean Community. *Computer Geoscience.* Vol. 37, 1501–1510.

Poorazizi, M. Ebrahim, Steiniger, S., & Hunter, A.J.S., 2015. A service-oriented architecture to enable participatory planning: an e-planning platform. *International Journal of Geographical Information Science.* Vol. 29:7, 1081-1110.

Puntodewo and Nataprawira, R., 2007. Indonesian Geospatial Data Clearinghouse. *Proceedings of 3rd FIG Regional Conference 2007,* Jakarta, Indonesia, October 3-7, 2007.

Rajabifard, A., Feeney, M., & Williamson, I. P., 2003. 'Spatial Data Infrastructures: Concept, Natures and SDI Hierarchy', Chapter 2, *Development of Spatial Data Infrastructures: from Concept to Reality*, ISBN 0-415-30265-X, Taylor & Francis, U.K.

Steudler D., and Rajabifard A. (eds), 2012. Spatially Enabled Society, International Federation of Surveyors, FIG Publication no. 58.

Tim Percepatan Kebijakan Satu Peta, 2017. Laporan Percepatan Pelaksanaan Kebijakan Satu Peta Semester 2/2016.

Van Oort, P. A. J., Kuyper, M. C., Bregt, A. K., & Crompvoets, J., 2009. Geoportals: An Internet Marketing Perspective. *Data Science Journal*. Vol. 8: 162-181.

W. K. Kellogg Foundation. (2004). *Logic model development guide*. Retrieved From https://www.bttop.org/sites/default/files/public/W.K.%20Kellogg%20LogicModel.pdf