Republic of Indonesia

FY2019 Ex Post Evaluation of Japanese ODA Loan Project

"National Geo-Spatial Data Infrastructure Development Project"

External Evaluator: Keiko Asato, Foundation for Advanced Studies on International Development (FASID)

0. Summary

The objectives of this project were to achieve efficient and sophisticated administrative operations, to avoid duplicate investment and work and to formulate provincial-level regional development plans by preparing basic map data of Sumatra island, developing a network system to share national spatial data and support the efficient formulation of regional development plans thereby contributing to improving the national and regional economic development and its governance, managing and developing natural resources appropriately and environmental conservation.

This project is consistent with the Indonesian government's development policy of standardization of spatial data and promotion of national development by sharing spatial data among public institutions. The development need is high, and coherent with Japan's policy. Thus, the relevance is high. Due to a change in scope after starting the project, it was difficult to judge the outcome based on the accomplishment of initially set indicators. However, the achievement of the alternative indicators shows this project is fully utilized, and has had positive impacts such as the improvement of sector planning and development planning. Therefore, the effectiveness and impact are moderate. In addition, this project plays the role of a platform to promote the Indonesian priority policy "One Map Policy". Although it is necessary to continue to strengthen the executing agency's organizational capacity status and secure a budget to meet the increasing need for spatial data, there are no problems in the organization, budget or technical aspects for sustaining the direct effects brought by this project itself; the benefits of this project are expected to continue, so sustainability is high. The project cost was within the plan, but the project period exceeded the plan, so project efficiency is moderate.

In light of the above, this project is evaluated to be satisfactory.

1. Project Description

Project Location

Ina-Geoportal Site

1.1 Background

At the time of appraisal, in Indonesia, map data with a scale of 1/250,000 to 1/1,000,000 was already prepared for the entire country. However, basic map data[1] with a scale of 1/10,000 to 1/50,000 used by government agencies for management and development of natural resources and environmental conservation, and utilized by local governments for regional development plans, had not been prepared in Sumatra, Papua, Maluku Island, etc. In particular, in Sumatra, despite progress in its development, basic map data had not been prepared, which occasionally resulted in inappropriate regional development.

Since regional development was carried out without coordination between sectors and regions without basic map data, environmental deterioration and inappropriate use of natural resources progressed in different areas. These problems were pointed out in the national medium-term development plan (Rencana Pembangunan Jangka Menengah, hereinafter referred to as "RPJM", 2004-2009). Another problem was the duplication of basic map data and thematic map data. Government agencies and research institutes independently created and held basic map data and thematic maps[2] for the same areas. It was urgent to avoid such duplication of work and investment and develop a networking system to share spatial data[3] efficiently.

1.2 Project Outline

The objectives of this project were to achieve efficient and sophisticated administrative operations, to avoid duplicate investment and work and to formulate provincial-level regional development plans by preparing basic map data of Sumatra island, developing a network system to share national spatial data and support the efficient formulation of regional development plans thereby contributing to improving the national and regional economic development and its governance, managing and developing natural resources appropriately and environmental conservation.

Loan Approved Amount/ Disbursed Amount	6,373 million yen/6,210 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	28 March, 2007/29 March, 2007
Terms and Conditions	Interest Rate 0.4% Repayment Period 40 years (Grace Period 10 years)

[1] It is the map data, with basic spatial information such as residential area, traffic, vegetation, rivers, contour lines, administrative boundaries, place names, etc. (according to the document provided by JICA).

[2] These are the maps which were produced by 19 government institutions and cover seven themes: (1) boundaries, (2) forestry, (3) spatial planning, (4) infrastructure, (5) land use permission, (6) environment and natural resources, and (7) special residential areas (https://portalksp.ina-sdi.or.id/).

[3] In this report, the basic map data and thematic map data are collectively referred to as "spatial data".

	Conditions for Procurement (STEP[4])
Borrower/ Executing Agency(ies)	Republic of Indonesia/Badan Informasi Geospasial (hereinafter referred to as "BIG") (At the time of appraisal, this agency was called Badan Koordinasi Survey dan Pametaan Nasional (BAKOSURTANAL)[5])
Project Completion	April 2015
Target Area	Sumatra Island and Jakarta DKI
Main Contractor(s) (Over 1 billion yen)	PASCO CORPORATION (Japan) Itochu Corporation(Japan) /NTT Data Corporation(Japan)
Main Consultant(s) (Over 100 million yen)	(1) Consultant service for entire project LAPI ITB(Indonesia/Aero Asahi Corporation(Japan)／ Yachiyo Engineering Co., Ltd.(Japan) (II) Consultant service exclusively for Output 3 PT. DEMENSI RONAKON(Indonesia)/ORIENTAL CONSULTANTS Co., Ltd.(Japan)
Related Studies (Feasibility Studies, etc.)	Special Assistance for Project Formation (SAPROF) for Development of National Geo-Spatial Data Infrastructure Indonesia
Related Projects	None

2. Outline of the Evaluation Study

2.1 External Evaluator

Keiko Asato, Foundation for Advanced Studies on International Development (FASID)

2.2 Duration of Evaluation Study

This ex post evaluation study was conducted with the following schedule:

Duration of the Study: August 2019-October 2020

Duration of the Field Study: November 27-December 18 2019

2.3 Constraints during the Evaluation Study

The second field study was scheduled in March 2020, but was cancelled due to the global expansion of the COVID-19 epidemic. Instead, the additional information was collected through online interviews, etc. The information collection process was partially affected: no information was collected from Statistic Agency, which could not be visited during the first field study.

[4] Japan excels in designing and customizing bottom-up integrated systems that efficiently share information, taking advantage of the characteristics of existing systems owned by different institutions. To build the network system for this project, it is important to utilize the existing systems of the 10 ministries and agencies, and the aforementioned technology, with which Japan has an advantage, was decided to be applied.

[5] In this report, the unified name "BIG" is used, regardless of the time.

3. Results of the Evaluation (Overall Rating: B[6])

3.1 Relevance (Rating: ③[7])

3.1.1 Consistency with the Development Plan of the Republic of Indonesia

Development policies related to this project include those related to the regulation of spatial data and those related to the regulation of the National Spatial Data Infrastructure[8] (hereinafter referred to as "NSDI") to promote the utilization of spatial data.

Regarding spatial data regulation, at the time of appraisal, Law No. 24, 1992, required the use of maps for the formulation of spatial plans such as regional development plans, and Law No. 32, 2004, also obliged the local government to formulate a regional development plan using maps of a specific scale (1/50,000 or greater scale for cities, 1/100,000 or greater for provinces, specified by Ordinance No. 10, 2000).

At the time of ex post evaluation, Law No. 4, 2011 stipulated that government agencies use and share standardized basic map data. In 2016, Presidential Decree No. 9, called OMP[9], required that one standardized basic map data set for the country had to be created by compilation, integration and synchronization of the different maps, and that thematic map data had to be created based on that standardized basic map data. OMP also recommended to share such spatial data and promote its utilization. In addition, in 2019, the "One Data Policy" (hereinafter referred to as "ODP") was promulgated by Presidential Decree No. 39, designating that the standardized data (mainly spatial data and statistical data) be utilized as a country in order to objectively formulate development plans. The importance of spatial data preparation was also mentioned in the relevant RPJM (2015-2019) as one of nine national development agendas: the importance of basic map data was stated, such as a common map to promote land utilization and prevent illegal logging, fishing and mining, for the development of cities and regions. Moreover, the current RPJM (2020-2024) states the importance of the use of spatial data for balanced growth between the urban and regional areas throughout the country, the promotion of basic map data at a scale of 1/5,000, and driving the implementation of OMP.

As a development policy related to NSDI, at the time of appraisal, Presidential Decree No. 85, 2007, required Indonesian government agencies and local governments to share spatial data through NSDI. At the time of ex post evaluation, Presidential Decree No. 27, 2014, regulating the establishment of the National Geospatial Information Network (hereinafter referred to a "NGIN"), was promulgated. The decree requested 644 public organizations nationwide[10], such

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[6] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[7] ③: High, ②: Fair, ①: Low

[8] This is the network system used for sharing spatial data (map information) throughout the country.

[9] This is according to the documents of BIG, "Peranan Informasi Geospasial Dalam Mendukung Percepatan Pemebangunan Berkelanjutan di Indonesia".

[10] There is a total of 644 institutions, including 62 ministries, 34 state governments, 514 municipalities, and 34 universities.

as the central government, local governments, universities and other public institutions, to connect to NGIN (these connecting institutions are called distributed network nodes (hereinafter referred to as "DNN")).

In this regard, this project is consistent with Indonesian development plans.

3.1.2 Consistency with the Development Needs of the Republic of Indonesia

At the time of appraisal, Sumatra Island, whose development was progressing, only had a 1/50,000 map formulated from 1974-1976. Due to this situation, environmental degradation and inappropriate use of natural resources had progressed, so the preparation of basic map data was an urgent need for the appropriate development. Moreover, although many government agencies and research institutes were using the spatial data for their work, these data were not standardized, so the same region looked different and important information was missing from agency to agency. In addition, due to insufficient sharing of spatial data among the government agencies, problems such as duplicate investment in spatial data for the same area and unnecessary time and cost for obtaining maps had arisen. It was pointed out that the regional development plan did not show the characteristics of the region.

At the time of the ex post evaluation, local government was required to formulate a development plan based on the basic map data at 1/5,000 scale, but the national coverage rate of that scale is only about 1.9%.[11] There is an urgent need to formulate large-scale basic map data. Spatial data sharing among the institutions is indispensable to drive forward the OMP promoted by the government, and NSDI plays an important role as a tool for data sharing.

In this regard, this project was consistent with the development needs at the time of appraisal and upon ex post evaluation.

3.1.3 Consistency with Japan's ODA Policy

At the time of the appraisal, the *Country Assistance Plan for Indonesia* (2004) set "construction of a democratic and fair society" as a prioritized field, and "support for formulation and implementation of the development plan and the improvement of various administrative services, etc. in the local government" was prescribed to assist in decentralization. In addition, in the *Implementation policy for Overseas Economic Cooperation Operations* (2005),[12] "improvement of infrastructure for sustainable growth" was prioritized, and "support for the establishment of an efficient administrative system utilizing IT" was emphasized. The *Country Base Implementation Policy* (2006)[13] also supports "private investment/infrastructure"

[11] Based on the documents provided by BIG (Ketersediaan Data PetaRupabumi Indonesia [RBI] January 2020).

[12] The name of the project policy applied to each country, formulated by JBIC before it and JICA integrated.

[13] The name of the project policy applied to each country, formulated by JICA before it and JBIC integrated.

and “governance” as a priority issue.

In this regard, this project was consistent with Japan’s ODA policy at the time of appraisal.

This project has been highly relevant to Indonesia’s development plan and development needs, as well as Japan’s ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating:②)

3.2.1 Project Outputs

(1) Planned and Actual Outputs

The achievement of the outputs of this project is as follows:

Table 1: Planned and actual outputs

Planned	Actual
1. Output 1: Production of basic map data of Sumatra Island	
-Basic map data of Sumatra Island (scale: 1/50,000)	
411,000 km^2	303,439 km^2
-Basic map data of 4 local governments (scale: 1/10,000)	
Medan	698.20 km^2
Padang	1003.70 km^2
Jambi	384.42 km^2
Pekanbaru	470.60 km^2
Bandar Lampung	Not produced
Pangkalpinang	Not produced
Bengkulu	Not produced
2. Output 2: Construction of NSDI network system	
-Construction of network to connect BIG and the related government agencies	-Constructed the network with the following changes; 1) Consolidation of server, network and storage equipment for the stable operation and function improvement 2) Construction of network system to accommodate the open source software to promote more number of access of DNN in the future
-Construction of map metadata [14] information searching system utilizing Geo-Portal (GIS software)	-Changed the GIS software to ArcGIS Online and construct a portal site that can directly search spatial data (hereinafter “Ina-Geoportal”), in addition to a search system using metadata https://tanahair.indonesia.go.id/portal-web

[14] These data are given to describe the other related data, not the data themselves. In the GIS sector, these are “data that shows the attributes of information such as the type, characteristics, quality, and acquisition method of spatial data in detail” (according to Pasco’s GIS Glossary, https://www.pasco.co.jp/recommend/word/word031/).

-Strengthening of GIS data centre	-In order to accommodate the above changes in scope, data and storage capacity was increased, resulting in expansion of the data centre
-Construction of recovery centre at the time of disaster (Disaster Recovery Centre, hereinafter referred to as "DRC")	-Constructed on Batam Island
-Capacity development for BIG, related ministries, agencies and local governments	-As planned
Output 3: Support for regional development plan formulation	
-Elaboration of modeling for regional development plan for 5 islands (Java, Bali, Sulawesi, Kalimantan, and Sumatra) and its training	-Elaboration of modeling for regional development plans for 2 islands (Sulawesi, Kalimantan)
Consulting Service I (hereinafter referred to "CS-I")	
-Detailed design study, preparation of bidding documents, assistance for bidding process and contract, and supervision of the project implementation process and operation for Outputs 1, 2, and 3	-The consulting services are related to Outputs 1 and 2 and were conducted as scheduled. However, the amount of work had increased due to the change in scope of Output 2 -The consulting services related to Output 3 were transferred to CS-II
Consulting Service II (hereinafter referred to "CS-II")	
-Technical support for BAPPENAS for Output 3 -Training and workshops for local governments and universities in the target area on forming regional development plans	-The nature of the work remains the same, but the amount of work had decreased, with fewer target islands, due to the budget cut caused by the scope change of Output 2

(Source: Documents provided by JICA)

(2) Main Points of Change

The main changes in outputs and the reasons for them are as follows.

① Reduction of coverage of Sumatra in basic map data production

Due to the change in the scope of Output 2, the budget allocation for the entire project was reviewed, and the budget for Output 1 was reduced. The target area of the 1/50,000-scale basic map data for Sumatra was reduced to 74% of the original plan. The number of municipalities targeted for producing 1/10,000-scale basic map data was also reduced from the original 7 to 4.

The basic Sumatran map data were produced at a scale of 1/50,000, but their resolution was quite high[15].

② Change of scope of the NSDI network system

The detailed design study for this project was conducted in 2008. We planned to use software (Geo-Portal) to construct a metadata search system by utilizing the technology which was common at that time. However, as system construction began after the bidding procedure (2011), another program (ArcGIS Online), which was excellent in user interface and displays the spatial data itself, had begun to appear on the market. Considering the better convenience in the future, BIG requested to change the scope to build the spatial data direct search function in ArcGIS Online, not only the original function using Geo-Portal. System development had already begun, and the scope change would cause various adjustment, so there was a lot of hot discussion between BIG and the contractor. However, BIG firmly requested that a system which more users would use for a longer time in the future should be built. Even after starting system development, the work process was reviewed and a network system, Ina-Geoportal, incorporating the new ArcGIS technology, was to be built.

Along with this change, several changes were made accordingly, such as changes to the specification of the hardware integration (server, network, storage device), the increase of communication capacity by mounting a map with image data, system changes to increase the number of DNN connections, the expansion of the data centre with these changes and so on. With these changes, the workload of contractors and consultants increased.

③ Support for formulating regional development plans

With the increase of the budget for Output 2, the budget for Output 3 was reduced, and the number of islands to be supported was also reduced from 5 to 2 (the training for related stakeholders was also reduced accordingly). Regarding the selection of the two islands, BAPPENAS had their own priority for the regional development plan formulation in the order of Java, Bali, Sulawesi, Kalimantan and Sumatra. Java and Bali had already formulated regional development plans, so the next prioritized islands, Sulawesi and Kalimantan, were targeted for development planning support. As a methodology to formulate the regional development plan, a "dynamic model"[16] was applied to support these two islands. Development plans for Sulawesi and Kalimantan were formulated together with the BAPPENAS database unit, and training was given to each island's provincial government on how to use the model and how to interpret the analysis results.

[15] High-resolution basic map data with a mesh of 62.5 cm were produced, which was highly appreciated by BIG (according to the interview with BIG).

[16] The dynamic modeling system, which is used to produce outputs, while the modeling, in itself, continues to change, subject to the changes in input data (variables). This model predicts how traffic congestion might be changed in response to population changes (changes in the number of people and their movements) and in the construction of new buildings.

As mentioned above, the scope change from a metadata searching system to one with an additional spatial data searching system with a superior user interface (Ina-Geoportal) brought a major change of direction, with adjustment to the project funding amount, project period and staffing. However, owing to this conversion, the system was highly utilized at the time of ex post evaluation (see 3.3.1 Effectiveness for details), and it is considered that this scope change was necessary and important. Although this affected the achievement of other outputs, it is considered that the planned outputs were generally achieved.

3.2.2 Project Inputs

3.2.2.1 Project Cost

While the total planned project funding amount at the time of appraisal was 7,520 million yen, the actual amount was 6,210 million yen. The project cost was 82.6% of the original plan, which was within the plan. The details are as follows:

Table 2: Planned and actual project cost

(unit: million yen)

	Planned			Actual		
	JICA	Others	Total	JICA	Others	Total
Production of spatial data, Construction of NSDI network	4,862	0	4,862	5,660	0	5,660
Consulting service	638	0	638	550	0	550
Price escalation	600	0	600	0	0	0
Physical contingency	273	0	273	0	0	0
Administration cost	0	510	510	0	N.A.	N.A.
Tax and duties	0	637	637	0	0	0
Total	6,373	1,147	7,520	6,210	0	6,210

(Source: documents provided by JICA)

Remarks: Exchange rate at the time of planning: USD1 = JP¥115.88 Rupiah 1 = JP¥0.0124 (September 2006).
Exchange rate for the actual amount: The actual amount was only borne by JICA, so the exchange was applied at the time of disbursement.

The biggest change compared with the plan was the increase of the budget for constructing the NSDI network. As mentioned above, the amount was increased by 1,146 million yen due to changes to the software that displays spatial data itself (Geo-portal and ArcGIS), the consolidation of hardware, changes in the scope of network systems to increase the number of DNN connections (larger scalability of NSDI system) and expansion of data centres. On the other hand, to keep the expenditure within the planned budget, the amount of spatial data production and support for development plan formulation and consultant services associated with it were reduced.

Regarding the budget that was originally to be borne by the Indonesian side, administrative costs were spent as part of BIG's ordinary expenditure, and expenditure amounts separate to this project could not be obtained. According to the executing agency, no taxes or duties were levied on ODA projects.

3.2.2.2 Project Period

At the time of the appraisal, the project period was planned for 88 months (March 2007-June 2014), but the actual period turned out to be 98 months (March 2007-April 2015). The project period was 111.4% of the original plan, exceeding the plan.

Table 3: Project period

	Planned	Actual
Selection of consultants and contractors		
Selection of consultants	March-November 2007	CS-I: March 2007-June 2008 CS-II: March 2009-March 2010
Selection of contractors	June 2007-June 2009	January 2009-December 2010
Production of outputs		
Production of spatial data	August 2009-December 2012	January 2011-June 2014
Construction of NSDI network	August 2009-June 2013	February 2011-April 2014
Support for the formulation of regional plan	August 2008-December 2009	April 2010-July 2011
Project completion	June 2014	April 2015

(Source: documents provided by JICA)

The main reasons for the extension of the project period are as follows:

① Selection of consultants and contractors

Regarding the consultant for CS-II, the one initially selected was involved in a case leading to a proceeding in Japan, which caused a re-bid process. The bidders in the re-bid did not reach the reference point in terms of technical points, which required another bid.

Regarding the selection of contractors, Indonesia's procurement regulations require another bidding in the case that no more than three companies pass the pre-qualification examination (Pre-Qualification, hereinafter referred to as "PQ"). Only one company passed the PQ for spatial data production and only two companies for NSDI network construction; this required re-PQ processes in each.

② Spatial data creation

The company for spatial data acquisition[17], selected by international bidding, had had an accident before in which it flew over a restricted area, so it took time to gain approval for flight permission: the start of work was delayed by seven months. Even after its start, data acquisition

[17] Spatial data production consists of two stages: data acquisition (acquisition) and data processing (process).

was affected by the weather. However, data processing progressed in parallel by inputting many personnel, and the working period was extended only by about one month. The task was completed in delay by more than a year and half, comparable to the plan.

③ NSDI system construction

The working period increased from the initial 882 days to 1,232 days due to major changes in the scope of work after starting work, as mentioned above.

④ Support for formulation of development plan

Even though it took time to select a consultant, the working period to complete the task was as planned.

3.2.3 Results of Calculations for Internal Rates of Return (Reference only)

This project contributed to the planning of development projects and does not generate direct benefits. Both EIRR and FIRR are difficult to calculate quantitatively, and their values have not been expected from the beginning.

In this regard, although the project cost was within the plan, the project period exceeded the plan. Therefore, efficiency of the project is fair.

3.3 Effectiveness and Impacts[18] (Rating: ②)

3.3.1 Effectiveness

3.3.1.1 Quantitative Effects (Operation and Effect Indicators)

The achievement of the operational indicators in this project is as follows.

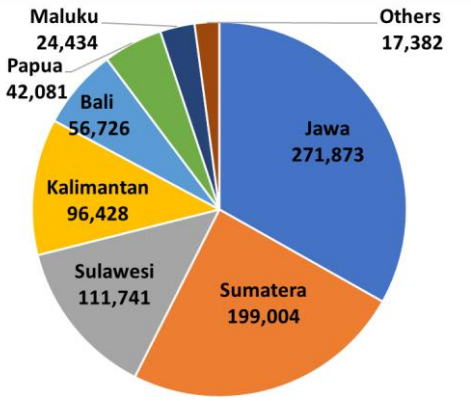
Table 4: Achievement of operational indicators

Indicators	Baseline	Target	Actual	
	2006	2016	2014	2020
		Two years after project completion	Upon project completion	Upon ex post evaluation
Indicator 1: Number of requests for the geospatial data of Sumatra Island, which was created under the project	N/A	2,000	Approximately 120	N/A
Indicator 2: Number of newly registered metadata in NSDI networking system	5,000 records	13,000 records	Approximately 12,000	10,118[19]

(Source: documents provided by JICA and executing agency)

[18] Sub-rating for effectiveness is to be set with consideration of impacts.

[19] The number of metadata aggregated by BIG is the one uploaded by DNN. According to the executing agency, the number of aggregates of metadata once would change due to DNN's correction and consolidation of metadata. And some metadata of DNN which are not connected due to server trouble etc., cannot be aggregated by BIG. Under these situations, the number of metadata has not increased as expected.



Graph 1: Number of spatial data downloaded by each island (2017-2020*)
*: figure for 2020 is for the period from April to June
(Source: elaborated by evaluator based on the data provided by BIG)

The number of requests for the basic map data of Sumatra Island created in this project could not be obtained from the executing agency at the time of the ex post evaluation. On the other hand, the numbers of spatial data for each island downloaded through Ina-Geoportal were as stated in the Graph 1.

Since this number of downloaded spatial data includes various spatial data for Sumatra in addition to the basic map data created in this project, it is difficult to judge whether the original objective was achieved by this number alone.

However, from the time of project completion to that of ex post evaluation, Sumatran spatial data were the most downloaded after those of the island of Java (24% of the total number of downloads in Indonesia), and it can be assumed that the basic map data produced in this project were also used. Even though it is difficult to judge the level of achievement for this indicator, we can infer that the basic map data created are in use.

Regarding the actual record of the number of metadata registered in the NSDI network system (the second indicator), even though the scope of the NSDI network system was changed, the following numbers in the Table 5 were registered. The information to be stated as metadata is defined by BIG, subject to ISO 9115, and each DNN prepared metadata observing these definitions. BIG checks whether the metadata submitted by each DNN meet its request; if the metadata satisfy the requirements, they are made public. The status of utilization of the NSDI network system, which was originally intended to be measured under the second indicator, can be judged by the increase of the number of network users, the number of DNNs connected to the network, the number of uploading institutions and the number of uploaded data. The transition of the data is as follows:

Table 5: Status of utilization of Ina-Geoportal

	2017	2018	2019	2020
Number of users	113,643	422,145	875,796	583,569*
Number of data downloaded	46,893	244,312	331,279	197,185*
Number of data uploaded	1,617	4,345	4,156	N/A**
Number of DNNs connected to the network	72	96	242	244*

(Source: elaborated by evaluator based on data provided by BIG, *: data as of 9 July 2020, **: data as of 16 December 2019)

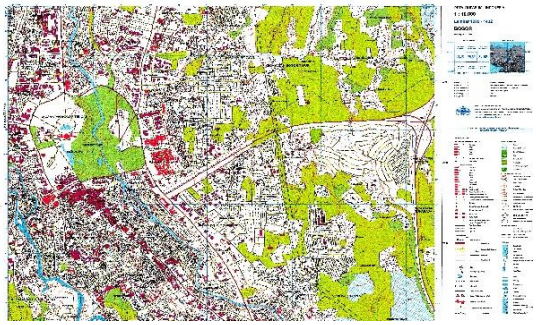
Ina-Geoportal also contains 85 thematic map data sets collected and combined by each ministry in accordance with OMP policy. The main ministries publishing thematic map data are the Ministry of Energy and Natural Resources (18 maps), the Ministry of Public Works and Settlement (11 maps), the Ministry of Agrarian Reform and Spatial Planning (10 maps), the Ministry of Environment and Forestry (9 maps), and the Ministry of Marine Affairs and Fisheries (6 maps).

In light of the above, usage of Ina-Geoportal is increasingly active year by year. The number of users and the number of downloaded data are increasing year by year, and the amount of uploaded data is also on the rise. Although the number of DNNs is increasing, the connection rate is still around 37%, considering that the total number of DNNs is 644. The institutions having particular difficulty being connected are local governments, such as cities and villages. 66% of the total are still unconnected. The reason why connection could not expand is that the installation of the equipment to connect Ina-Geoportal is expensive. BIG are promoting the connection by using the cloud system and free software so that the local governments can connect as a lower cost (please refer to 3.4.4 Status of Operation and Maintenance for details).

3.3.1.2 Qualitative Effects (Other Effects)

(1) Qualitative effects of Ina-Geoportal construction

The main advantages of using the NSDI network system are: (1) It is easy to share maps produced by other ministries, and duplicate production of similar maps by multiple ministries can be avoided. (2) The way to obtain a map became easier, by switching from a request conventionally submitted to another ministry in writing to a download through Ina-Geoportal. (3) Utilization of the standardized maps allows the overlays of different thematic maps to be more accurate without deviation, which enables advanced analysis of spatial data. However, for a while after project completion, the ministries and agencies hesitated to share spatial data actively using the NSDI network system.



Ina-Geoportal geospatial data

Although these advantages were explained to each ministry and agency at the time of project completion, not many of them were willing to upload their maps to Ina-Geoportal for a while for the following reasons: (1) Each ministry had already produced and used maps using their own method, so they did not realize the necessity of adopting a new method; (2) It was troublesome to switch to the BIG-designated format for posting on Ina-Geoportal; (3) There were still no users who had utilized the geospatial data on

the network, and the benefits explained could not be realized; and (4) The ministries and agencies were afraid that their maps would be edited without permission by acquisition through the network, and other reasons.

This trend has changed since 2016, when the presidential OMP decree was promulgated. This project contributed to the promotion of OMP. As mentioned above (see 3.1.1, Consistency with the Development Needs), OMP is a policy to promote the production, sharing and utilization of standardized basic map data. The production of basic map data for Sumatra was part of standardized cartography, and Ina-Geoportal served as a platform for enhancing map sharing and promoting utilization. Due to their strong coherence with this policy, the ministries that initially hesitated to use Ina-Geoportal gradually began to post various maps after the promulgation of this decree.

The utilization status of Ina-Geoportal of each institution at the time of ex post evaluation is as follows.

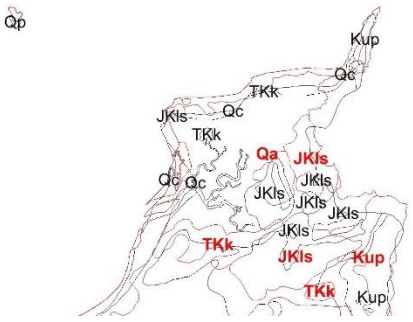
Table 6: Utilization status of other ministries' maps in each ministry

Ministries of which Maps are used	BIG	Ministry of Environment and Forestry	Ministry of Energy and Natural Resources	Ministry of Agrarian Reform and Spatial Planning	Ministry of Public Works and Settlement	Ministry of Agriculture	Ministry of Marine Affairs and Fisheries	Others
BIG								
Ministry of Environment and Forestry	○		○	○	X		X	Statistic Agency
Ministry of Energy and Natural Resources	X	○		X	X	X	X	
Ministry of Agrarian Reform and Spatial Planning	○	○	○		X	X	X	Ministry of Interior, Meteorological agency
Ministry of Public Works and Settlement	○	○	○	○		X	X	Ministry of Transportation, Ministry of interior
Ministry of Agriculture	○	X	○	○	○		X	LAPAN
Ministry of Marine Affairs and Fisheries	○	○	○	X	○	X		
Jakarta DKI	X	X	X	X	X	X	X	Ministry of Transportation
West Java	○	○	○	○	X		X	

(Source: results of interviews from each ministry)

Various benefits are recognized by the ministries who use Ina-Geoportal. The previous complicated procedure to obtain the maps is now avoided, and they can obtain maps more quickly. In addition, digital maps, instead of on paper, facilitate overlaying multiple spatial data sets, making their work less complicated. They can analyse the maps more precisely with the various information posted. Moreover, the maps posted on public networks have become more reliable than before.

A common benefit is that by superimposing standardized maps, overlaps between uses in a given area are revealed at the planning phase. This way, troubles can be avoided which would have arisen after starting a project. For example, an area designated as a protected area by the Ministry of Environment and Forestry might be classified as a developable area by the Ministry of Energy and Natural Resources. In the past, the maps used by each ministry were different, so overlap was not realized during planning. After starting a project, it was often found that a protected area was being developed.



Graph standardization of the map (result of the work to standardize the difference of different maps for the same area)

When overlap is found while planning, adjustments are made such as excluding zones from project areas and discussing development along with related ministries and agencies. The spatial planning of each ministry is now done more efficiently and effectively by utilizing Ina-Geoportal.

On the other hand, some negative opinions were also heard: The large-scale spatial data at 1/50,000 scale is not sufficient[20], the overlap on the spatial data between ministries is not resolved, and there remain many maps which still need the synchronization process. The number of thematic maps (85) is not enough. Many of the maps are in WMS format,[21] which is difficult to edit, and so on. BIG also recognizes that production of large-scale spatial data is an urgent issue, and is currently considering how to handle it (please refer to 3.4.4 Status of Operation and Maintenance" for details). Regarding expansion of the thematic map, BIG is currently working on internal standardization with 250 candidate maps, and the number of thematic maps to be posted is expected to increase by the end of this fiscal year.[22]

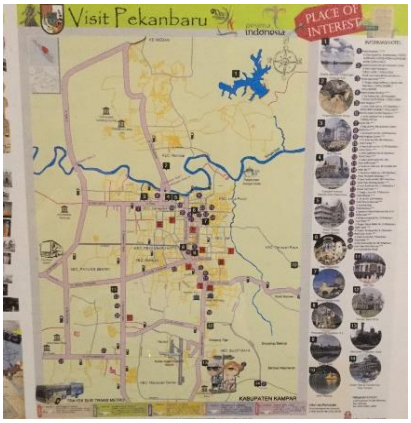
(2) Qualitative effect of creating basic map data for Sumatra

BAPPENAS formulated the regional development plan of Sumatra Island (2015-2019) utilizing its basic map of 1/50,000 scale (based on the experience in Output 3), to analyse and judge the result of dynamic model analysis together with a Japanese consultant. By using this dynamic model, BAPPENAS simulated the multiple plans necessary to achieve the targeted

[20] The coverage rate of 1/5,000 basic map data is about 1.9%. The coverage rates for 1/10,000 data is 1%, 42.6% for 1/25,000, and 89.1% for 1/50,000 (from the documents provided by BIG).
[21] This is the abbreviation for Web Map Service. This map is produced based on images, so the data cannot be edited directly. On the other hand, Web Feature Service (WFS) maps can be edited. WMS is comparable to PDF, and WFS is comparable to Microsoft Word. The ministry that produced the map can decide which format to post on Ina-Geoportal. It was said that each ministry is prone to select WMS for uploads to Ina-Geoportal so that the posted spatial data cannot be edited by the user and the data will go beyond the ministry's control (according to the interview to each ministry).
[22] According to the interview with BIG.

economic growth, then selected the optimal plan subject to the change of the main variables of the target area, such as movement of people and development of the city. The regional development plan was formulated using this process.

On the other hand, while the basic 1/10,000-scale map was used in the cities of Medan and Pekanbaru, it was not used in Padang or Jambi.



Map information found at the Hotel in Pekanbaru (Utilization of spatial data in tourism sector)

The city of Medan produces its own 1/1,000-scale basic map data, which is used for detailed development planning of urban areas. The 1/10,000 scale data are for wider areas' development plans. Various resources (such as administrative boundaries, roads, various facilities, land use and others) are superimposed on the basic Medan map data to elaborate project plans. It is said that working from one standardized map, it is easier to make any adjustments and negotiations based on the facts, even if the opinions of city departments differ[23]. In Pekanbaru, to utilize the spatial data is the ultimate policy in entire city office. All city offices, not only the departments of development planning, public works, and spatial planning, as well as the department of education and health and hygiene also use spatial data for project planning. It is said that an appropriate development plan can be elaborated rapidly with the necessary information posted on standardized spatial data, even though the necessary resources to formulate a development plan was identified by hearing with the staff in charge before[24].

On the other hand, in Padang and Jambi, the spatial data produced by this project were not used because these maps were not in the hands of the persons currently in charge of the development plans (in the department of development planning and spatial planning). According to them, the new spatial data were not delivered to them. However, the professor from the university which gives technical support to cities cited the high possibility that the map delivered in the form of data was not recognized as a "map" because officials only understood maps in the form of paper, and that the information was not taken over during the rotation of the personnel. At the time of the ex post evaluation, Padang is formulating a development plan using a 1/25,000-scale map. Jambi uses a 1/25,000-scale map for its general development plan, and a 1/5,000-scale map purchased from a private company for detailed development planning[25].

Currently, in Indonesia, local governments are obliged to formulate development plans using 1/5,000 spatial data. Each local government tries to obtain a map of 1/5,000 scale, but until such

[23] According to the interview with Medan city officials.
[24] According to the interview with Pekanbaru city officials
[25] According to the interview with Padang and Jambi city officials

maps become available, Padang and Jambi will substitute 1/10,000 spatial data for 1/5,000 maps. They want to get the data from BIG.

3.3.2 Impacts

3.3.2.1 Intended Impacts

The map data on Ina-Geoportal are used among the ministries, and the spatial data production process of each ministry has improved. Similar opinions were heard from two out of four target cities of the local governments in Sumatra Island on obtaining basic map data. The effects of the improvement of these spatial data on the planning of each ministry and local government are as follows: Overall, acquiring spatial data with standardized information enabled fair, impartial, accurate and appropriate decision-making. This in turn improved sector planning and development planning. On the other hand, others requested greater accuracy of the spatial data published in Ina-Geoportal and the large-scale maps.

Table 7: Impact to development plans brought by use of Ina-Geoportal by each ministry, agency and local government

	Impact on sector plan and development plans
Ministry of Environment and Forestry	Since it is based on one standardized accurate spatial data set, appropriate judgment can be made when planning. The ministry can make efficient and effective plans.
Ministry of Energy and Natural Resources	Little impact is seen on this ministry's sector plans. The role of this ministry is rather to provide the spatial data through Ina-Geoportal to be utilized by other ministries, such as (1) Geological data, (2) Earthquake/Tsunami/Landslide/Volcano areas, (3) Mineral/Coal/Geothermal areas and (4) Groundwater status.
Ministry of Agrarian Reform and Spatial Planning	Land use information of the target area (whether the target area is a forest reserve or not) is standardized by OMP and easily available through Ina-Geoportal, so an appropriate land use permission can be issued. In the currently promoted project for complete land registration, Pendaftaran Tanah Sistematis Lengkap (PTSL), accurate land information can be obtained by sharing spatial data among ministries and agencies through Ina-Geoportal, which is useful.
Ministry of Public Works and Settlement	The information posted to Ina-Geoportal by each ministry is often too small-scale and not updated, so they are not useful as a reference. To improve the accuracy of spatial data, it is necessary to strengthen the capacity of local governments. On the other hand, using the available information to prepare hazard maps and reconstruction plans enables this ministry to elaborate reliable plans.
Ministry of Agriculture	Spatial data from Ina-Geoportal was used to complete the thematic map data on suitable sites for nationwide cultivation of nine strategic crops (rice, sugarcane, corn, soybeans, cacao, etc.). Some information difficult to obtain through Ina-Geoportal was requested by writing letters.
Ministry of Marine Affairs and Fisheries	This ministry can now comprehend exactly where the mangroves live. Standardized spatial data (such as ship routes and marine resource reserves) are now easily accessible and accurate, which makes it possible to identify appropriate farms. Information on a wide range of states was available in a shorter period of time, which facilitated the planning of ocean space.
Jakarta DKI	Spatial data of each ministry are available through Ina-Geoportal, and are now referred to when development plans are formulated.
West Java	In addition to basic map data, maps of land use, economic infrastructure (electricity, dams, irrigation), hazard maps, and so on are now obtained through Ina-Geoportal, which

	facilitated the Javanese to formulate spatial plans. By referring to various information posted in Ina-Geoportal, it became possible to analyse more deeply and make appropriate plans. Moreover, by seeing a lot of spatial data published in Ina-Geoportal, the knowledge on how to utilize spatial data can be deepened.
Medan	Now, the city's development plans are formulated by each department based on one map. This enables appropriate decision-making based on the facts, instead of by political voice as before, in case that the different opinions are expressed from different departments of the city office. The problems are visualized, and issues to be addressed have become clearer.
Pekanbaru	The visualization of the resources in the region enables the city to formulate an appropriate development plan. Unused land can be clarified, and a land use plan can be elaborated strategically. The transparency of the planning process is improved because it is now based on one basic map data.

(Source: results of the interviews from each ministry)

3.3.2.2 Other Positive and Negative Impacts

(1) Impacts on the Natural Environment, Resettlement and Land Acquisition

No impact on the natural environment, on resettlement or on land acquisition occurred due to this project.

(2) Unintended Positive/Negative Impacts

No other negative impact was observed.

As mentioned, the achievement indicators originally set could not be confirmed because the outputs changed from the time of the detailed design study, and it was not possible to measure the achievement of the project's purpose by the original indicator. On the other hand, the number of utilized spatial data on Sumatra Island is the second largest after Java, including the 1/50,000 and 1/10,000-scale basic map data produced by this project. 1/50,000 basic map data were used by BAPPENAS to formulate regional development plans, and the 1/10,000 maps are still used in two of the four target cities. The usage of Ina-Geoportal has increased since the presidential OMP decree was issued in 2016, and the numbers of DNNs and general users are also increasing.

By preparing basic map data and using Ina-Geoportal, the process of spatial data formulation in each ministry and local government became more efficient, which brought positive effects in sector planning and development planning as a result.

In light of the above, this project has achieved its objectives to some extent. Therefore, the effectiveness and impact of the project are fair.

3.4 Sustainability (Rating：③)

3.4.1 Institutional/Organizational Aspects of Operation and Maintenance

A coordinating committee organized by the Coordinating Ministry for Economic Affairs has been set up to promote OMP, and BIG is in charge of its secretariat. Since 2011, BIG has been

designated as the only institution that provides basic map data[26]; and since 2015, BAPPENAS has supervised BIG, changing from its prior position directly under the presidential office. This project plays an important role as a platform for promoting OMP and ODP, which are important policies of the Indonesian government, and BIG is positioned as a core organization to promote the policy, which is effective for this project to continue its effect.

The total number of BIG staff is about 700, of which about 10 have doctoral degrees (civil engineering, urban engineering, geodesy), and 60% of the staff are qualified surveyors. The implementing bodies of each department directly involved in this project are as follows:

Table 8: Staff allocation and sufficiency in each department of BIG and required expertise

Department	Number of staff	Sufficiency		Required expertise and qualifications
BIG main body		To continue the effect of project	To promote OMP	
Project Management Office	1	Enough	Enough	No special requirements
Centre for Topographic Mapping and Toponyms	74	Enough	Not enough	Geography, geodesy
Centre for Management and Dissemination of Geospatial Information	48	Enough	Not enough	IT infrastructure, application, database management
Centre for Atlas and Spatial Mapping	37	Enough	Not enough	Geography, geodesy
Data Centre	41	Enough	Not Enough	
Operation Manager	2	Enough	Enough	Bachelor's degree in IT, data management
Business Relation Manager	2	Enough	Not enough	Bachelor's degree in IT, IT management
Service Management	12	Enough	Not enough	Bachelor's degree, IT management, IT services, IT audit training
Database Administrator	5	Enough	Not enough	Bachelor's degree, database management & operations
Application Administrator	10	Enough	Not enough	Bachelor's degree, spatial/non-spatial application development
IT Service	10	Enough	Not enough	Bachelor's degree in IT, IT management

(Source: response to the questionnaire by executing agency and interview with executing agency)

With the promotion of OMP by the government, the needs for the preparation of spatial data and its sharing system are increasing. In this project, 10 government agencies were targeted for network connection, but now BIG is aiming for DNN connection of all public institutions (644 institutions). Among them, 244 agencies have already been connected. In addition, there is a strong need for large-scale basic map data, and the president has instructed us to prepare 1/5,000-scale basic map data to cover the whole country by 2024, which will be posted to Ina-Geoportal and BIG plan to enhance the Ina-Geoportal.

The institutional and organizational status to sustain the direct effect caused by this project

[26] Presidential Decree No. 94 (2011)

seems to be in place[27]. On the other hand, the current organization of BIG is not sufficient to meet the growing needs mentioned above. To respond to these needs, various works are expected to increase, such as the support for DNN connection to organizations with insufficient financial and technical capabilities, such as local governments; guidance on how to use the software (please refer to 3.4.2 Technical Aspects of Operation and Maintenance for details); the procurement, the supervision of the process and quality, and the verification of output to produce the nationwide basic 1/5,000-scale map product. It is difficult to handle this variety of tasks with the current number of people, and BIG is applying to the Ministry of Finance to increase their number of staff.

On the other hand, the organization for spatial data utilization and maintenance in each ministry and local government is as follows. It is considered that the organizational status is generally in place.

Table 9: Sufficiency of the number of staff for utilizing and maintaining spatial data in each ministry and local government

Institutions	Sufficiency	Institutions	Sufficiency	Institutions	Sufficiency
Ministry of Agriculture	Sufficient	Ministry of Marine Affairs and Fisheries	Sufficient	Ministry of Agrarian Reform and Spatial Planning	Sufficient
Ministry of Public Works and Settlement	Sufficient	Ministry of Energy and Natural Resources	Insufficient	Ministry of Environment and Forestry	Sufficient
Statistic Agency	N/A	Jakarta DKI	Sufficient	West Java	Sufficient
Medan city	Insufficient	Padang city	Sufficient	Jambi city	Insufficient
Pekanbaru city	Sufficient				

(Source: results of the interviews from each ministry)

3.4.2 Technical Aspects of Operation and Maintenance

In addition to the Project Management Office, the Centre for Topographic Mapping and Toponyms was responsible for producing basic map data (Output 1). The Centre for Management and Dissemination of Geospatial Information was responsible for NSDI network system construction (Output 2). The Centre for Atlas and Spatial Mapping was responsible for supporting regional development plan formulation (Output 3) as a counterpart. They worked together with Japanese consultants and learned methods of updating and constructing data and sharing them with related parties. Even now, they continue to work on expanding the production of basic map data, enhancing the NSDI network system and increasing the number of DNNs. However, well planned capacity building roadmap regarding geo specific IT and ICT skills & IT management is desirable to respond the rapidly increasing needs to the basic map data, which

[27] According to the interview with BAPPENAS

requires the budget allocation but delivers a consistent career path of human resources.

Regarding ministries and agencies, there were no major technical problems with the staff in charge of maintenance of spatial data or in charge of formulation of spatial plans and development plans using the data. On the other hand, the local governments, such as cities and villages, call for training on how to use the installed software and applications. In particular, in order to formulate an entire city development plan using map information, it is necessary that the staff in the different departments dealing with the project all need to be able to use the system (software and application). The strengthening of their technical capabilities was requested. Technical guidance by a visit from BIG and technical support from local academic institutions are also available, but these assistances are not yet sufficient (please refer to 3.4.4 Status of Operation and Maintenance, for details).

3.4.3 Financial Aspects of Operation and Maintenance

The changes in revenue and expenditure from the completion of this project to the time of the ex post evaluation of BIG are as follows.

Table 10: BIG's revenues and expenditures in the past 4 years

(unit: billion Indonesian rupiah)

	2015	2016	2017	2018
Revenue				
Budget for data centre	61.9	102.9	83.8	78.3
Sales of spatial data and maps	0	0	0	0
sub-total	61.9	102.9	83.8	78.3
Expenditure				
Maintenance of hardware	4.0	4.0	4.0	4.0
Maintenance of software	3.1	3.5	13.4	11.0
System operations	0.5	0.5	0.5	0.5
Personnel	--		0.5	0.5
Communication	5.0	5.0	5.0	5.0
sub-total	12.6	13.0	23.4	21.0

(Source: data provided by BIG)

Every year, the expenditures were within the budget for the data centre, and the budget necessary for the operation and maintenance of the current system is secured. Regarding spatial data and map sales, the basic map is no longer on sale because it can be accessed free of charge through Ina-Geoportal, even though it was sold at the time of project planning. BIG had borne the communication cost of connection between the 10 ministries and Ina-Geoportal until 2015.

However, since then, each ministry bears the cost. The main hardware expense item is the purchase of consumables and spare parts. The increased expense for software, especially since 2017, is attributed to the installation and maintenance of the cloud system, local government-friendly software development, license renewals, security software enhancements and others. In addition, it is estimated that 605 million dollars will be prepared for the production of 1/5,000-scale basic map data covering the whole country by raising funds from donors (the donors to be procured are currently under examination). The capacity of the current data centre in BIG will not be sufficient when the nationwide 1/5,000-scale map data are available and the expansion of the number of DNN connections is realized. As of the time of ex post evaluation, under the promotion of ODP, the Indonesian government plans to set up four data centres in the country in the next five years. The expanding spatial data will also be maintained and managed as part of this plan. The budget for setting up these centres is expected to be borne by the Indonesian government and donors (mainly assuming the World Bank). The budget for maintenance will be borne by the Indonesian government.

No specific budget figure was obtained for the 10 ministries and local governments, but all of them use Ina-Geoportal within their own budgets, and no major financial problems were found.

3.4.4 Status of Operation and Maintenance

As mentioned above, the Sumatran basic map data and Ina-Geoportal constructed by this project were utilized, and a regional development plan for Sumatra was also formulated. The outputs of this project are utilized continuously as part of OMP, Indonesia's prioritized policy, and play a role in promoting the policy.

Public agencies at the ministerial level use Ina-Geoportal subject to their own purposes, but many local governments cannot realize DNN connection. For those who hesitated to access Ina-Geoportal due to the cost-wise aspect, BIG encourages them to connect with cloud services and to install the custom application developed from open source geospatial software, named "PALAPA" by BIG. BIG also implements training programs[28] for local governments. However, the city officials cannot master the software with only 2- to 3-day training, and in some cases, the staff who participated in the training are transferred. Due to these reasons, not all local governments can show the effects of improvement of the development plan. Since BIG does not have a regional office, training on how to use the map and spatial data (how to use spatial data and Ina-Geoportal, how to input map data, etc.), and also support needed to formulate spatial

[28] Policy explanations such as of OMP, the role of DNN, explanations of necessary equipment, downloads of free software, instructions on how to map resources to basic diagram data using this software and how to upload basic diagrams to Ina-Geoportal, etc. It is a program of about two and a half days (from the "training program" obtained from BIG).

plans and development plans are conducted with the cooperation of local universities.[29] As such, continuous technical support is necessary to realize concrete effects such as improvement of development plans.[30]

Moreover, aiming to standardize the spatial data, BIG has established procedures to produce the spatial data and their quality standards, to be posted on Ina-Geoportal. In addition, BIG has introduced a certificate system to approve the ability of handling spatial data if certain criteria is satisfied, to foster the human resources. By this way, BIG is working on creating a mechanism for the quality control of spatial data.

The 1/5,000-scale basic map data in high demand will be prepared by an international bid to be held in August-September this year to cover the whole of Indonesia by 2024. BIG has been examining the most realistic technology to be applied for map production which should be chosen, based on three aspects: data quality, time required to produce, and cost. Highest priority was put on time and cost, and the combined technology of aircraft-mounted IFSAR[31] and satellite imagery was chosen for map production[32].

The hardware and software for Ina-Geoportal operation have been maintained and updated with BIG's budget, and are still in use. On the other hand, many of the mini-servers installed in ministries and local governments are not in use at the time of ex post evaluation.

Table 11: Status of mini-server use in each ministry and local government

Status of use	Related ministries, agencies and local governments
In use	Ministry of Environment and Forestry, Jakarta DKI, Padang, Pekanbaru
Not in use	Ministry of Marine Affairs and Fisheries, Ministry of Public Works and Settlement, Ministry of Energy and Natural Resources, Ministry of Agrarian Reform and Spatial Planning, West Java
N/A	Ministry of Agriculture, Statistic Agency, Medan, Jambi

(Source: result of interview by the evaluator)

The reasons why the equipment are not in use are as follows: (1) Documents for transferring materials and equipment were not exchanged, and the ownership was not clear, so a budget for maintenance could not be secured, which prevented the ministries from using the equipment actively. (2) The temperature of the server room was not adjusted accordingly, and the out-of-order equipment was left unrepaired. (3) Servers already owned by the ministry could fulfil the

[29] Such as Surabaya University, Institute of Technology of Bandung, Gadjah Mada University, Udayana University.
[30] According to the interview with BIG officials
[31] This is the abbreviation for interferometric SAR, which is a technology for determining the elevation and fluctuation of terrain using imagery from two synthetic aperture radars.
[32] According to BIG, they plan to produce 1/5,000 basic map data with 25-cm resolution (aspect of quality), 60-100 dollars/km^2 (cost aspect), 885,000 to 1,000,000 km^2/year (timeline aspect). The estimated budget for this project is $605 million. Of these costs, donors are being selected and are expected to bear $565 million.

function originally expected, so they were used instead.

As mentioned above, no major problems have been observed in the institutional/organizational, technical, financial aspects or the current status of the operation and maintenance system. Therefore, sustainability of the project effects is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objectives of this project were to achieve efficient and sophisticated administrative operations, to avoid duplicate investment and work and to formulate provincial-level regional development plans by preparing basic map data of Sumatra island, developing a network system to share national spatial data and support the efficient formulation of regional development plans thereby contributing to improving the national and regional economic development and its governance, managing and developing natural resources appropriately and environmental conservation.

This project is consistent with the Indonesian government's development policy of standardization of spatial data and promotion of national development by sharing spatial data among public institutions. The development need is high, and coherent with Japan's policy. Thus, the relevance is high. Due to a change in scope after starting the project, it was difficult to judge the outcome based on the accomplishment of initially set indicators. However, the achievement of the alternative indicators shows this project is fully utilized, and has had positive impacts such as the improvement of sector planning and development planning. Therefore, the effectiveness and impact are moderate. In addition, this project plays the role of a platform to promote the Indonesian priority policy "One Map Policy". Although it is necessary to continue to strengthen the executing agency's organizational capacity status and secure a budget to meet the increasing need for spatial data, there are no problems in the organization, budget or technical aspects for sustaining the direct effects brought by this project itself; the benefits of this project are expected to continue, so sustainability is high. The project cost was within the plan, but the project period exceeded the plan, so project efficiency is moderate.

In light of the above, this project is evaluated to be satisfactory.

4.2 Recommendations

4.2.1 Recommendations to BIG

Basic 1/10,000 map of Padang and Jambi produced by this project should be provided to both cities to help them to formulate development plans. The reason why the cities cannot utilize the basic map data assumed by the university officials who gave technical guidance to the local

government is that the basic map data in the form of a CD-ROM was not recognized as a map, and it was not handed over to the next person in charge in the rotation of local government personnel. It is recommended to prepare a certificate regarding the transfer of outputs and keep a record of their transfer when the project deliverables are handed over to an organization other than the executing agency.

4.2.3 Recommendations to JICA

None

4.3 Lessons Learned

Flexible response in projects of a sector with rapid technology renovation

ODA cooperation in a sector where technology changes rapidly may result in the content of the initial plan not being appropriate at the actual start of the project. This occurs because the technology has progressed and the business environment changes as the years pass from the formulation of a detailed plan to the start of the project. In this project, after the start of the project, the scope was changed from the originally planned network system of searching spatial data by metadata to a scope including a network system with an excellent user interface. It was a change after the start of the project, and there was a lot of trouble for the people involved, such as adjusting other outputs. However, this change greatly enhanced the sustainability of the project. The government's priority policy (OMP) might be an important factor in the high utilization of the system. But unless the available platform is user-friendly, the increase of network utilization cannot be expected only by the existence of the policy.

Assuming that ODA projects take time from planning to implementation, in case that the cooperation is for the sector with rapid technological changes, it is important to identify the risks and countermeasures to revise the original plan due to changes in the business environment at the time of planning. In addition, if the business environment changes after the start of the business, it is crucial to examine the necessity of project revision, considering the sustainability from a long-term perspective, and respond the situation flexibly.

Comparison of the Original and Actual Scope of the Project

Planned	Actual
① Outputs	
1. Output 1: Production of basic map data of Sumatra Island	
-Basic map data of Sumatra Island (scale: 1/50,000)	
411,000 km^2	303,439 km^2
-Basic map data of 4 local governments (scale: 1/10,000)	
Medan	698.20 km^2
Padang	1003.70 km^2
Jambi	384.42 km^2
Pekanbaru	470.60 km^2
Bandar Lampung	Not produced
Pangkalpinang	Not produced
Bengkulu	Not produced
2. Output 2: Construction of NSDI network system	
-Construction of network to connect BIG and the related government agencies	-Constructed the network with the following changes; 1) Consolidation of server, network and storage equipment for the stable operation and function improvement 2) Construction of network system to accommodate the open source software to promote more number of access of DNN in the future
-Construction of map metadata information searching system utilizing Geo-Portal (GIS software)	-Changed the GIS software to ArcGIS Online and construct a portal site that can directly search spatial data (hereinafter "Ina-Geoportal"), in addition to a search system using metadata. https://tanahair.indonesia.go.id/portal-web
-Strengthening of GIS data centre	-In order to accommodate the above changes in scope, data and storage capacity was increased, resulting in expansion of the data center.
-Construction of recovery centre at the time of disaster (Disaster Recovery Centre, hereinafter referred to as "DRC")	-Constructed on Batam Island
-Capacity development for BIG, related Ministries, agencies and local governments	-As planned
3. Output 3: Support for regional development plan formulation	
-Elaboration of modeling for regional development plan for 5 islands (Java, Bali, Sulawesi, Kalimantan, and Sumatra) and its training	-Elaboration of modeling for regional development plans for 2 islands (Sulawesi, Kalimantan)

4. Output 4: Consulting Service I (hereinafter referred to “CS-I”)	
Detailed design study, preparation of bidding documents, assistance for bidding process and contract, and supervision of the project implementation process and operation for Outputs 1, 2, and 3	-The consulting services are related to Outputs 1 and 2 and were conducted as scheduled. However, the amount of work had increased due to the change in scope of Output 2. -The consulting services related to Output 3 were transferred to CS-II.
5. Consulting Service II (hereinafter referred to “CS-II”)	
-Technical support for BAPPENAS for Output 3 -Training and workshops for local governments and universities in the target area on forming regional development plans	-The nature of the work remains the same, but the amount of work had decreased, with fewer target islands, due to the budget cut caused by the scope change of Output 2.
3) Project period	
March 2007-June 2014 (88 months)	March 2007-April 2015 (98 months)
4) Project cost (million JPY)	
Foreign currency 4,536 million JPY Local currency 2,984 million JPY Total 7,520 million JPY ODA loan portion 6,373 million JPY	Foreign currency 6,210 million JPY Local currency N.A. Total 6,210 million JPY ODA loan portion 6,210 million JPY
5) Final disbursement	
July 2017	