Australia Indonesia Partnership
Kemitraan Australia Indonesia

GIS FOR INFRASTRUCTURE DEVELOPMENT: RECOMMENDATIONS FOR BAPPENAS

INDONESIA INFRASTRUCTURE INITIATIVE

Indonesia Infrastructure Initiative

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NGIS Australia Pty Ltd
Jakarta, August 2009

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ACRONYMS AND ABBREVIATIONS

AMDAL	*Analisis Mengenai Dampak Lingkungan* (Environment Impact Assessment)
BAKOSURTANAL	*Badan Koordinasi Survei dan Pemetaan Nasional* (National Coordinating Agency for Survey and Mapping)
BAPPENAS	*Badan Perencanaan Pembangunan Nasional* (National Development Planning Agency)
BNPB	*Badan Nasional Penanggulangan Bencana* (National Agency for Disaster Management)
BPJT	*Badan Pengatur Jalan Tol* (Toll Road Regulatory Agency)
BPMIGAS	*Badan Pelaksana Kegiatan Usaha Hulu Minyak dan Gas Bumi* (Executive Agency for Upstream Oil and Gas Activity)
BPN	*Badan Pertanahan Nasional* (National Land Agency)
BPPSPAM	*Badan Pendukung Pengembangan Sistem Penyediaan Air Minum* (Water Supply Development Supporting Agency)
BPS	*Badan Pusat Statistik* (Central Bureau of Statistics)
BRTI	*Badan Regulasi Telekomunikasi Indonesia* (Indonesian Telecommunications Regulatory Body)
BUMN	*Badan Usaha Milik Negara* (State-owned Enterprise)
DAK	*Dana Alokasi Khusus* (Specific Allocation Fund)
DAU	*Dana Alokasi Umum* (General Allocation Fund)
DCA	Direct Cash Aid
Depkeu	*Departemen Keuangan* (Ministry of Finance)
Depkominfo	*Departemen Komunikasi dan Informatika* (Ministry of Communication and Informatics)
DesInventar	GIS developed by UNDP using open-source products
DESDM	*Departemen Energi dan Sumber Daya Mineral* (Ministry of Energy and Mineral Resources)
GIS	Geographic Information System
GITA	Geospatial Information & Technology Association
IDSD	*Infrastruktur Data Spasial Daerah* (Regional Spatial Data Infrastructure) (RSDI)
IDSN	*Infrastruktur Data Spasial Nasional* (National Spatial Data Infrastructure) (NSDI)
IFGI	Infrastructure for Growth Initiative
IGOS	Indonesia Goes to Open Source
IndII	Indonesia Infrastructure Initiative
JBIC	Japan Bank for International Cooperation
JDSN	*Jaringan Data Spasial Nasional* (National Spatial Data Network)
JICA	Japan International Cooperation Agency

KDP	*Kecamatan* Development Program
KKPPI	*Komite Kebijakan Percepatan Penyediaan Infrastruktur* (National Committee for the Acceleration of Infrastructure Provision)
KPS	*Kerjasama Pemerintah dan Swasta* (Public Private Partnership) (PPP)
LAPI	*Lembaga Afiliasi Penelitian dan Industri* (Foundation for Research and Industrial Affiliation)
MDGs	Millennium Development Goals
Menkokesra	*Kementerian Koordinator Bidang Kesejahteraan Rakyat* (Coordinating Ministry for People's Welfare)
MoU	Memorandum of Understanding
MPP	*Manual Petunjuk Penggunaan* (Operational Guidelines Manual)
O&M	Operational & Maintenance
Open Source	Software products where source code is available to users and programmers so they can enhance it and build solutions on top of it.
P2DTK	*Program Percepatan Pembangunan Daerah Tertinggal dan Khusus* (Accelerated Program for Development of Special and Undeveloped Regions)
P2KP	*Program Penanggulangan Kemiskinan di Perkotaan* (Urban Poverty Alleviation Program)
PDRB	*Produk Domestik Regional Bruto* (Gross Regional Domestic Product)
PISEW (RISE)	*Pengembangan Infrastruktur Sosial Ekonomi Wilayah* (Regional Infrastructure for Social and Economic Development)
PKPS	*Pusat Kerjasama Pemerintah Swasta* (Public Private Partnership Centre)
PLN	*Perusahaan Listrik Negara* (National Electricity Company)
PNPB	*Program Nasional Penanggulangan Bencana* (National Program for Disaster Recovery)
PNPM	*Program Nasional Pemberdayaan Masyarakat Mandiri* (National Program for Community Empowerment)
PP	*Peraturan Pemerintah* (Government Regulation)
PPIP	*Program Pembangunan Infrastruktur Perdesaan* (Rural Infrastructure Development Program)
PPK	*Program Pengembangan Kecamatan* (Subdistrict Development Program)
PPPD	Public Private Partnership Development
PUSDATIN	*Pusat Data dan Informasi* (Data and Information Centre)
RKP(D)	*Rencana Kerja Pemerintah* (Annual (Regional) Government Work Plan)
RMU	Risk Management Unit
RPJM	*Rencana Pembangunan Jangka Menengah* (Mid-term Development Plan)
RPJP	*Rencana Pembangunan Jangka Panjang* (Long-term Development Plan)
RTRW	*Rencana Tata Ruang Wilayah* (Regional Spatial Planning)
SDM	*Sumber Daya Manusia* (Human Resources)

SIMRENAS	*Sistem Informasi Manajemen Perencanaan Pembangunan Nasional* (National Development Planning Management Information System)
SNI	*Standar Nasional Indonesia* (Indonesian National Standard)
SPADA	Support for Poor and Disadvantaged Areas
UDP	Urban Development Program
UN	United Nations
UNDP	United Nations Development Programme
VPN	Virtual Private Network
WMS	Web Mapping Service

EXECUTIVE SUMMARY

Bappenas is the national agency responsible for coordinating, prioritising, monitoring and independently evaluating development planning at the national level. Bappenas is also responsible for financial arrangements (funding priorities and distribution) for development programs and it has a role to play in supporting rapid response to disasters. In addition, it has a role in ensuring provincial spatial plans comply with national policies.

Recent government and presidential decrees (such as the spatial planning decree) have increased the burden on Bappenas to independently evaluate, monitor and report on projects. Traditional methods of evaluation and prioritisation, that relied on paper maps and hardcopy reports, are no longer viable.

Geographic Information Systems (GIS) have been used throughout the world for over 30 years to support the planning and monitoring activities of infrastructure agencies. "Best practice" infrastructure and development planning now includes GIS embedded into the business processes of an organisation.

To understand how GIS can support the operations of Bappenas, this review was initiated and funded by a technical assistance grant from the Indonesia Infrastructure Initiative (IndII).

Findings:

- GIS is used extensively by planning and infrastructure agencies throughout the world.
- In Indonesia, government agencies are increasingly using GIS to manage their information needs and for analysis and decision support.
- Bappenas's mandate and recent government and presidential decrees leave little alternative for Bappenas but to embrace GIS technologies in conjunction with the other business intelligence systems.
- To do nothing now would mean that Bappenas would fall further behind in its ability to evaluate, prioritise and monitor projects.
- Further, as there are already isolated examples of GIS use at Bappenas, if a coordinated program is not initiated; such examples are likely to multiply, resulting in duplication of effort and data.

Recommendations:

- **We are recommending that Bappenas invest significantly in GIS technology over a period of the next two to four years and develop a long-term, coordinated approach to its implementation. This should be initiated with a series of pilots in the Infrastructure Division to demonstrate the benefits and identify issues that may arise and how they can be resolved.**
- **As other GoI infrastructure agencies also require spatial information to effectively perform their responsibilities, we also recommend that they initiate programs to build their internal capacity to use GIS and share spatial information.**

Indicative Budget:

This report focuses on GIS implementation at Bappenas through a series of pilot projects over six months, followed by increasing the capacity over a period of two to four years. The investment required by Bappenas over this period is between US$1 and US$2 million, to cover hardware, software, additional staff resources, staff training, consulting services and data acquisition. The pilots are estimated to cost about US$210,000 over six months.

The review also considered issues relevant for effective GIS implementation at Bappenas and made

the following recommendations:

- **The Pusdatin should be responsible for the administration and management of all spatial data.**
- **A GIS training program should be developed and implemented for Bappenas staff to cover both technical skills and general GIS understanding and awareness.**
- **Establish a Spatial Secretariat, with the power to make decisions, to oversee and coordinate spatial activities at Bappenas.**
- **Bappenas enters into formal agreements with GoI line agencies to share information.**
- **Bappenas plays a proactive role in the development and implementation of the NSDI.**

Bappenas plays a significant role in development planning in Indonesia. This role is likely to increase. If it is to effectively meet its obligations, it must embrace the use of GIS technology and invest in its long-term implementation. Action now will place it in a favourable position to take advantage of the NSDI when implemented.

During this review, we heard the comment that Bappenas was merely a "compiler" of projects, rather than a "prioritiser." This comment arose from the fact that it was perceived to not have the information or tools to be able to independently evaluate proposals.

If Bappenas seeks to truly prioritise, not just compile, then effective use of GIS technology is essential.

1. BACKGROUND

Bappenas is the national agency responsible for coordinating, prioritising, monitoring and independently evaluating development planning at the national level. Bappenas is also responsible for financial arrangements (funding priorities and distribution) for development programs and it has a role to play in supporting rapid response to disasters. Within Bappenas, the Infrastructure Division is responsible for planning and evaluating the nation's infrastructure needs. Bappenas also has a role in ensuring provincial spatial plans comply to national policies.

To undertake its mandate, Bappenas needs access to reliable and up-to-date information and the tools with which to analyse it. Bappenas is typical of most GoI departments with respect to its acquisition and management of information. Over time, it has developed a number of operational and divisional databases to meet specific needs. This information typically resides in data silos, with the result that it is not easy to integrate the different databases or access them. Evidence from other countries demonstrates that spatial information systems can help improve information use and access. Thus, this review of GIS requirements at Bappenas was initiated, funded by a technical assistance grant from the Indonesia Infrastructure Initiative (IndII). The review is clearly focused on the Infrastructure Division of Bappenas, where the key concerns are:

- importance of communicating infrastructure needs to a wide audience of investors;
- monitoring changes in the economic situation linked to the development of infrastructure;
- monitoring and evaluating the performance of the various infrastructure sectors; and
- the need for up-to-date information, indicators and tools to assist decision makers to monitor current and past infrastructure projects.

1.1 PROJECT OBJECTIVES

- To determine whether a GIS is required in Bappenas to help it fulfil its mandate.
- If so, to recommend options for GIS implementation.

1.2 PROJECT SCOPE

The scope is focused on the Infrastructure Division of Bappenas (Deputi Bidang Sarana dan Prasarana), in particular, the Public Private Partnership (PPP) Directorate. The information use, technical capacity and GIS potential of the Infrastructure Division was reviewed in detail. In so doing, its relationships with counterparts in other divisions within Bappenas and other GoI line agencies were evaluated. While options and recommendations are specific to the Infrastructure Division, they are made in such a way that they are relevant to all of Bappenas.

1.3 PURPOSE OF THE DOCUMENT

This report explains why Bappenas will benefit by investing in GIS technology and it describes an approach for implementation. It does not cover information contained in the Situational Analysis, which is included as Appendix H.

2. GIS & INFRASTRUCTURE

2.1 WHAT IS GIS?

GIS is technology that links information about a feature or asset (such as a road, land parcel or land use type) to its geographic location. The power of a GIS comes from its ability to relate different information in a spatial context and to reach a conclusion about this relationship. Most of the information we have about our world contains a location reference, placing that information at some point on the globe. When rainfall information is collected, it is important to know where the rain is falling. Comparing the rainfall information with other information, such as the types of land cover (porous or impervious) and steepness of the terrain, may show which areas are prone to local flooding. This fact may indicate that roads in the vicinity should be constructed above the minimum flood level to ensure they are passable during heavy rain. This inference can assist with decisions about road construction and routes in areas subjected to flooding during heavy rain. A GIS, therefore, can reveal important new information that leads to better decision making.

GIS has been used to support infrastructure planning for more than 20 years. This is not just true for developed countries but there are numerous examples in developing countries in Asia and Africa, where GIS has improved the effective distribution of the limited resources available for infrastructure projects. Nor is it true for only transportation networks–power and water utilities, airports and seaports are becoming some of the more advanced users of GIS for managing their operations. There would be few government agencies not using GIS. In the USA, GIS was recently used to help allocate funds for the infrastructure stimulus package prepared to stimulate the shrinking economy there.[1] In fact, GIS is ubiquitous in transport, utilities, telecommunications, planning and infrastructure agencies worldwide as a decision support tool, to the point that it is now just a component of mainstream information management along with financial, statistical and scheduling packages.

Typical scenarios where GIS can support infrastructure planning include:

- evaluation of options (for example, costs of road versus rail networks);
- route location – by analysing and modeling environmental and social factors that may impact a road route. This information can be used to develop cost surfaces which calculate the cost of different routes;
- modelling of water supply and irrigation options;
- modelling population and power supply to develop options for future power generation;
- management of ports via real time tracking of boats;
- congestion management through access to real-time traffic information;
- improved maintenance through condition surveys;
- safety management through access to accident information and associated data (such as road conditions, weather, traffic); and
- providing the “big picture”.

For further information on the use of GIS for infrastructure planning, operations and maintenance, the Geospatial Information & Technology Association (GITA) has a range of publications.[2] Appendix A also describes GIS in more detail.

[1] http://surveying-mapping-gis.blogspot.com/2009/01/stimulus-and-infrastructure-planning.html
[2] http://www.gita.org/

2.2 GIS AND BAPPENAS

- Bappenas is responsible for formulation of development planning, coordination, monitoring and evaluation at the national level. Bappenas is also responsible for financial arrangements (funding priorities and distribution) for development programs, in conjunction with the Ministry of Finance. This is enshrined in government regulations and presidential decrees (refer to Situational Analysis Report, Section 2.1.1). It is required to independently assess development proposals and prioritise them. This is presently carried out with limited information and without knowing the inter-relationship between projects.

- In addition, Presidential Decree No. 26/2008 requires that spatial planning be integrated at the national level. Bappenas has the responsibility to ensure that the spatial plans developed by provincial and district governments are integrated and compatible and comply with national policies. This is an overwhelming task and one that is almost impossible to achieve without the use of GIS.

The Situational Analysis (delivered on 31 July 2009 – refer to Appendix 8) found that:

- Bappenas needs a wide range of information to be able to independently evaluate proposals. This information typically comes from the proposer and Bappenas does not have the time, resources or skills to acquire additional information. This potentially compromises its ability to deliver independent appraisals. In addition, each directorate collects and maintains the data it requires to carry out its duties. This has resulted in a large number of disparate databases (or data silos) and duplication of data and effort. Typically these data are not managed using best practice procedures, are unknown to other sections of Bappenas and, hence, there is little opportunity for data sharing. Recognising this, Bappenas is in the process of implementing an integrated decision support and data management system. Spatial information needs to be included in this solution.

- Most of the information used by Bappenas comes from other government agencies. The upside of this is that Bappenas does not need to embark on a major data acquisition program. The downside is that agreements need to be reached between Bappenas and each government agency regarding data sharing. At times Bappenas will require additional information and its staff need the skills to obtain it directly from such sources as satellite imagery or by using GPS.

- Recent government and presidential decrees have increased the burden on Bappenas to locate, evaluate, prioritise, coordinate, monitor and report on projects. Proposals can no longer be appraised in isolation to one another but rather their inter-relationship needs to be understood. This is particularly true when developing the RPJM, RKP and PPP plans. Traditional methods of evaluation and prioritisation, that relied on paper maps and hardcopy reports, are no longer viable. Throughout the world, planning authorities are increasingly using GIS to support "best practice" development planning. While there are a few isolated instances of GIS use at Bappenas, there are limited skills and the GIS solutions developed are typically uncoordinated and duplicated data and effort. A coordinated and staged approach to the use of spatial information and technologies will significantly improve the capacity of Bappenas to meet its analysis, evaluation and reporting requirements.

- Many of the government agencies from which Bappenas obtains data (Ministry of Public Works, Ministry of Transport, PLN, Bakosurtanal) operate GIS systems and can provide the information in digital format. A recent presidential decree (No 85/2007) places the responsibility to collect, maintain and disseminate national information clearly with the government agency responsible for the information. This means that there is an obligation for government agencies to share information with each other at no or minimal cost. The National Spatial Data Infrastructure (NSDI) program, currently in the design phase, will (in theory) make much of this spatial data available online or via VPN. Consequently, in the near future, more data will be available to Bappenas and it needs to prepare so that it can access and use these data.

2.3 GIS AND GOI LINE MINISTRIES

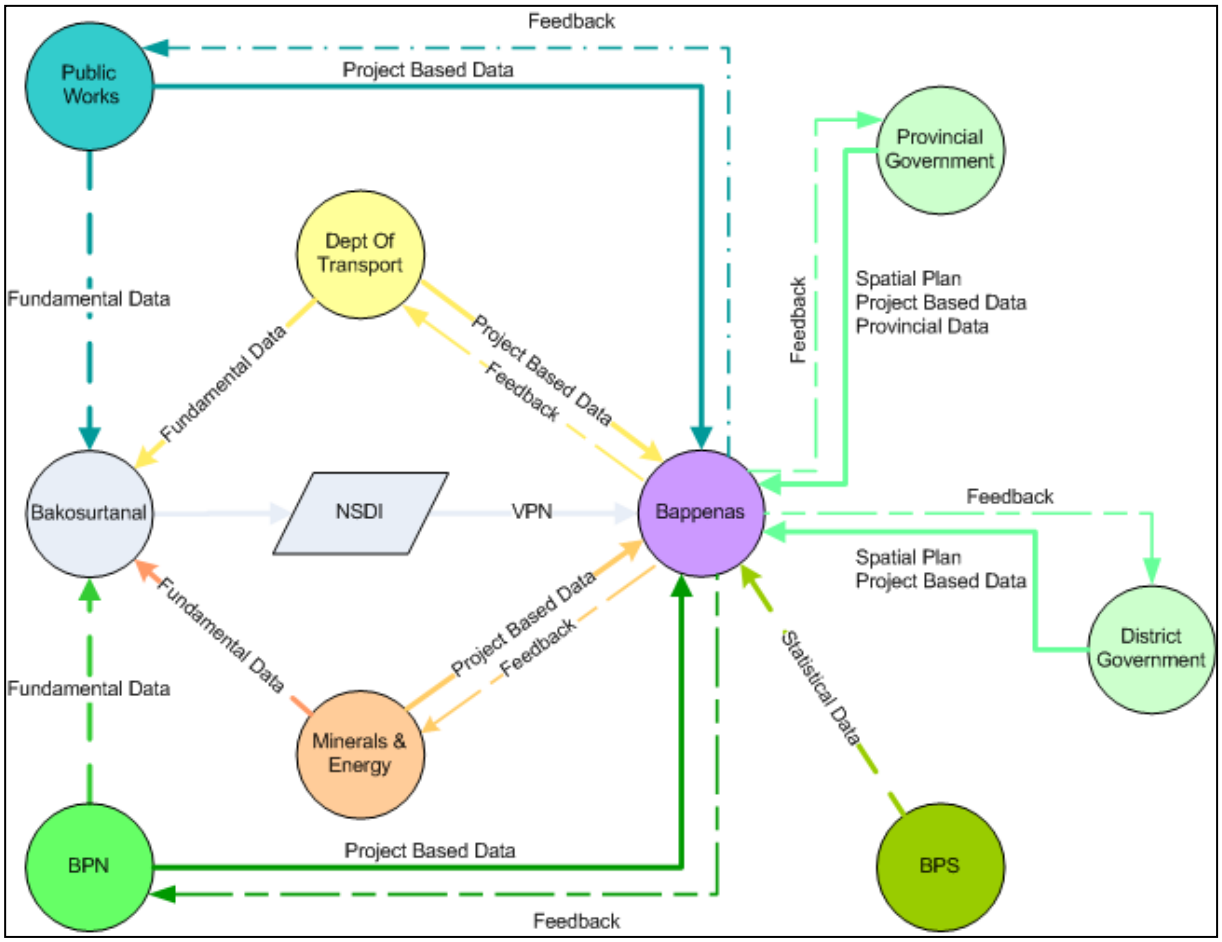
The Situational Analysis Report identified some of the GoI line ministries that are using GIS. These include Ministry of Transport, Ministry of Public Works, PLN, Ministry of Energy and Mineral Resources (DESDM) and Bakosurtanal. Some agencies are more advanced in their use and internal expertise than others. Table 1 compares GIS at government agencies from which Bappenas receives data. Despite being a planning agency that must analyse and integrate information, GIS is less used at Bappenas than at most other GoI line agencies. The NSDI initiative (described above) will enable GoI agencies to better share and access spatial information. This, in turn, will lead to an increased capacity to create and use spatial data.

Table 1. GIS Use & Capabilities at Some GoI Government Agencies.

GoI Department	GIS Use	GIS Capability
Ministry of Transport	Medium	Intermediate
Ministry of Public Works (PU)	Medium	Intermediate
National Electricity Company (PLN)	Medium	Intermediate
Ministry of Energy & Minerals (ESDM)	Medium	Intermediate
Bakosurtanal	Extensive	Intermediate/Advance
Central Bureau of Statistics (BPS)	Low	Low
Bappenas	Low	Low

As the capacity to use GIS increases at the line agencies, so will its effectiveness to plan and monitor infrastructure projects. Fundamental to this is having access to reliable datasets, hence the importance of the NSDI initiative. In the meantime, line agencies and, indeed, provincial agencies, require support to improve their data capture and management programs and to build the capacity to use spatial technologies. As Figure 1 shows, Bappenas is reliant on information from other government agencies and, in turn, it is in a position to provide feedback and updated information back to the line agencies regarding project evaluation and monitoring.

Figure 1. Dataflow Among Bappenas & GIS Agencies



The ultimate aim is to integrate GIS with the work practices and business processes of an organisation to the extent that they may not even know they are using spatial technologies to undertake a given task–it operates in the background. Before this can occur, the business processes need to be fully understood and mapped, the information required to support them acquired and validated and applications built that automate these processes. Even in countries that have been using GIS for a decade or longer, this is not always understood or implemented.

In Indonesia, the focus remains on gathering reliable datasets, facilitating access to these data and building the capacity to use it for planning, monitoring and evaluation.

2.4 RECOMMENDATIONS

Findings:

- GIS is used extensively by planning and infrastructure agencies throughout the world.
- In Indonesia, government agencies are increasingly using GIS to manage their information needs and for analysis and decision support.
- Bappenas's mandate and recent government and presidential decrees leave little alternative for Bappenas but to embrace GIS technologies in conjunction with the other business intelligence systems.

- To do nothing now would mean that Bappenas would fall further behind in its ability to evaluate, prioritise and monitor projects.
- Further, as there are already isolated examples of GIS use at Bappenas, if a coordinated program is not initiated, these are likely to increase, resulting in duplication of effort and data.

Recommendations:

- We recommend that Bappenas invest significantly in GIS technology over a period of the next two to four years. This should be kicked off with a series of pilots in the Infrastructure Division to demonstrate the benefits and identify issues that may arise and how they can be resolved.
- As other GoI infrastructure agencies also require spatial information to effectively perform their responsibilities, we also recommend that they initiate programs to build their internal capacity to use GIS and share spatial information.

Indicative Budget:

This report focuses on GIS implementation at Bappenas through a series of pilot projects over six months, followed by increasing the capacity over a period of two to four years. The investment required by Bappenas over this period is between US$1 and US$2 million, to cover hardware, software, additional staff resources, staff training, consulting services, data acquisition and a fact finding tour to Australia for senior Bappenas staff to see first-hand how GIS is used for infrastructure planning (see Table 2). The pilots are estimated to cost about US$210,000 over six months. See Appendix B for budget breakdowns.

Table 2. Broad Breakdown of Expenditure Required to Implement Corporate GIS

	US$	US$
Hardware	150,000	200,000
Software	50,000	200,000
Staff costs	300,000	600,000
Training	50,000	100,000
Consultants	200,000	400,000
Other	250,000	500,000
TOTAL	**1,000,000**	**2,000,000**

Annual costs, to cover software maintenance, training and consumables are likely to be between US$50,000 and US$100,000, depending on what software is purchased.

3. IMPLEMENTATION APPROACH

This section describes the GIS implementation approach recommended for Bappenas.

3.1 VISION

Ultimately, the vision for GIS use within Bappenas is:

All Bappenas staff have access to spatial data to assist them with their operational activities and these data will come from a single point of truth.

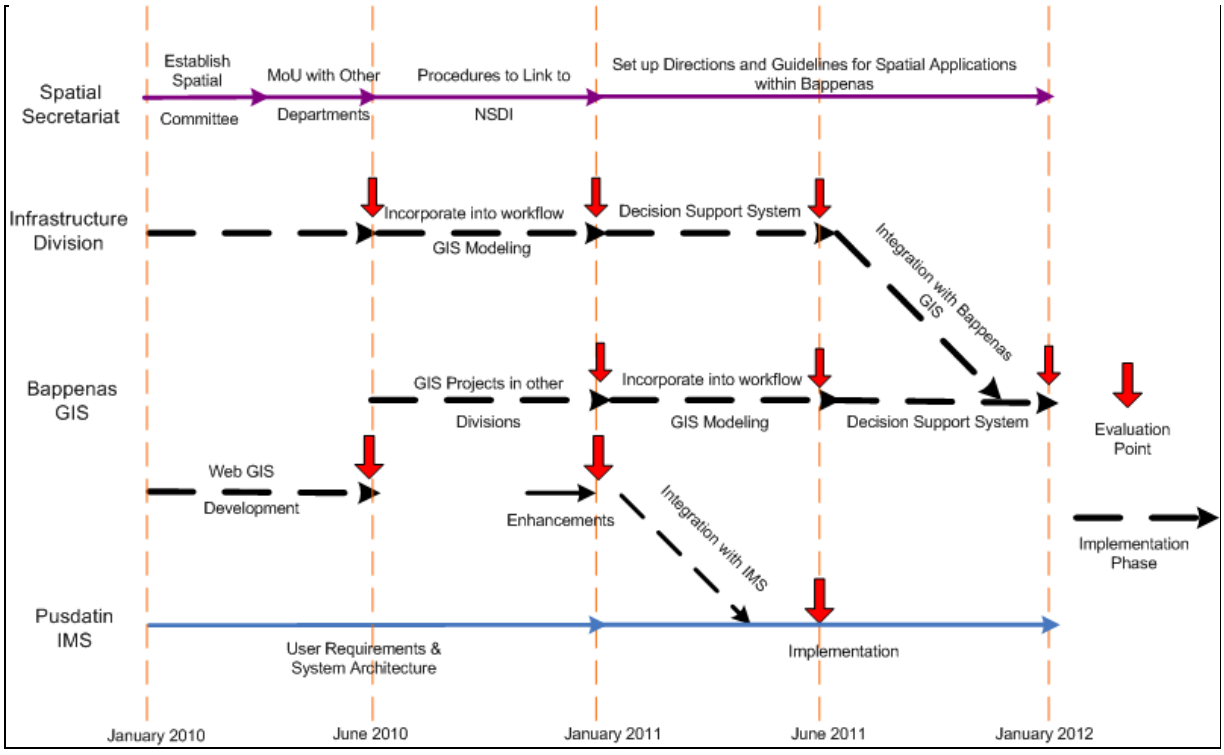
The vision implies that access to spatial information for staff will be through an internal web-mapping application, the spatial data will be stored in a central location and managed using "best practice" procedures to ensure data are not duplicated and that staff at Bappenas have the skills and tools to manipulate and analyse the data.

3.2 IMPLEMENTATION TIMEFRAME

It is recommended that this vision be implemented in a staged approach over a period of two to four years. This will enable Bappenas to build internally the skills required, develop data sharing agreements with GoI line agencies, develop and test data management procedures, demonstrate the benefits of GIS and evaluate the process at appropriate points.

The first six months consists of software and hardware acquisition, training and pilot projects in the Infrastructure Division. The following six months repeats these activities across other divisions. In the following years, GIS should be integrated into Bappenas activities, providing decision support. Figure 2 also shows the timing and features of the GIS implementation.

Figure 2. Implementation Plan



3.3 PILOTS

It is recommended that implementation commence with pilot projects in the Infrastructure Division. These pilots demonstrate the benefits of GIS for a number of Bappenas activities (monitoring, evaluation, analysis and prioritisation), incorporate staff skills development, include a variety of data acquisition actions and introduce "best practice" spatial data management.

Five pilot projects have been identified; one for each directorate within the Infrastructure Division. These pilots are described in detail in Appendix G. The pilots will highlight benefits and challenges associated with using spatial data.

Benefits include:

- knowing where all the proposed and existing projects are located;
- ability to undertake independent evaluations;
- more accurate post-implementation monitoring;
- improved ability to prioritise projects;
- improved capacity to understand inter-relationship of projects;
- improved ability to analyse the impact of projects and recommend options;
- better governance through a clear audit trail;
- agreements in place regarding inter-agency data sharing; and
- cost savings.

Some of the challenges that will, hopefully, be resolved include:

- issues associated with obtaining data from other agencies;
- need to independently acquire data;
- how data will be shared and accessed across Bappenas;
- dealing with unrealistic expectations; and
- inadequate GIS skill levels of staff.

Prior to the completion of the pilots, an evaluation will be undertaken and lessons learned from the pilots will be used in the whole of Bappenas GIS implementation.

3.4 HUMAN RESOURCE REQUIREMENTS

Additional personnel are required to manage and implement the six-month capacity building program and pilots. They are:

- International GIS Expert – to coordinate activities, assist with change management and carry out formal and on-the-job training;
- National GIS Database Specialist – to develop and implement the data model, acquire data and populate database, develop data management procedures and train staff; and
- National Web GIS Developer – to develop corporate web mapping interface, in conjunction with *Pusdatin*.

Job descriptions for these personnel can be found at Appendix F. Initially, they will be based in the Infrastructure Division. It is recommended that, providing performance is satisfactory, the two national staff be engaged by Bappenas after the pilots are completed, to be based with the *Pusdatin*.

3.4.1 GIS Skills Development

GIS skills and knowledge among Bappenas staff is limited and varies among directorates. Some staff have received formal GIS training, others have acquired it on-the-job. Most of those with some training had not used GIS for at least a few years. Expectations of what GIS can achieve are also varied, some staff having unrealistic concepts, seeing GIS as a cure for all problems, others have the view that it is not needed at Bappenas. A series of GIS training courses will be required to build the capacity of Bappenas staff and management to use GIS and understand its potential. Appendix E identifies a recommended training program.

3.5 GOVERNANCE

Evidence from other countries clearly demonstrates that a group coordinating GIS activity within an organisation contributes to a successful GIS implementation. As there are already isolated instances of GIS use at Bappenas, such a group is urgently needed.

Consequently, we recommend the establishment of a "Spatial Secretariat" to coordinate spatial activities. This secretariat would have responsibility for:

- developing, implementing and auditing data management policies and guidelines;
- approving spatial software;
- coordinating training;
- coordinating development of GIS applications;
- liaising with other GoI agencies to develop data sharing agreements;
- representing Bappenas on NSDI implementation;
- providing technical direction on the adoption of new technologies; and
- reviewing the success of GIS implementation at Bappenas

To be effective, the secretariat should be made up of senior staff at Bappenas who have the authority to make decisions. It should include representatives from:

- *Pusdatin*
- Infrastructure Division
- Regional Development Division
- Poverty Alleviation Division
- Performance Evaluation Division (Disaster Response)

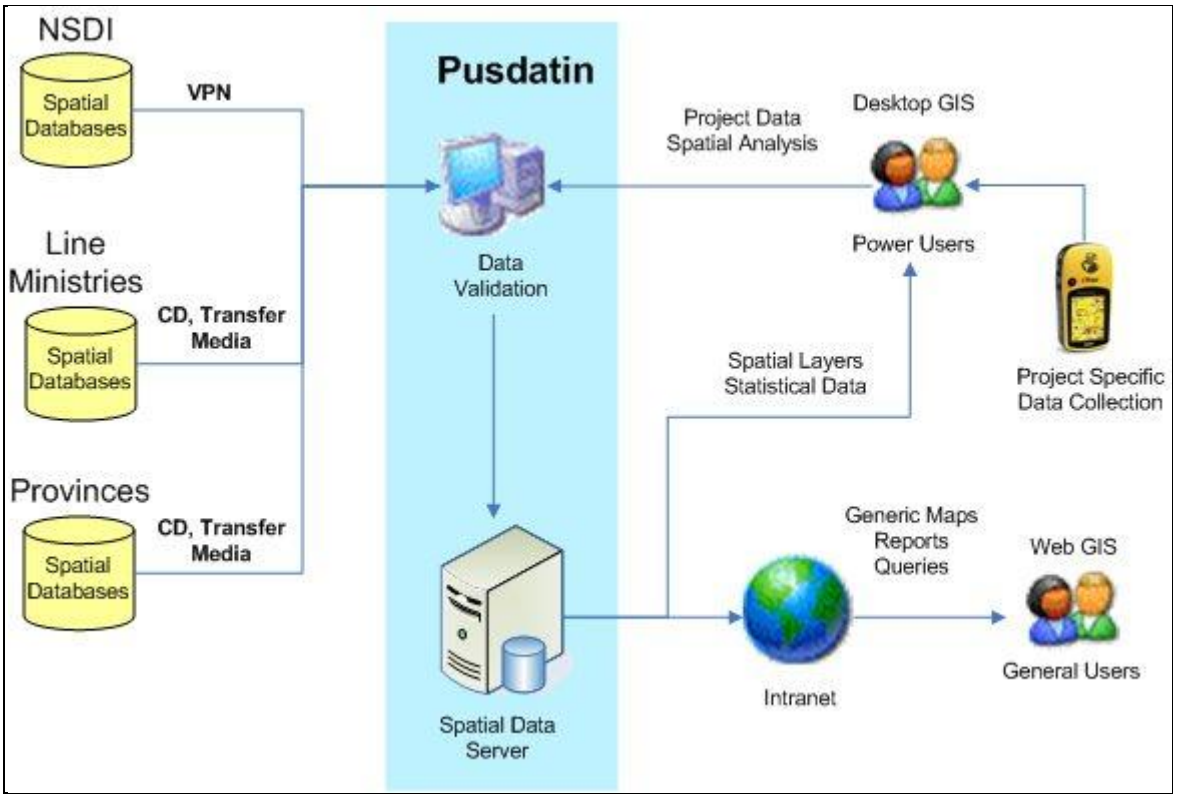
3.6 DATA ACQUISITION & MANAGEMENT

The pilots rely on information being provided from a number of other GoI agencies. Critical to the success of GIS implementation at Bappenas is the development of agreements with these government agencies to provide spatial data in digital format. The pilots provide the opportunity to develop these agreements, similar to MoU between Bappenas and BPS currently being negotiated.

Once received at Bappenas, the spatial data needs to be reviewed and approved by the *Pusdatin* (Spatial Data Manager) for completeness and metadata. The data is then submitted for inclusion on the spatial data server for use by Bappenas staff and for publication.

From time to time, project specific data will be acquired by Bappenas staff to model and analyse a specific project. Once this process is completed, the data should be validated and stored on the spatial data server, in a similar manner to that required for data obtained directly from government sources. Figure 3 describes this process.

Figure 3. Recommended Data Management Process



We recommend that the *Pusdatin* should be responsible for the administration and management of spatial data, together with their responsibility for nonspatial data. The responsibility for data content should, however, remain with the data custodians (the creators or suppliers of the data).

We also recommend that a full-time Spatial Data Manager be engaged by Bappenas, initially based at the Infrastructure Division but after the pilots to be moved to the *Pusdatin*. A position description for this role can be found at Appendix E.

As part of the pilots, some information (such as RKP, PPP and loan projects) will be converted from hardcopy format to a database linked to features in the GIS. Once complete, this information will be provided to the *Pusdatin* for management and publishing.

Furthermore, as part of the pilots, Infrastructure staff may need to generate new data from GPS field surveys or from remote sensing. Again, these data will be provided to the *Pusdatin*.

3.7 NSDI

Bakosurtanal is leading the implementation of NSDI. A current initiative is the planned development of VPN access for 11 national government agencies so they can share spatial data via Web Mapping Services (WMS). Once this is operational, much of Bappenas's data needs will be met through this service. However, there remains uncertainty regarding the timing and data to be provided.

Consequently, it is recommended that Bappenas develop inter-department agreements, in the interim. Nevertheless, Bappenas should be proactive in supporting this initiative and guiding its direction.

4. BENEFITS & RISKS

4.1 BENEFITS

Bappenas's mandate requires it to prepare new five-year plans (RPJM), evaluate previous RPJMs, prioritise projects for implementation and identify suitable funding models. This is currently achieved by relying on information provided to them in a variety of hardcopy documents and through limited field investigations. They are frequently unable to verify the information that has been provided and project evaluations are undertaken in isolation of one another.

GIS is a tool that provides information integration, as well as analysis, and can provide access to corporate information through a single point. The benefits it provides to Bappenas are identified in Table 3 against some of the major activities undertaken by Bappenas.

Table 3. Benefits of GIS for Bappenas

Activity	Benefit
Project Evaluation and Monitoring	• More accurate information coming from source agencies • Integration of information acquired by different methods (from agencies, through field trips, imagery) • Evaluations are more credible and auditable • Process is quicker and more effective • More effective monitoring of post-project benefits • Ability to undertake independent reviews of projects
Project Planning and Identification	• Identify areas where projects are required (gaps) • Understand regional impacts of projects • Ability to see "whole picture" and make more informed decisions
Project Prioritisation	• Ability to see and understand inter-relationship of projects (based on location) • Understand whether projects complement or conflict with one another • Identify where there are gaps • Fosters good governance processes
Funding and Promotion	• Easy access to information for stakeholders • Potential partners can see the complete picture • Improved public participation
Spatial Planning	• Improved compliance with regulations • Integration of spatial plans from provinces • Identify inconsistencies

Activity	Benefit
Disaster Response	• Improved response times • More accurate assessments of damage and impacts • More reliable decisions
Corporate	• "Single point of truth" that is used throughout Bappenas, resulting in more reliable decisions • Less duplication of data and effort • Improved data management • Improved quality of reports • Increased sharing of information among directorates • Elimination of data silos • Improved ability to "discover" data available • Greater productivity from existing staff • Fosters inter-agency collaboration • Reduction of long-term costs • GIS provides a platform on which business applications can more readily be built

4.2 RISKS

No project is without risks and there are a number that may hinder and constrain the implementation of GIS at Bappenas if they are not identified and contingency plans developed. Some of these risks are beyond the scope of Bappenas, yet their impact needs to be considered. Table 4 below identifies some of the risks, their potential impact and proposed mitigation actions.

Table 4. Risks

Risk	Impact	Action
Ability to share information within Bappenas	High	• Develop and implement guidelines for better data management • Successful pilot projects to identify benefits
Protectiveness of some directorates with respect to what they have and what they are doing	Medium	• Clear directives from senior management • Successful pilot projects to identify benefits • Role of Spatial Secretariat
Availability of data from other agencies in appropriate formats.	High	• Continue to develop mutually beneficial relationships with key agencies • Provide information back to agency, where appropriate

Risk	Impact	Action
Low level of GIS skills and understanding at Bappenas	Medium	• Training needs assessment required • Ongoing training programs need to be implemented
Expectations too high	Medium	• Workshops on GIS for senior management
Integration with new Integrated Management System (IMS) not successful	Medium	• Spatial architect needs to be engaged at beginning of project to ensure spatial issues are considered when designing IMS architecture
NSDI not implemented	High	• Bappenas staff should be actively involved in this initiative to help drive its delivery • Develop agreements with key government agencies to share data

4.3 COST BENEFITS

It was not within the scope of this review to analyse cost-benefits for Bappenas in detail. However the following observations are made:

- International research indicates that an investment in GIS technology produces a 4:1 benefit.[3] That is, for every US$1 invested, there is a benefit of US$4 in terms of improved efficiencies, revenue generated and better decisions.
- Bappenas's annual operating budget is about US$40M (2009).[4] A 0.1 percent improvement in efficiencies will save it US$400,000 each year. This is greater than the annual investment required in GIS.
- Projects that require nongovernment funding can be financed through loans, grants or private partnership. The Public Private Partnership Centre (PKPS) reviews project suitability for private funding before commissioning detailed feasibility studies. In the case of Kertajati airport proposal, the actual cost of a comprehensive feasibility study is about US$1 million. Therefore, it is paramount to evaluate the proposal prior to commissioning a feasibility study. GIS can support this pre-feasibility evaluation, potentially saving millions of dollars if the need for costly feasibility studies is negated.

[3] Korte, George. 1996. "Weighing GIS Benefits with Financial Analysis." *Government Finance Review*, October, p. 49-52.(and also in *GIS World*, July 1996, p. 48-52).

[4] http://www.inilah.com/berita/ekonomi/2009/06/09/114028/bappenas-targetkan-serap-anggaran-95/

5. SUMMARY & RECOMMENDATIONS

Recent government and presidential decrees (such as the spatial planning decree) have increased the burden on Bappenas to locate, evaluate, prioritise, coordinate, monitor and report on projects. Traditional methods of evaluation and prioritisation, that relied on paper maps and hardcopy reports, are no longer viable. Throughout the world, planning authorities are increasingly using GIS to support "best practice" infrastructure and development planning. A coordinated and staged approach to the use of spatial information and technologies will significantly improve the capacity of Bappenas to meet its analysis, evaluation and reporting requirements.

Recommendation 1: Bappenas develops a staged plan to implement a corporate GIS.

When a large organisation first implements GIS, best practice suggests that it is most effectively achieved through pilot projects. Pilot projects demonstrate the benefits of GIS and identify and resolve issues that may arise prior to a full implementation. Pilot projects are cheaper to implement, provide "quick wins" and minimise project risks.

Recommendation 2: The GIS implementation should commence with pilots in the Infrastructure Division.

Effective data management is essential for effective use of spatial data. There should be a single "point of truth" for each dataset. Information created by Bappenas directorates needs to be available to other sections of Bappenas from a central location. The *Pusdatin* is well placed to manage the spatial data and to ensure "best practice" management procedures are in place and enforced.

Recommendation 3: The Pusdatin should be responsible for the administration and management of all spatial data.

Additional human resources will be required to carry out the pilots and for ongoing data management and application development. These include an international GIS database expert and local staff to fulfil GIS Web development and GIS data management roles. It is expected that there will be sufficient work to continue the engagement of the national staff after the completion of the pilots. They should be located with the *Pusdatin*.

Recommendation 4: A GIS web developer and GIS database manager should be engaged for the pilots and retained thereafter, located with the Pusdatin.

Recommendation 5: An international GIS expert should be engaged for a period of six months to support the GIS implementation and change management.

GIS skills and knowledge among Bappenas staff is limited and varies among directorates. Expectations of what GIS can achieve is also varied, some staff having unrealistic concepts, seeing GIS as a cure for all problems, others have the view that it is not needed at Bappenas. A range of GIS training is required for Bappenas staff and management. This includes technical training as well as awareness workshops. On-the-job training should also be provided.

Recommendation 6: A GIS training program should be developed and implemented for Bappenas staff to cover both technical skills and general GIS understanding and awareness.

Evidence from other countries clearly demonstrates that a group coordinating GIS activity within an organisation contributes to a successful GIS implementation. Consequently, we recommend the establishment of a "Spatial Secretariat" to coordinate spatial activities. This secretariat would have responsibility for policies, technical direction, resource requirements and liaising with other GoI agencies. To be effective, the secretariat should consist of senior staff from a range of divisions at Bappenas and who have the authority to make decisions.

Recommendation 7: Establish a Spatial Secretariat, with the power to make decisions, to oversee and coordinate spatial activities at Bappenas.

Bappenas receives most of its data from other government agencies. This is currently done in an informal manner and usually pertains to hardcopy information. GIS requires digital information and agreements are required between Bappenas and other GoI line agencies to share information. It is a matter of some urgency that these agreements are put in place.

Recommendation 8: Bappenas enters into formal agreements with GoI line agencies to share information.

It is important that Bappenas plays a proactive role in the development of the NSDI. Once the NSDI is in place, data acquisition for Bappenas will be much easier, quicker and cheaper.

Recommendation 9: Bappenas plays a proactive role in the development and implementation of the NSDI.

ANNEXES

ANNEX 1: GIS DEFINITION & EXAMPLE

What is GIS?

A GIS is a computer system capable of capturing, storing, analysing, and displaying geographically referenced information; that is, data identified according to location. Practitioners also define a GIS as including the procedures, operating personnel, and spatial data that go into the system.

GIS allows us to view, understand, question, interpret, and visualise data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts.

A GIS helps you answer questions and solve problems by looking at your data in a way that is quickly understood and easily shared.

More and more frequently, GIS technology is integrated into enterprise information system frameworks.

How does a GIS work?

Relating information from different sources

The power of a GIS comes from the ability to relate different information in a spatial context and to reach a conclusion about this relationship. Most of the information we have about our world contains a location reference, placing that information at some point on the globe. When rainfall information is collected, it is important to know where the rain falls. This is done by using a location reference system, such as longitude and latitude, and perhaps elevation. Comparing the rainfall information with other information, such as the location of marshes across the landscape, may show that certain marshes receive little rainfall. This fact may indicate that these marshes are likely to dry up, and this inference can help us make the most appropriate decisions about how humans should interact with the marsh. A GIS, therefore, can reveal important new information that leads to better decision making.

Many computer databases that can be directly entered into a GIS are being produced by governments, private companies, academia, and nonprofit organisations. Different kinds of data in map form can be entered into a GIS (Figures 1a, 1b, 1c, 1d, 1e, 1f, and 2). A GIS can also convert existing digital information, which may not yet be in map form, into forms it can recognise and use. For example, digital satellite images can be analysed to produce a map of digital information about land use and land cover (Figures 3 and 4).

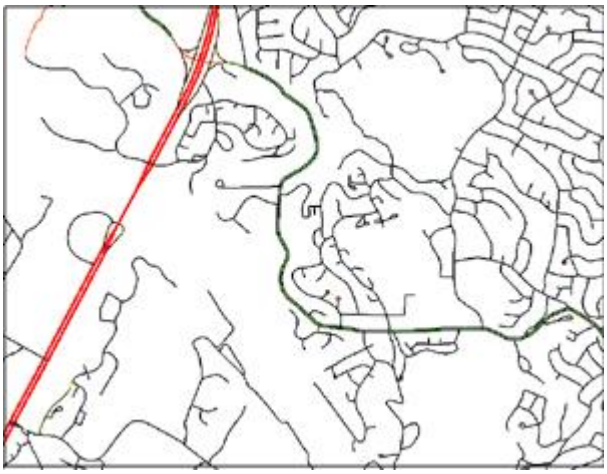


Figure 1a. Road Network

Figure 1b. Hydrology

Figure 1c. Contours

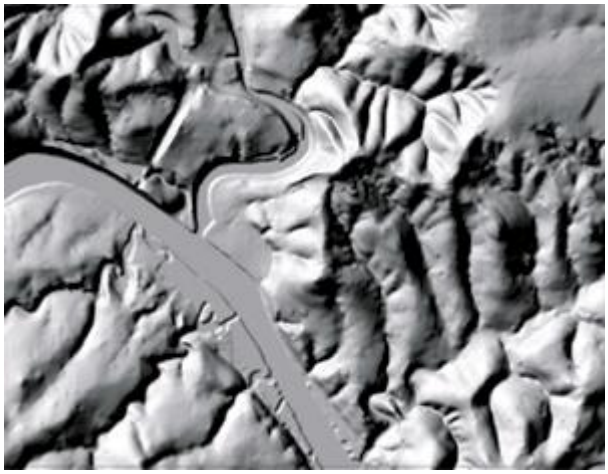


Figure 1d. Digital Elevation Model

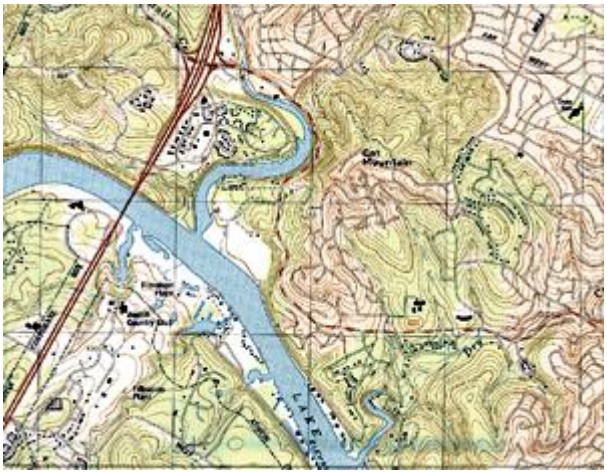


Figure 1e. Scanned topographic map

Figure 1f. Digital orthophoto

Figure 2. Geologic map.

Figure 3. Landsat 7 satellite image from which land cover information can be derived

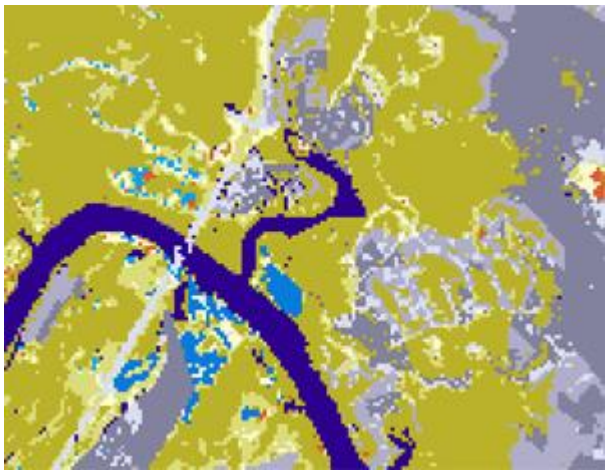


Figure 4. Satellite image data in figure 3 have been analysed to indicate classes of land uses and cover.

ANNEX 2: BUDGET BREAKDOWNS

GIS Implementation at Bappenas: Budget for Six-month Pilots

Item	Number	Unit Price (US$)	Total (US$)	Comment
Hardware				
Desktop computers	5	2,000	10,000	Required for ArcGIS licences
Server	1	5,000	5,000	
A3 printers	1	5,000	5,000	
GPS units	3	300	900	Required for field work and training
Subtotal Hardware			**20,900**	
Software				
ArcGIS ArcView 9.3.1	5 licences	2,100	10,500	
Spatial Analyst Extension	1 licence	3,500	3500	
MapWindow Open Source Desktop GIS	10 licences	0	0	Existing computers should be adequate
MapServer web mapping application	1 licence	0	0	
Total Software			**14,000**	
Staff Resources				
International GIS expert (includes fee, travel, living expenses)	1		105,000	4 months intermittent.
National experts (GIS Database; Web Mapping)	2 for 6 months		25,000	
Total Staff Resources			**130,000**	
Capacity Building				
Training	3-4 courses		15,000	Formal GIS, GPS, RS courses
Field trips			9,000	For data collection and training
Total Capacity Building			**24,000**	
Other Project Expenses				
Consumables, communication, reports			9,500	
Contingencies			10,000	
Total Other Expenses			**19,500**	
TOTAL			**208,400**	

GIS Implementation at Bappenas: Budget for Four Years (Excluding Pilot Expenses)

Item	Number	Unit Price (US$)	Total (US$)	Comment
Hardware				
Desktop computers	20	2,000	40,000	Required for ArcGIS licences
Server	2	5,000	10,000	
A0 plotter	4	10,000	40,000	
A3 printers	5	5,000	25,000	
GPS units	20	300	6,000	Required for field work
Subtotal Hardware			**121,000**	
Software				
ArcGIS ArcView 9.3.1	20 licences	2,100	42,000	Less if open-source products used
Extensions (Spatial Analyst, 3D Analyst)	4 licences	3,500	14,000	
ArcGIS Server	1 licence	100,000	100,000	Optional – there are other cheaper alternatives
Software maintenance	3 years	30,000	90,000	Usually 20% of software price
MapWindow Open Source Desktop GIS	30 licences	0	0	If open-source products are used, desktop software prices decrease
MapServer web mapping application	1 licence	0	0	
Total Software			**246,000**	
Staff/Consulting Resources				
Bappenas staff	150 staff months		150,000	Additional Bappenas staff required
National experts	100 staff months		200,000	On-site for up to 4 years
Implementation consulting (local and international)			240,000	Support ArcGIS Server (or similar) implementation
Total Staff Resources			**590,000**	
Capacity Building				
Training	12 courses		55,000	Formal GIS, GPS, road safety courses
Field trips			20,000	For data collection and training
Fact Finding Trip			22,000	For up to 6 Bappenas staff
Total Capacity Building			**97,000**	

Item	Number	Unit Price (US$)	Total (US$)	Comment
Other Project Expenses				
Consumables, data, imagery, communication, reports			220,000	
Contingencies			200,000	
Total Other Expenses			**420,000**	
TOTAL			**1,474,000**	

Notes on Budget:

- Recurrent costs are included in the budget and include:
  - Software maintenance of approximately US$30,000 per year. This could be less if more open-source and less ESRI products are used;
  - Consumables is approximately US$35,000 per year; and
  - Training of about US$15,000 per year.
- Hardware specifications can be found in Appendix B.
- A discussion regarding software options can be found in Appendix E.
- Position descriptions for recommended staff can be found in Appendix F.
- The pilots recommend a mix of ESRI and open-source GIS software, the mix to be evaluated at the end of the pilots. This may impact the overall software cost.
- Some hardware could be leased but it is not expected that this would have a significant impact on the budget.

ANNEX 3: HARDWARE SPECIFICATIONS

The hardware specifications are indicative only.

Spatial Data Server

DELL Power Edge R710 (or similar), Quad Core Intel Xeon E5310, 2x4MB Cache 2.0 GHz, Memory 4GB (4x1024), DDR-2 667MHz ECC 2R Fully-Buffered Memory edit, 2 x Hard Drives (SATA/SAS) 250GB 3.5-inch 7.2K RPM SATA II Hard Drive - RAID 1, Operating System Microsoft Windows Server 2008 X32 Standard Ed. Eng (5 CALs).

Desktop Computers

Processor: Intel or AMD 2.4 GHz or greater.

RAM: 2 GB DDR 2 800

HDD: 320 GB, 7200 RPM

Optical Drive: Dual Layer DVD reader

Graphics: Geforce 9600 or Radeon 4500 series with 512 MB of RAM.

Monitor: at least 22" with resolution of at least 1680 x 1050.

A0 HP Large Format Inkjet Plotter

Technology	Colour Thermal Inkjet
Max. Resolution	2400 x 1200 dpi
Platform	PC - Mac
Printer Type	Large Format Printer
Connectivity	RJ-45 Network Adapter
Media Type	Coated paper * Plain Paper * Semi-gloss Paper
Total Media capacity	1 Roll
Max media Size	Roll (106mm)
Internal hard drive size	Greater than 20,000 MB
Memory	Min 256 MB
Operating System	Windows XP, Windows NT Server, Windows 2003

A3 Colour Laserjet Printer

Technology	Colour LED
Max. Resolution	1200 x 600 dpi
Platform	PC - Mac
Printer Type	Laser Colour Printer
Connectivity	RJ-45 Network Adapter/USB
Media Type	64-120 g/sq m
Total media capacity	400 sheets
Max media Size	A3
Memory	Min 256 MB
Operating System	Windows XP, Windows NT Server, Windows 2003

Garmin GPS

Product Model	Garmin 60CSX
Interface	Serial & USB
Waterproof	Yes
Receiver	High Sensitivity
Ability to add maps	Yes
Memory	Expendable
Custom Point of Interests	Yes

ANNEX 4: ESRI SOFTWARE PRICES

Note: These prices may vary and prices should be confirmed with the vendor prior to purchase.

ESRI Software Prices

ArcGIS ArcView 9.3.1 (includes ArcPress and StreetMap)

Single Licence

1st licence	2nd to 10th licences
US$2,104	US$1,896

Concurrent Licences

1st licence	2nd to 10th licences
US$4,191	US$3,774

ArcGIS Extensions (Single or concurrent licences)

3D Analyst, Spatial Analyst, Geostatistical Analyst, ArcGIS Publisher, Network Analyst.

1st licence	2nd to 10th licences
US$3,496	US$3,148

ArcGIS Arc Editor 9.3.1 (single or concurrent)

1st licence

US$9,756

ArcGIS ArcInfo 9.3.1

1st licence

US$19,495

ArcGIS Server Enterprise (Advanced)

Up to 4 cores

US$55,930

ArcGIS Server Workgroup (Advanced)

Price per core

US$9,555

ANNEX 5: PILOT IMPLEMENTATION AT INFRASTRUCTURE DIVISION: DETAILS, ISSUES & RECOMMENDATIONS

The pilot projects at the Infrastructure Division are described in Appendix G. They will include the following steps:

1. select and procure hardware and software;
2. carry out formal training;
3. confirm pilot projects;
4. acquire data to support pilots;
5. implement pilot projects that demonstrate how GIS can be embedded into Infrastructure Division business processes;
6. identify staff requirements to support GIS applications;
7. on-the-job training; and
8. implement web mapping application for all Infrastructure staff.

At the same time, Bappenas should be proceeding with the following:

1. establishing a "Spatial Secretariat" to coordinate activities within Bappenas;
2. collaborating with IMS team to ensure spatial information is integrated in the architecture;
3. developing spatial data management procedures and practices that fit with guidelines for nonspatial data;
4. defining relevant staff roles to support GIS applications and data management;
5. reviewing existing GIS applications to ensure compatibility and interoperability;
6. identifying and implementing web mapping application for all Bappenas staff; and
7. developing agreements with other GoI line agencies to share data.

Obviously, these activities cannot be carried out in isolation to one another and it is expected that GIS activities at the Infrastructure Division will drive and support activities across Bappenas.

1. Hardware

Hardware requirements include:

- Application and data servers
- Desktop workstations
- Plotters and printers
- GPS units and digital cameras

Specifications for these can be found in Appendix 2.

For the pilots at the Infrastructure Division, we recommend the following hardware be purchased:

- 5 GIS workstations
- 1 Data server (to be managed by Pusdatin)
- 1 A0 plotter (optional)
- 1 A3 colour printer
- 3 GPS units

To best utilise GIS software and to allow for good visualisation of maps, it is recommended that dedicated GIS workstations be acquired with large screens. Existing staff workstations may not have the capacity to effectively use GIS software, resulting in slow outputs. These computers should be placed in a location where there is common access. Existing computers should be adequate to run MapWindow or could be upgraded at minimum cost.

A centralised and dedicated GIS data server is recommended, to be based at the *Pusdatin*. This enforces the concept of a single source of data and will provide more effective and efficient data management.

An A0 plotter is required to print larger maps but is optional for the pilots. A good quality A3 colour printer is recommended to supplement existing printers. Colour printing is essential for GIS maps.

Field equipment: While most spatial information will be provided from other agencies, on occasions it will be necessary for Bappenas staff to obtain and validate data from field visits. For this, a basic GPS unit will be needed. For the pilots, the Infrastructure Division should acquire three units to be shared among each directorate, as required.

2. Software

2.1 Open Source versus Commercial

2.1.1 Open-source Software

Open-source software is distributed freely, together with the source code, which enables the user to customise it. Open-source products typically originate from not-for-profit organisations, universities or agencies, such as the UN. Most open-source products have a user community that provides support and enhancements to the base product. There are a growing number of desktop and web-GIS open-source products with functionality that is now comparable to commercial products. Some of the better known ones include:

- GRASS
- GeoServer
- MapBender
- MapServer
- MapWindow
- Open Layers
- PostGIS
- Quantum GIS
- uDIG

Using free open-source software enables an organisation to put a GIS on every desktop computer and customise the interface to the users' specific requirements. However, there is always the concern that the product may not have an enduring future and, generally, commercial products have more features.

2.1.2 Commercial GIS Software

The best known commercial GIS products include:

- AutoCad

- ArcGIS (ESRI)
- CadCorp
- Intergraph
- MapInfo
- Smallworld

In Indonesia, ArcGIS and MapInfo are the most common, and most government agencies that have GIS use ESRI products. However, because of the cost, an increasing number of agencies are moving to open-source products. It is important to bear in mind that the cost does not only include the initial purchase price but also an annual support and maintenance fee, usually about 20 percent of the purchase price.

The prices for ESRI products can be found in Appendix D. ESRI desktop ArcView licences are either single (for an individual workstation) or concurrent (or floating). Concurrent licences are more expensive but provide flexibility as the licence can be shared across a number of workstations. There are also a number of ArcView extensions (3D Analyst, Spatial Analyst) which provide modelling capabilities and may be required by some Bappenas staff.

ESRI ArcGIS is recommended over MapInfo because it is more widely used among government agencies in Indonesia.

2.2 Types of Users

Typically, an organisation has a number of different types of GIS users who each require access to different functionality and, hence, different software. Briefly, they are described in Table 5 (below):

Table 2.1: Matrix of User Groups Mapped to Functionality Required

User Group	Functionality Required	Software Recommended
Power User	• Create and edit data • Modelling • Spatial analysis • Quality map production	ArcView Spatial Analyst
General User	• Data discovery • Simple modelling and analysis • Map production	Open Source (for example, MapWindow)
Casual User	• Viewing of information • Data discovery • Simple map production	Web-GIS

2.2.1 Web GIS

Web GIS applications allow the user to access spatial information via their browser. There is no need to purchase a software licence for each computer, although a map serving application is required. Both open-source and commercial map servers are available. The use of open-source map servers (such as MapServer and GeoServer) generally requires significant development effort to implement, while commercial products (such as GeoSamba and ArcGIS Server) can be implemented quicker and

include built-in functionality that may have to be programmed if open-source map servers are used. Full ArcGIS Server implementation is expensive and not warranted or recommended at this point.

At Bappenas, online GIS applications have been developed by some groups (Performance & Evaluation and PNPM Mandiri). In each case they use the DesInventar product developed by UNDP, which is based on open-source products – OpenLayers, MapServer, PostGIS, PostGres and MySQL. UNDP staff have advised that DesInventar can be made more widely available for Bappenas. Consequently, building open-source solutions for Bappenas will not be as time-consuming or expensive as if they were starting from no base.

2.3 Software Options & Recommendations

Desktop GIS

The following desktop software options are appropriate for the pilots at the Infrastructure Division:

Option 1.

- 5 ArcView single licences – one in each directorate on a dedicated workstation
- 1 Spatial Analyst Extension (concurrent licence)
- MapWindow licences for all staff who require personal access to GIS software

Option 2.

- 3 ArcView concurrent licences – that can be shared across all directorates
- 1 Spatial Analyst Extension (concurrent licence)
- MapWindow licences for all staff who require access to GIS software

Option 3.

- MapWindow licences for all staff who require access to GIS software

The software for options 1 and 2 costs approximately the same (about US$13,200). Concurrent licences are a more efficient use of licences but require that licences do need to be shared – this could be inconvenient while staff are learning to use the software and demand is high. Spatial Analyst is recommended because it provides advanced modelling capabilities that will be of benefit for some evaluation and monitoring activities undertaken by Bappenas staff. Option 3 is basically free in terms of software but may not provide all the modelling functionality required by Power Users.

Consequently, we recommend Option 1.

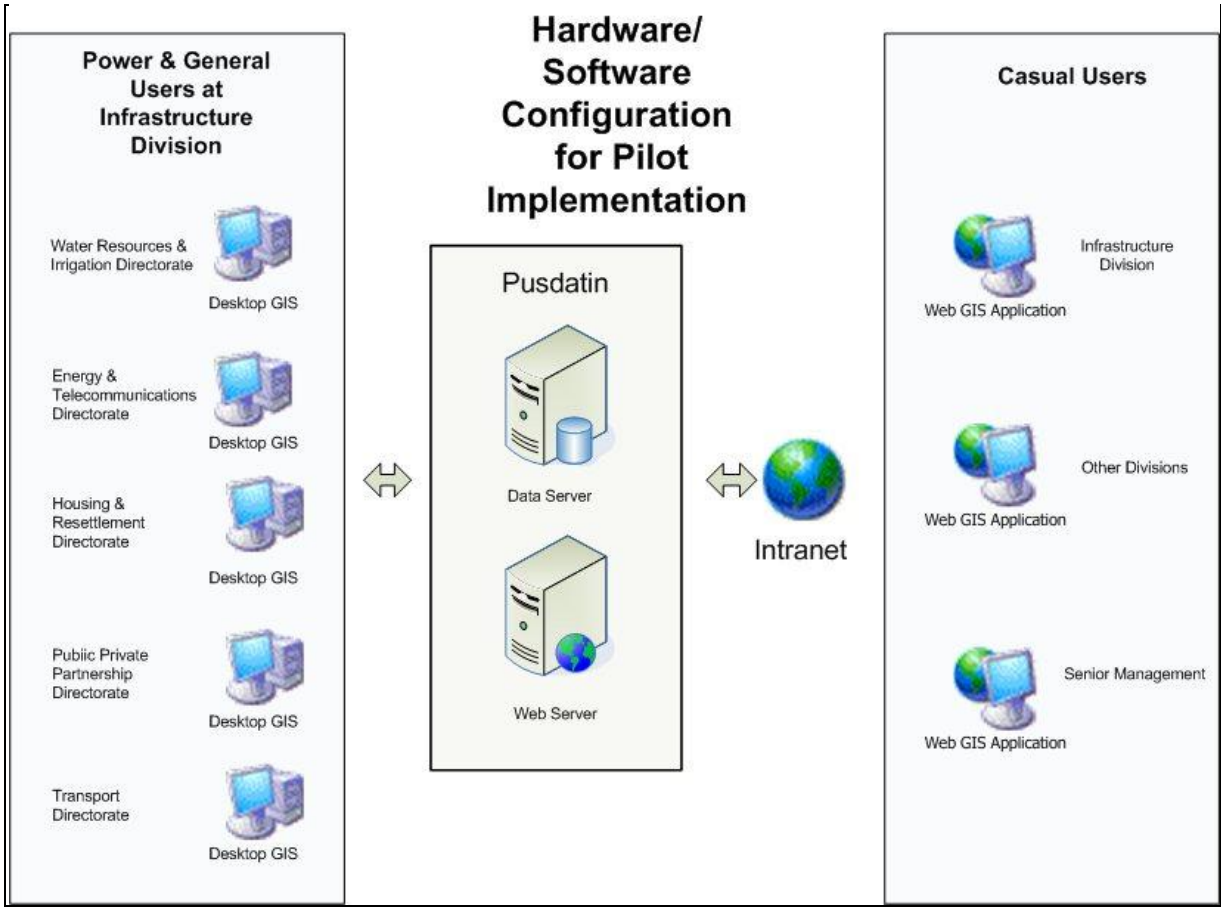
Web GIS

DesInventar can be customised and integrated with the Bappenas intranet to provide access to project and proposal information via a map interface. The backend open-source products (Map Server and Open Layers) used in DesInventar are suitable for expanded web-GIS development.

We recommend that DesInventar be enhanced to serve as an enterprise WebGIS solution for Bappenas, commencing with roll out in the Infrastructure Division. Using DesInventar leverages the development effort already undertaken at PNPM Mandiri.

A suitably skilled GIS web developer should be engaged for six months to develop and support the Web-GIS application (see Appendix 6 for job description). Figure 4 shows the hardware/software configuration recommended.

Figure 2.1: Hardware & Software Configuration for Pilot at Infrastructure Division



2.4 GIS Skills Development

GIS skills and knowledge among Bappenas staff is limited and varies among directorates. Some staff have received formal GIS training, others have acquired it on-the-job. Most of those with some training had not used GIS for at least a few years. Expectations of what GIS can achieve is also varied, some staff see GIS as a cure for all problems, others have the view that it is not needed at Bappenas.

The following formal GIS training courses are recommended for staff in the Infrastructure Division once the software has been installed:

- Introduction to GIS Concepts
- Introduction to ArcView
- Introduction to MapWindow
- Introduction to Spatial Analyst
- Using Web-GIS

In addition we recommend that an international GIS expert be engaged for the period of the pilots (six months) to provide project management, change management, on-the-job training and to conduct GIS awareness workshops for management (see Appendix E for position description). Other training may be required in conjunction with some of the pilots (for example, data acquisition using GPS and satellite image interpretation).

2.5 Data Acquisition & Management

The pilots rely on information being provided from a number of other GoI agencies. Critical to the success of GIS implementation at Bappenas is the development of agreements with these government agencies to provide spatial data in digital format. The pilots provide the opportunity to develop these agreements, similar to the MoU between Bappenas and BPS currently being negotiated.

Once received at Bappenas, the spatial data needs to be reviewed and approved by the *Pusdatin* (Spatial Data Manager) for completeness and metadata. The data is then submitted for inclusion on the spatial data server for use by Bappenas staff and for publication.

From time to time, project specific data will be acquired by Bappenas staff to model and analyse a specific project. Once this process is completed, the data should be validated and stored on the spatial data server, in a similar manner to that required for data obtained directly from government sources. Figure 5 describes this process.

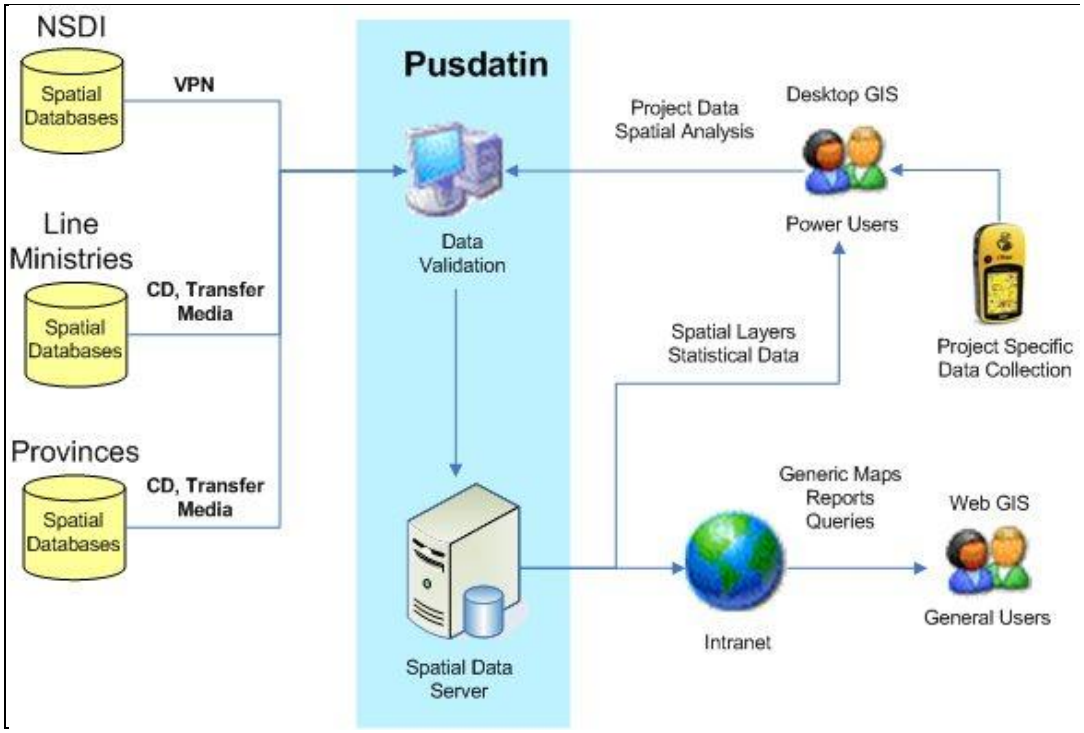
We recommend that the *Pusdatin* should be responsible for the administration and management of spatial data, together with their responsibility for nonspatial data. However, the responsibility for data content should remain with the data custodians (the creators or suppliers of the data).

We also recommend that a full-time Spatial Data Manager be engaged by Bappenas, initially based at the Infrastructure Division but after the pilots to be moved to the *Pusdatin*. A position description for this role can be found at Appendix F.

As part of the pilots, some information (such as RKP, PPP and loan projects) will be converted from hardcopy format to a database linked to features in the GIS. Once complete, this information will be provided to the *Pusdatin* for management and publishing.

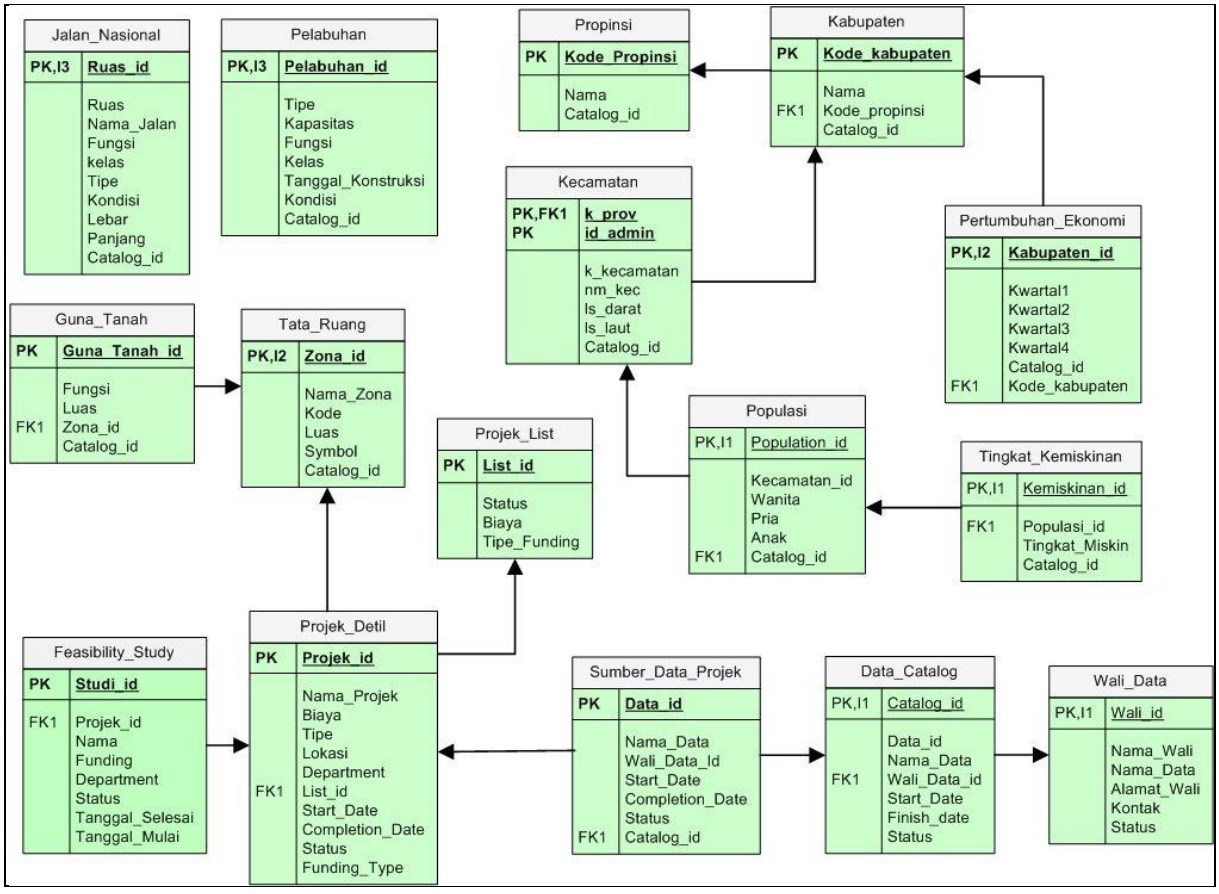
Further, as part of the pilots, Infrastructure staff may need to generate new data from GPS field surveys or from remote sensing. These data will also be provided to the *Pusdatin*.

Figure 2.2: Recommended Data Management Process



2.5.1 Data Model

Figure 2.3: Proposed Data Model



The data model integrates information received from different suppliers, so that data may be efficiently stored and retrieved. It describes the relationships between datasets received from a variety of providers. The basis for the data model are administrative boundaries and most other data link to this dataset. This includes both national and project generated data.

This data model is conceptual and will need to be refined once the pilots commence when the actual data to be used is confirmed and the data fields known.

2.6 Human Resources

As identified above, three additional personnel are required to manage and implement the six-month capacity building program and pilots. They are:

- International GIS Expert – to coordinate activities, assist with change management and carry out formal and on-the-job training;
- National GIS Database Specialist – to develop and implement the data model, acquire data and populate database, develop data management procedures and train staff; and
- National Web-GIS Developer – to develop corporate web mapping interface, in conjunction with Pusdatin.

Position descriptions for these personnel can be found in Appendix F. Initially, they will be based in the Infrastructure Division.
It is recommended that, providing performance is satisfactory, the two national staff be engaged by Bappenas after the pilots are completed, to be based with the *Pusdatin*.

2.7 Bappenas Integrated Decision Support & Data Management System

Bappenas is currently designing an integrated IMS to support its national development planning and monitoring and evaluation processes. The aim is to store all Bappenas data in a single data warehouse with a data search and discover capability. Some analytical and modelling tools will also be available.

Location is the means by which most of this information can be truly integrated. Hence, it is essential that access to, and management of, spatial information is considered in the architectural design phase of this IMS. Of particular importance is the database. We recommend that SQL Server2008 be used so that the spatial data can be stored in the database, rather than in separate files (all editions of SQL Server 2008 support spatial data). The design should also take into consideration accepting a WMS from other government agencies, which is proposed as part of the NSDI.

ANNEX 6: POSITION DESCRIPTIONS

International GIS Expert

Position : **Senior GIS Database Specialist (International)**

Location : **Bappenas, Jakarta**

Duration : **6 months**

Duties and Responsibilities

- Oversee implementation of GIS at Bappenas
- Prepare program to execute pilot projects
- Assist with development of User Requirements
- In conjunction with Pusdatin, prepare data model and populate database
- Develop guidelines for "best practice" data management
- Implement change management at Bappenas associated with GIS introduction
- Help establish a "Spatial Secretariat" at Bappenas
- Support the Spatial Secretariat to develop data sharing agreements with other GoI line agencies
- Conduct formal and on-the-job GIS training
- Schedule other training (GPS, remote sensing) as required
- Conduct workshops for Bappenas management on benefits of GIS
- Implement web-based solutions to support information integration and decision support
- Liaison with Bakosurtanal regarding integration with the NSDI framework

Qualifications/Experience

- University degree in Geography, Planning, Computer Science, GIS or other relevant field;
- Minimum of ten (10) years of relevant work experience;
- Proven experience developing and managing teams and mentoring senior staff;
- Competent user of ArcGIS;
- Proven training experience;
- Understanding of data issues in Indonesia;
- Sound knowledge and understanding of interoperable SDI;
- End-to-end project management and delivery;
- Knowledge in IT architecture and distributed data;
- Knowledge of database structures and models;
- Interface design and development experience;
- Experience publishing data over the web;
- Understanding of web security issues: securing Web Services, data access restrictions;
- Understanding of metadata standards;
- Previous experience working in Indonesia;
- Ability to write clearly and concisely in English;
- Knowledge of Indonesian language desirable.

National GIS Database Specialist

Position : **GIS Database Specialist (National)**

Location : **Bappenas, Jakarta**

Duration : **6 months**

Duties and Responsibilities

- Working with *Pusdatin*, develop and implement data model for spatial data at Bappenas
- Develop data management procedures
- Liaise with GoI line agencies to acquire spatial data
- Populate geodatabase
- Manage data conversion from hardcopy products, as required
- Training
- Liaise with Bakosurtanal regarding access to NSDI

Qualifications/Experience

- Degree or Diploma in Computer Science, GIS or other relevant field or equivalent;
- Minimum of five (5) years of relevant work experience;
- Proven experience managing and administering spatial databases;
- Practical experience with ESRI GIS products, MS Access;
- Experience with web mapping applications, geodatabases and open-source software;
- Understanding of SDI (Spatial Data Infrastructure) and OGC (Open Geospatial Consortium) standards;
- Proven training experience;
- Ability to write clearly and concisely in English.

National GIS Web Developer

Position : **GIS Web Developer (National)**

Location : **Bappenas, Jakarta**

Duration : **6 months**

Duties and Responsibilities

- Customise open-source products (DesInventar) to meet needs of Bappenas staff
- Gather user requirements for web-GIS applications
- Training
- Preparation of training manuals
- Integrate GIS with other Bappenas web-based solutions
- Liaise with Bakosurtanal regarding access to NSDI

Qualifications/Experience

- Degree or Diploma in Computer Science, GIS or other relevant field or equivalent;
- Minimum of three (3) years of relevant work experience;
- Experience developing web-mapping applications, including open-source software;
- Practical experience with ESRI GIS products (desirable);
- Web development using Java;
- Understanding of Web Services;
- Understanding of SDI and OGC standards (desirable);
- Proven training experience;
- Ability to write clearly and concisely in English.

ANNEX 7: PILOT PROJECTS

Description	Objectives	Data Requirements	Outputs/Outcomes
Water Management & Irrigation	**Project Evaluation & Monitoring**		
The Directorate of Water Management & Irrigation (WMI) receives proposals to increase the water available for irrigation to meet increasing agricultural demands. WMI is required to independently assess whether these proposals meet RPJM goals and whether the proposal can be implemented effectively. These proposals typically have a social cost (resettlement) which must be weighed against the economic benefit. WMI is also required to carry out post-implementation monitoring to ascertain if the predicted outcomes have been achieved. All the information used by WMI for evaluation is normally provided to them by the proposer. Yet the evaluation is supposed to be independent. This pilot aims to make relevant spatial information available to staff at WMI, together with the appropriate analysis tools (GIS), so they can evaluate and monitor the outcomes of the proposal. The pilot will require information from the Directorates of Land Administration & Spatial Planning and Regional Development, hence providing the opportunity for cross-directorate collaboration. While this pilot will focus on one project area, the location of all projects that are part of the current RKP will be identified and mapped in the GIS.	1. Provide WMI staff with the skills, tools and data so they can independently evaluate proposals. 2. Develop linkages with other government agencies so they willingly provide relevant spatial data. 3. Foster collaboration and sharing of information across Bappenas directorates. 4. Locate and map all projects for current RKP.	• Dams • Irrigation network • Changes in land use • Rainfall • Infrastructure • Topography • Socio-economic • Resettlement • Imagery • Spatial plans • Land ownership and value • RKP projects • Hydrology/Rivers • Flood plains/catchment areas • Contours	***Outputs:*** • Staff trained to use GIS, GPS and remote sensing for information gathering, modelling and project evaluation. • MoUs signed with other government agencies regarding data sharing. • GIS database for all current RKP projects. ***Outcomes:*** • Ability to undertake independent evaluations. • More accurate post-implementation monitoring. • Improved ability to prioritise projects.

Description	Objectives	Data Requirements	Outputs/Outcomes
Energy, Telecommunications & Informatics	**Prioritisation & Visualisation**		
The Directorate for Energy, Telecommunications & Informatics (ETI) is required to prioritise proposals for new energy supplies. It receives many proposals from a number of government agencies. Generally, these are reviewed in isolation to one another. ETI would like to have the capability to visualise the inter-relationship of these proposals, together with relevant data on energy sources and networks and energy needs for the next five years (RPJM), so that they can better prioritise project proposals and allocate budgets. In particular, the government wants to increase the proportion of renewable energy projects in provinces. This pilot will bring together all the relevant information required by ETI to assist with the prioritising of proposals, together with the tools to enable access to, and visualisation of, this information for decision makers.	1. Provide ETI staff with the skills, tools and data so they can visualise the inter-relationship of proposals and prioritise them more convincingly. 2. Develop linkages with other government agencies so they willingly provide relevant spatial data. 3. Locate all energy proposals for current RPJM. 4. Locate all geothermal plants.	• Administration boundaries • Roads, railways • Transmission lines • Power stations • Distribution networks (electricity and gas) • Oil and LPG storage and plants • Renewable energy sites • Energy resources (for example, geothermal) • Population centres (cities) • Population • Socio-economic (% poverty) • Imagery • Spatial plans • Geological Data - fault lines, geological structure of the area • Volcanic data	***Outputs:*** • Staff trained to use GIS for information management and visualisation. • MoUs signed with other government agencies regarding data sharing. • GIS database for all current RPJM energy projects and geothermal plants. ***Outcomes:*** • Improved ability to prioritise projects. • Improved capacity to understand inter-relationship of projects. • Ability to identify locations for potential geothermal power plants.

Description	Objectives	Data Requirements	Outputs/Outcomes
Transportation	**Analysis of Options**		
The Ministry of Transport has responsibility for rail networks in Indonesia, while the Ministry of Public Works has responsibility for road networks. Consequently, there can arise competing priorities for transport options from these two agencies and the Transportation Directorate at Bappenas is required to arbitrate. It does not always have the information to adequately adjudicate. This pilot considers access to the port at Tanjung Priok in Jakarta, in particular the rail and road options. It will gather the information required to undertake a high-level analysis of the options and train staff in GIS modelling techniques. It will also map all the proposed transport projects for the next RKP and assess them against the RPJMN objectives.	1. Transport staff have the skills, tools and information to analyse different options. 2. Demonstrate how GIS can provide objective analysis. 3. Locate all transport RKP projects and analyse against national targets.	• Tanjong Priok port layout and infrastructure (including 5km buffer around port) • Rail network • Toll road network • Land ownership • Land use • Socio-economic • Traffic information • Travel time from industrial areas • Accident locations and severity • Port capacity and expansion plans • RKP transport projects	***Outputs:*** • Staff trained to use GIS for analysis and modelling. • Staff trained to use GPS for data collection. • GIS database for all current RKP transport projects. ***Outcomes:*** • Improved ability to analyse projects and recommend options. • Objectivity of GIS demonstrated. • Transport projects checked against national targets (RPJMN).
Housing & Settlement			
(to be confirmed)			

Description	Objectives	Data Requirements	Outputs/Outcomes
Public-Private Partnerships (PPP)	**Project Analysis & Feasibility**		
The PPP Directorate is required to evaluate and prioritise projects that are suitable for funding through Public-Private partnerships. Projects are typically provided in isolation to one another, with limited data to support an evaluation. Consequently, expensive pre-feasibility studies are required. One example is the proposed Kertajati Airport in West Java and a number of toll roads that are adjacent to it. This pilot will demonstrate how GIS can assist with the analysis of project by modelling the impact of the proposed airport on existing airports and identifying its inter-relationship with existing and proposed toll roads. For example, the analysis may identify additional revenue to the proposed toll roads from the potential traffic generated by Kertajati airport. Similarly, Kertajati airport may benefit from additional access provided by the proposed toll roads. This information would make both proposals more attractive to potential investors therefore a feasibility study can be commissioned. It will also map all current PPP proposals to identify gaps.	1. Provide PPP staff with the skills, tools and data so they can analyse the impact and benefits of proposals, prior to going to a feasibility study. 2. Develop linkages with other government agencies so they willingly provide relevant spatial data. 3. Locate and map all current PPP proposals.	• Airports • Roads, railways • Land use • Socio-economic • Spatial plans • Imagery	***Outputs:*** • Staff trained to use GPS, satellite imagery and GIS to acquire and model information. • MoUs signed with other government agencies regarding data sharing. • GIS database for all PPP projects. • Options for Kertajati airport identified. ***Outcomes:*** • Improved ability to analyse the impact of a development proposal. • Improved capacity to understand how projects can impact each other – benefits and constraints. • Cost savings, resulting from more stringent selection of projects suitable for feasibility studies.

ANNEX 8: SITUATIONAL ANALYSIS

1. INTRODUCTION

1.1. Background

The Indonesia Infrastructure Initiative (IndII) was established in July 2008 as part of the Australia Indonesia Partnership under the Infrastructure for Growth Initiative (IFGI). IndII has three components to its structure–one is concerned with infrastructure project management, one with removing policy and regulatory constraints to infrastructure development, and the last is a grants program directed at enhancing social and environmental impacts of the government's infrastructure projects.

In this activity, specialist GIS consulting company, NGIS Australia, has been engaged by IndII to work with Bappenas to review its GIS requirements. The key concerns for Bappenas are:

- importance of communicating infrastructure needs to a wide audience of investors;
- monitoring changes in the economic situation linked to the development of infrastructure;
- monitoring and evaluating the performance of the various infrastructure sectors; and
- the need for up-to-date information, indicators and tools to assist decision makers to monitor current and past infrastructure projects.

1.2. Project Objectives

- To determine whether a GIS is required in Bappenas to manage its data analysis needs.
- If so, to recommend options for GIS implementation.

1.3. Project Scope

The scope is focused on the Infrastructure Division of Bappenas (*Deputi Bidang Saran dan Prasarana*), in particular the Public-Private Partnership (PPP) Directorate. The information use, technical capacity and GIS potential of the Infrastructure Division was reviewed in detail. In so doing, its relationship with counterparts in other divisions within Bappenas was evaluated. While options and recommendations are specific to the Infrastructure Division, they are made in such a way that they are relevant to all of Bappenas.

As Bappenas works in collaboration with a number of other government agencies, the following other government departments were also consulted: Ministry of Public Works, Ministry of Transport, Bina Marga, PLN, BPS, BPN, Ministry of Energy & Mineral Resources, Coordinating Ministry of Economic Affairs, Bakosurtanal and UNDP. National policies on data acquisition and sharing were reviewed and considered in order to ascertain realistic opportunities for inter-agency cooperation. World "best practice" models for data sharing, access and management are described and incorporated into an appropriate solution for Bappenas.

This Situational Analysis also considers the Executive Information System currently being implemented at Bappenas, using SAS products, and how GIS can best fit within the proposed IMS architecture.

1.4. Methodology

A number of methods to collect relevant information from Bappenas staff and other agencies were used to prepare the review. These included:

- ***Interviews:*** Face-to-face interviews were conducted with a number of subdirectorates within the Infrastructure Division and, where possible, a subdirectorate from other departments. The aim was to understand their business processes and the associated use of information, any issues encountered and how to improve existing processes. Interviews were also undertaken with staff from other government agencies and the UN. A list of people interviewed can be found in Appendix A.
- ***Questionnaires:*** A questionnaire was distributed to selected Bappenas staff. The objective of the questionnaire was to collate information regarding the types of activities undertaken by the staff, what information they required to support these activities, how the information was obtained and any issues experienced. Seven questionnaires were completed and returned (from about 15 distributed) across a range of directorates. The questionnaire can be found in Appendix B.
- ***Workshops:*** A workshop was held with the Transport subdirectorate to understand how they prepare their mid-term development plan. Another workshop was conducted with the Public-Private Partnership (PPP) subdirectorate. The objective of the workshops was to capture the business processes, data input and the expected outcome of the process.

We are confident that this combination of approaches provided adequate information from a representative cross-section of Bappenas staff for the researchers to be able to undertake the analysis required.

1.5. Purpose of the Document

This document reviews the current situation at Bappenas, in particular the Infrastructure Division, with respect to its objectives, use of information to meet these objectives and GIS capacity (both technical and in terms of staff resources). It describes some of the issues facing Bappenas and how GIS can address these issues and provide long-term benefits.

This document serves as the background to a final report that will propose recommendations for Bappenas and an Implementation Plan. It also provides information to key staff at Bappenas and IndII to encourage further discussion.

2. CURRENT SITUATION

This section describes the function of Bappenas and its mandate. It also describes how information is used by Bappenas to meet its objectives and the drivers for change. It describes the current GIS use and capacity at Bappenas and, in particular, the operations of the Infrastructure Division.

2.1. Bappenas Mandate & Objectives

Bappenas is responsible for the formulation of development planning, coordination, monitoring and evaluation at the national level. Bappenas is also responsible for financial arrangements (funding priorities and distribution) for development programs, in conjunction with the Ministry of Finance. This is enshrined in government regulations and presidential decrees (see below).

Bappenas also has a role to play in supporting rapid response to disasters.

2.1.1. Laws and Regulations

Bappenas mandates and responsibilities are clearly defined in Presidential Decree No.82/2007:

- Formulation of National Development Plan
- Coordination of the National Development Plan process
- Monitoring and evaluation of the progress of National Development Plan
- Budget preparation for development programs in conjunction with the Ministry of Finance and National Development Planning Minister
- Coordinate domestic and foreign funds sourcing in cooperation with relevant government agencies
- Monitor the implementation of development projects identified from National Development Plan
- Preparation of reviews and recommendations on the implementation of National Development Plan to the president
- General administrative duties

The above presidential decree provides high-level guidelines to Bappenas. The mandates and objectives are expanded further for each directorate. The Ministerial Decree PER.005/M.PPN/10/2007 defined Infrastructure's directorate functions and responsibilities.

2.1.2. National Development Plans

To fulfil its mandate, Bappenas prepares a series of development plans in conjunction with the Ministry of Finance and relevant ministries. In general, the development plans are grouped into:

- Long-term national development plan (RPJPN) (25 years);
- Mid-term national development plan (RPJMN) (5 years); and
- Work schedules (RKP/RKPD) (1 year).

2.2. Infrastructure Division

Deputy Infrastructure is required to develop and implement policy on national infrastructure planning and to evaluate proposals and monitor their implementation. It is divided into five directorates, each with sub directorates:

Irrigation and Water Supply

- Swamp, Irrigation & Water Management
- River, Coast, Dam and Lake
- Water Resources Infrastructure Institution

Transportation

- Land Transportation
- Sea Transportation
- Air Transportation
- Road Transportation

Housing and Settlement

- Drinking Water & Waste Water
- Garbage and Drainage
- Housing and Settlement Development

Energy, Telecommunication and Information

- Energy Development & Utilisation
- Electric Power
- Telecommunication & Informatics

Public-Private Partnership Development

- Institutional, Information and Regulation
- Rate and Risk Analysis
- Budgeting and Investment cooperation

Each directorate has between 10 and 14 staff, responsible for:

- Preparation of national development planning policy
- Synchronising and coordination of National Development Planning
- National Development Planning implementation
- Monitoring, Evaluation & Analysis of National Development Planning progress reports

2.3. Drivers

Bappenas is typical of most GoI departments with respect to its acquisition and management of information. Over time, it has developed a number of operational and divisional databases to meet

specific needs. This information typically resides in data silos, with the result that it is not easy to integrate the different databases and there is some level of duplication.

Access to reliable, consistent and up-to-date information is crucial for the operations of any business. Bappenas management recognise that to achieve this, better information management and access procedures need to be implemented.

Bappenas is seeking to facilitate better integration of, and access to, planning-related information. Spatial systems can support this aim.

The benefits of implementing a corporate-wide spatial information solution include:

- better integration among different directorates and deputies;
- everyone using the same version of the data ("single point of truth");
- improved reporting;
- improved information management and access;
- data duplication and data silos eliminated;
- centralised and intuitive access to all corporate information through a single point;
- ability to respond to emergencies more quickly and effectively.

The drive to develop NSDI also means that in the near future more national datasets will be available and Bappenas needs to be ready to use them effectively (see Section 3.1 below).

2.4. Data Use & Management at Bappenas

As a coordinating agency, Bappenas generally does not collect its own data; instead it relies on other departments to supply data to support its activities. Bappenas receives project proposals for review from government agencies at all levels. As an example, these proposals could be for a railway expansion or a new toll road. The proposals include supporting information such as costs estimate, environmental and social impact assessment and an implementation plan. The proposals and supporting information typically come in hardcopy format and are scanned, prior to distribution, and are stored in Bappenas's Electronic Library System (ELS). This is the only central record of proposals maintained by Bappenas.

Typical proposal documentation contains maps of the location of the proposed project, existing land use, technical drawings of proposed structure and adjacent infrastructure. These are usually provided as hardcopy products, often at different scales. As a result, information is difficult to manipulate or analyse, layers cannot be overlaid and information storage and retrieval is cumbersome. Appendix D identifies the spatial data used by Bappenas and the agencies that provide it.

One of Bappenas's mandates is to provide an independent review of development project proposals. Therefore it is not sufficient for Bappenas to simply accept and adopt the supplied studies, analysis and recommendations. Bappenas must be able to perform independent high-level evaluation of the proposals. Hence, it must be able to acquire and use independent information to assist this process. Interviews with Bappenas staff indicated that this was often difficult to achieve.

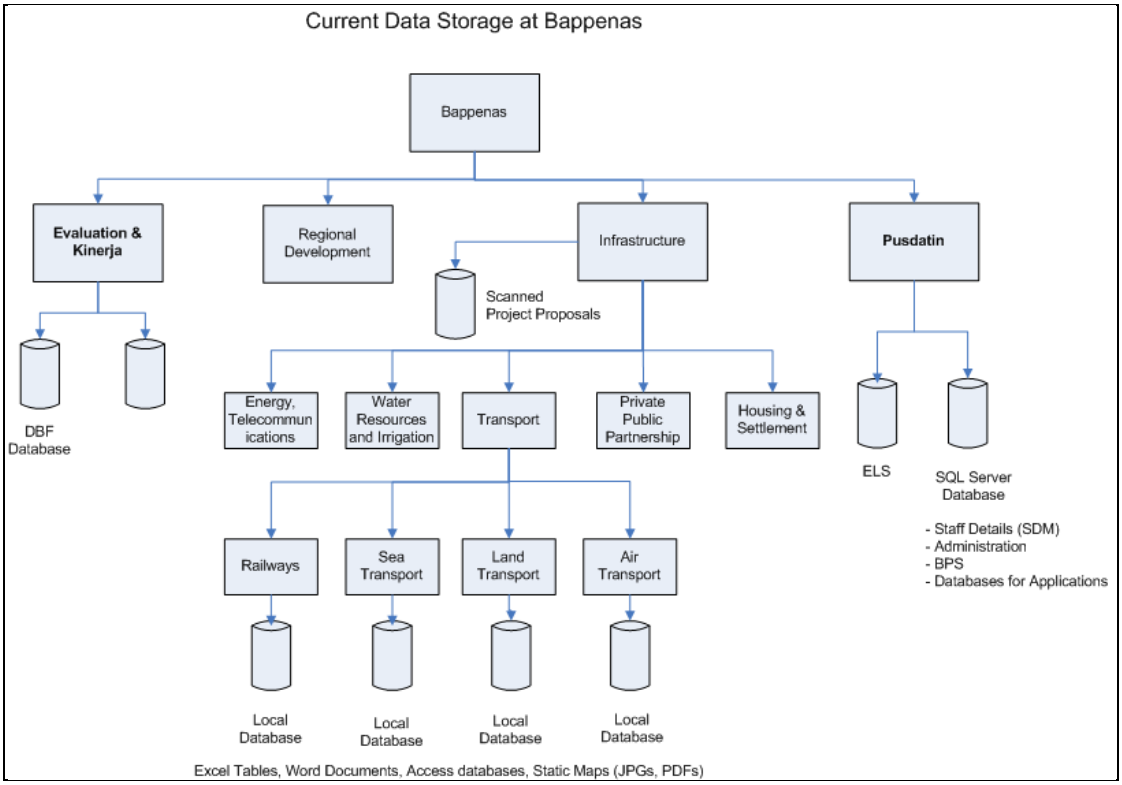
The questionnaire also highlighted the following issues:

- difficulty in obtaining relevant data;
- data is often outdated and incomplete;
- no data description (metadata);

- need to know the location of projects, existing infrastructure;
- project impacts and constraints are too narrowly focussed;
- data is often isolated from other directorates; and
- no means for data discovery.

In general, Bappenas staff rely on other organisations to provide the information they need to undertake their duties and they have inadequate resources to validate the information. There is no formal process for acquiring information from other government agencies or from other sections in Bappenas. This is typically achieved by informal requests and the process can be quite time consuming.

Figure 2.1: Data Management at Bappenas



The diagram above (Figure 2.1) demonstrates how each directorate and subdirectorate collects, stores and manages their own data. This leads to information duplication and makes data discovery and access difficult.

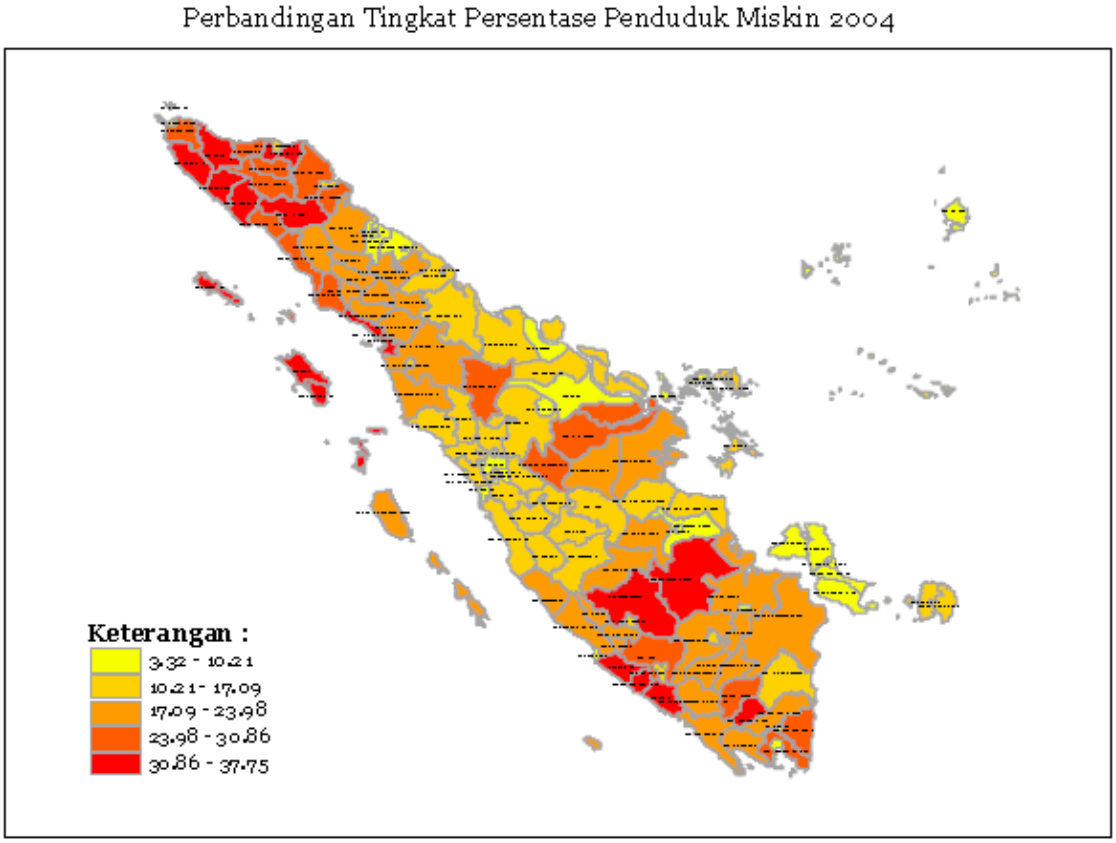
2.5. Examples of GIS Use at Bappenas

At Bappenas, there are a number of units that are using GIS for a specific purpose. This has generally occurred because someone in that unit had previous GIS skills or because of collaboration with an external agency that was using GIS. These GIS applications are being developed independently and often in isolation from one another, resulting in data duplication and siloed information. In some cases, the units are protective of what they developed and are not keen to share it with other groups within Bappenas. The take-up of GIS by subdirectorates is expected to continue and it is critical to provide an integrated approach for GIS implementation to ensure compatibility and reduce duplication. The following use of GIS at Bappenas was identified and there may be other isolated examples.

2.5.1. Regional Development and Planning

The Regional Development and Planning Directorate has established a Data Utilisation Unit (DUU) to develop spatially dynamic models to meet its mandate. Law No.17/2007 stipulates that development plans must incorporate spatial planning laws. The unit has recently completed a data modelling exercise to illustrate the potential of desktop GIS technologies (ArcGIS) to incorporate spatial planning data in data modelling. The model uses BPS statistical data and Bakosurtanal administrative boundaries to produce a number of scenarios for economic development on Sumatra and Java. This project is funded via a loan from the Japan Bank for International Cooperation (JBIC) and is a component of Indonesia's NSDI implementation strategy.

Figure 2.2: Sample Output from DUU GIS Application

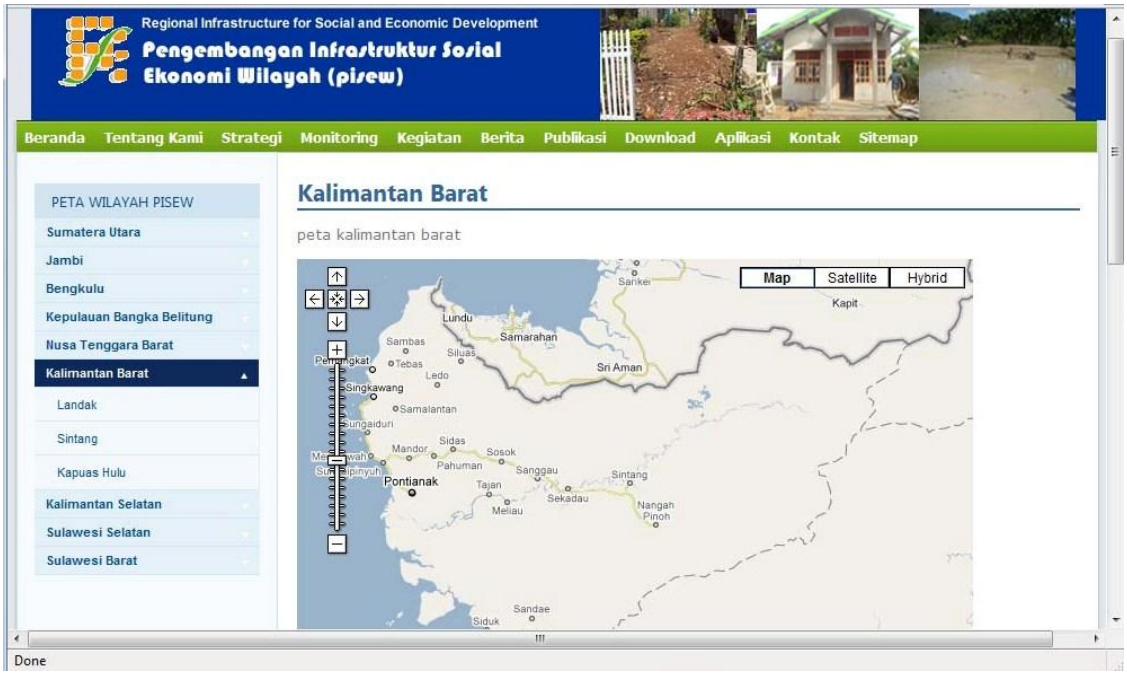


2.5.2. Spatial Planning and Land Administration

One of the main programs in this subdirectorate is the National Program for Community Empowerment (PNPM) Mandiri. The PNPM project is a collaboration between a few sectors within Bappenas: Human Resources and Culture (SDM), Regional Infrastructure for Social and Economic Development (PISEW) and Regional Planning and Development. The PNPM Mandiri program focuses on alleviating poverty through infrastructure projects.

The program is developing a centralised information system to monitor progress and activities from a number of its initiatives (RISE, SPADA, PPIP, PPK and P2KP) and to share the information among its stakeholders. The system is based on the UNDP DesInventar product, customised to meet its particular requirements. DesInventar is an open-source product and utilises data from Bakosurtanal (administrative boundaries) and BPS (socio-economic statistics). Bappenas staff primarily use it for data visualisation (for example, location of villages adjacent to infrastructure projects) and for simple report and map generation.

Figure 2.3: DesInventar GIS Interface used by PNPM Mandiri Project



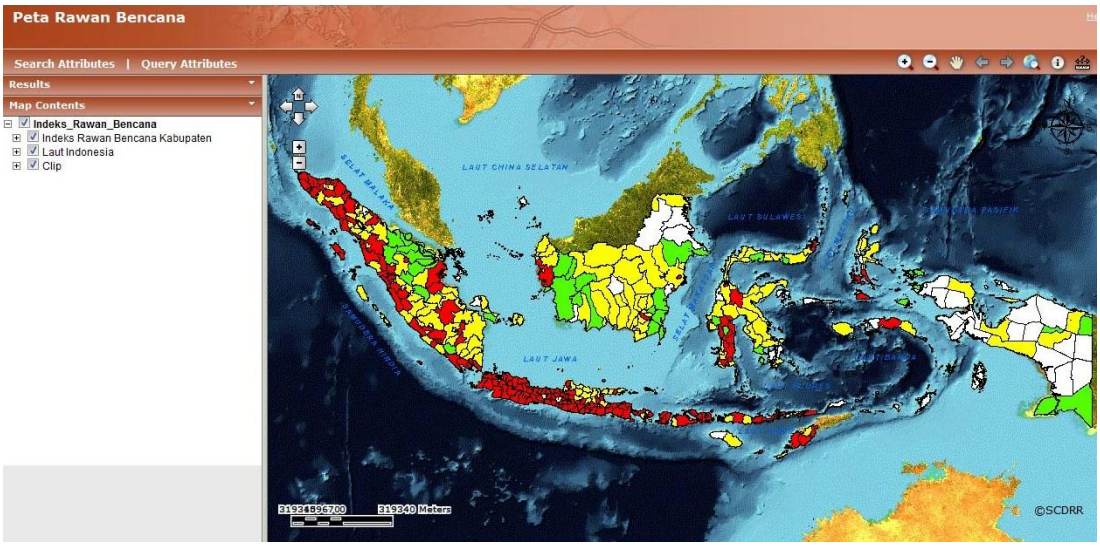
2.5.3. Performance and Evaluation

Performance & Evaluation is a new directorate established in 2009 to focus on the evaluation of progress/outcomes from the various projects approved by Bappenas. The directorate is also responsible for rapid impact assessment during disasters.

GIS has been used in the past to assist this directorate to meet this second objective. The directorate uses UNDP's DesInventar to overlay information and assist with rapid damage assessment reports. It is basically a viewing tool and limited by the reliability of the information that it has access to.

At least two groups within Bappenas are using DesInventar and its suitability for wider use needs to be evaluated. It is a simple GIS-based data viewing tool, originally designed for generic disaster management.

Figure 2.4: DesInventar Interface showing Location of Recent Disasters in Indonesia

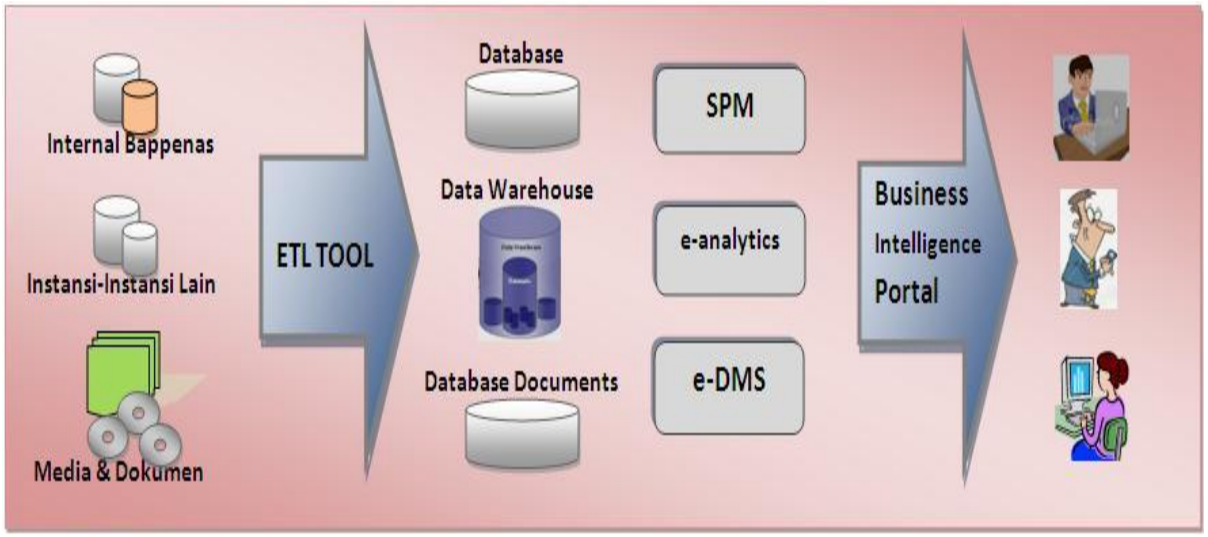


2.6. Bappenas Integrated Decision Support & Data Management System

Bappenas is implementing an integrated information management system to support its national development planning and monitoring and evaluation processes. The aim is to store all Bappenas data in a single data warehouse with a data search and discover capability. Some analytical and modelling tools will also be available. The information will be used to support decision making and make information available via mobile devices. The implementation team is currently gathering users' requirements and will commence system design in September 2009, with a view to full system implementation in 2011 to assist the 2011 RKP formulation.

One of the main objectives of the new information management system is to store data and documents from all directorates in one central location. Each directorate currently stores and manages their own data. This practice leads to data duplication and information silos and means that data sharing is difficult. Figure 2.5 reflects the new architecture where data, from external agencies or from within Bappenas are to be loaded and stored in a central database.

Figure 2.5: Proposed IMS Overview



This IMS initiative provides the opportunity to also store spatial data with the textual data in a managed environment. Before this can occur, a number of issues have to be resolved, such as data custodianship, data models and data management practices. However, it is important that the searching functionality and the architecture developed for the IMS incorporates spatial information.

2.7. Staff Technical Capacity

From the sample of staff that was surveyed, GIS skills and knowledge among Bappenas staff is limited and varies between directorates. Some staff have received formal GIS training, others have acquired it on-the-job. Most of those with some training had not used GIS for at least a few years. The expectations of what GIS can achieve was also varied, some staff unrealistically seeing GIS as a cure for all problems.

Should Bappenas implement a GIS solution, considerable training for staff will be required at a number of levels.

3. OTHER INITIATIVES

This section describes other initiatives and projects occurring in Indonesia and worldwide that may have an impact on Bappenas.

3.1. GoI Initiatives and Mandates

There are a number of laws, including presidential decrees that govern the use and dissemination of spatial information.

3.1.1. NSDI

Presidential Decree No.85/2007 provides legal foundation and support from the President of Indonesia for a National Spatial Data Infrastructure (NSDI). Article 6 of this decree places the responsibility to collect, maintain and disseminate national information clearly with the government agency responsible for the information. This means that there is an obligation for government agencies to share information with each other at no or minimal cost.

Bakosurtanal is the leading agency for NSDI implementation. Funded by a grant from the Japanese government, it has commenced pilot projects for Bali, providing access to spatial data online. The next stage is for similar projects in Surabaya and Yogyakarta. At the national level, Bakosurtanal is developing VPN access to 11 national government agencies to access spatial data via Web Mapping Services (WMS). Bappenas is represented in this group. This project is expected to be operational by October 2009, but will initially only provide a list of available static maps; the WMS service will follow.

In the short term, Bappenas will need to continue to access information directly from line agencies, but once the WMS service is fully operational, much of the data it will require can be accessed via this service. To utilise it, a user requires desktop GIS software or a GIS-based web viewer, such as GeoSamba or GeoServer. It is important that the architecture implemented for spatial information is designed in a way to take advantage of this service, when it occurs.

3.1.2. Spatial Planning

The law 17/2007 and 26/2007, stipulated that spatial planning at all levels of government (provincial, district and subdistrict) should be completed by April 2009. In addition, Presidential Decree No.26/2008 requires that spatial planning be integrated at the national level. Bappenas has the responsibility of ensuring that the spatial plans are integrated and compatible and comply with national policies. This is a daunting task and one difficult to achieve without the use of GIS. However, a number of obstacles remain to be overcome, not least of which is the compatibility of the provincial and district spatial plans.

3.1.3. E-Government

The law 11/2008 defines the framework on the use, management and access of electronic data. This provides the foundation for data accessibility and sharing between government agencies. The Ministry of Public Works is preparing a ministerial decree on public access to electronic data. In essence it stipulates that data collected by government agencies (spatial or nonspatial) must be accessible to the public (where appropriate). When this decree is in place, in theory it will encourage data sharing

among agencies. Bappenas needs to be ready to be able to accept these data and it could also play a role in making it happen.

3.2. Relationship with Other Projects

There are a number of projects external to Bappenas that should be taken into account when reviewing GIS requirements for Bappenas as these projects may influence the outcome of GIS implementation.

3.2.1. The UN Millennium Development Goals (MDGs)

The United Nations Millennium Development Goals (MDG) were established in 2000 as the targets for raising communities out of poverty. In Indonesia, the UNDP has developed a website that utilises GIS technologies to monitor MDG progress. The website is based on DesInventar and utilises BPS data. This information and software are available to Bappenas and some groups within Bappenas are already utilising it. DesInventar implementation in Indonesia is a cooperation between UNDP, Bappenas, BNPB, Ministry of Home Affairs and DFID. Further information is available at http://dibi.bnpb.go.id/DesInventar/about.jsp.

3.2.2. Ministry of Transport

The Ministry of Transport commenced a data capture project in 2008. This project is capturing major transport assets, such as airports, harbours and train stations as point information. As part of the NSDI, this information will be available as a WMS service. The Ministry of Transport is also developing Rail and Sea Transport Master Plans. One of the objectives of the rail master plan is to identify areas for rail network expansion and the feasibility of involving the private sector.

Bappenas needs to be aware of these master plans when evaluating projects. It currently receives the information in hardcopy format only. This makes it difficult to evaluate new proposals adequately. The WMS data service from the Ministry of Transport will also provide information that can support Bappenas's activities.

3.2.3. Ministry of Public Works

Bina Marga (a unit within the Ministry of Public Works (PU)) manages a national road database of some 36,000 km of roads. The road attributes are updated yearly but road positions were last updated in 2003. A new project to update road locations using in-car GPS is currently underway and it is expected that within a few years an accurate national roads database for the whole of Indonesia will be available. As part of the NSDI project, this dataset will be available via a WMS service. Access to this dataset by Bappenas will greatly help it to meet is project evaluation responsibilities.

At PU, the Pusdata (Centre for Data and Information) is investigating a web-based GIS solution to provide access to spatial data to the rest of the ministry. They plan to use open-source products for this application. This will potentially increase the amount of data available to other agencies, such as Bappenas.

3.3. Google Earth & MS Virtual Earth

Web-based mapping products such as Google Earth and Microsoft Bing Maps (previously known as Virtual Earth) can be used as an alternative for background data for many GIS applications. The resolution of these products varies from sub-metre (in some cities) to over 100 metres in less populated, remote areas. Most of Indonesia is covered by Landsat satellite imagery with a resolution of 25-30 metres, with some cities having imagery available at 1-3 metres. The imagery is typically 2-3 years old; older in some locations. However, for many applications, this imagery is quite appropriate.

Figure 2.6: DesInventar Interface using Google Earth Data as Background

Google Earth and Bing Maps can be integrated with GIS applications, such as ArcGIS Server, GeoSamba and MapGuide. An agency can overlay its corporate information to provide a locational context. At a simple level, this can be done at no cost, but if an agency wants to use Google Earth or Bing Maps as part of an operational system, fees apply.

At this point it is not clear whether Google Earth and Bing Maps would be part of an operational GIS solution for Bappenas. This will depend on Bappenas users' requirements.

As a point of interest, the UNDP DesInventar solution displays data from BPS and Bakosurtanal on a Google Earth background (see Figure 2.6 above).

4. PROJECT PLANNING & EVALUATION AT BAPPENAS

This section describes how projects are identified, prioritised and evaluated at Bappenas and how GIS can fit into some of these processes.

4.1. Development Planning Process

Figure 4.1: Development Planning Process

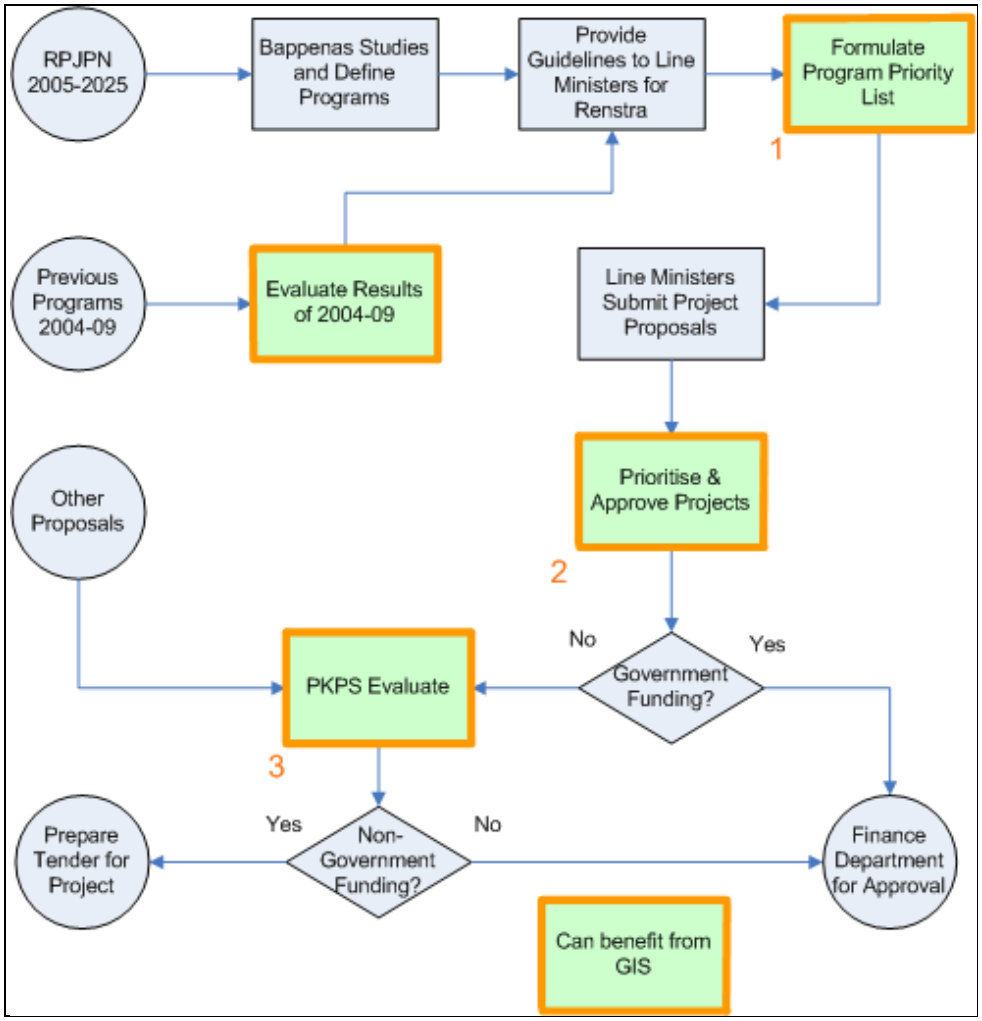


Figure 4.1 (above) illustrates the development planning process in Bappenas. The National Long-term Development Plan (RPJPN) provides Bappenas with the Government of Indonesia's missions and visions for the next 25 years. The RPJPN is divided into five Mid-Term Development Plans (RPJM), each plan lasts for five years. Line ministers prepare their development plans in accordance with the themes and objectives of the mid-term plans set out by Bappenas. The plans are further divided into five Annual Development Programs (ADP). These programs contain project proposals for implementation. There are a number of points in this process where GIS can assist.

4.2. Mid-Term Development Plan

Figure 4.2: Mid-Term Development Plan

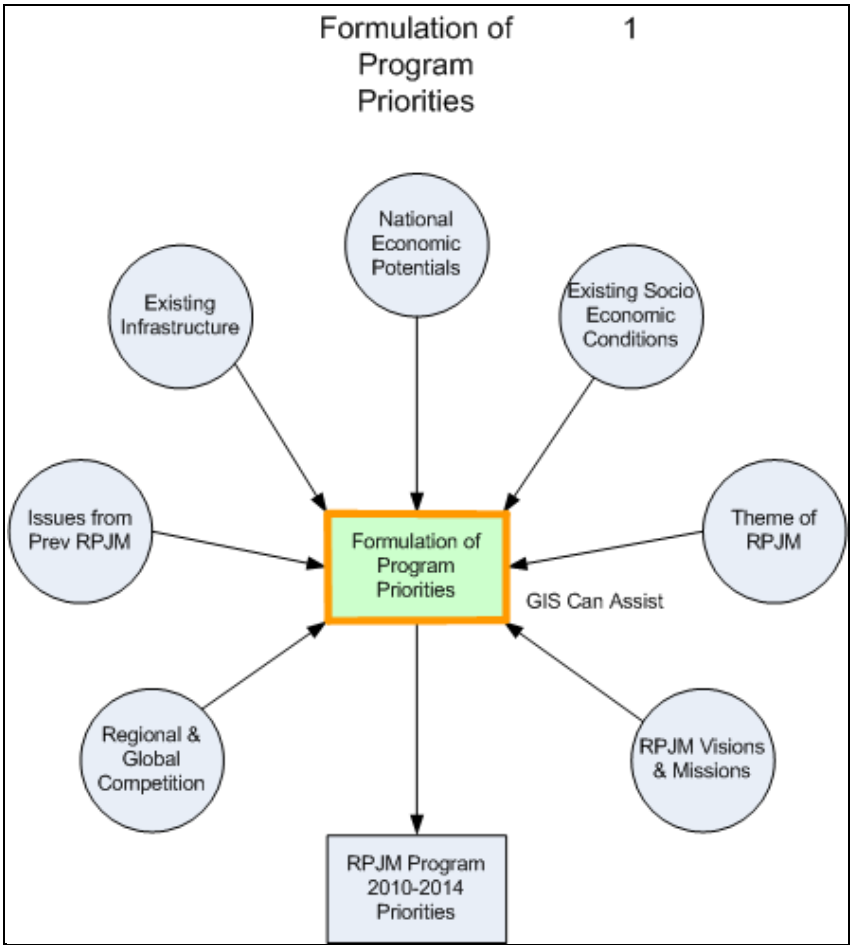


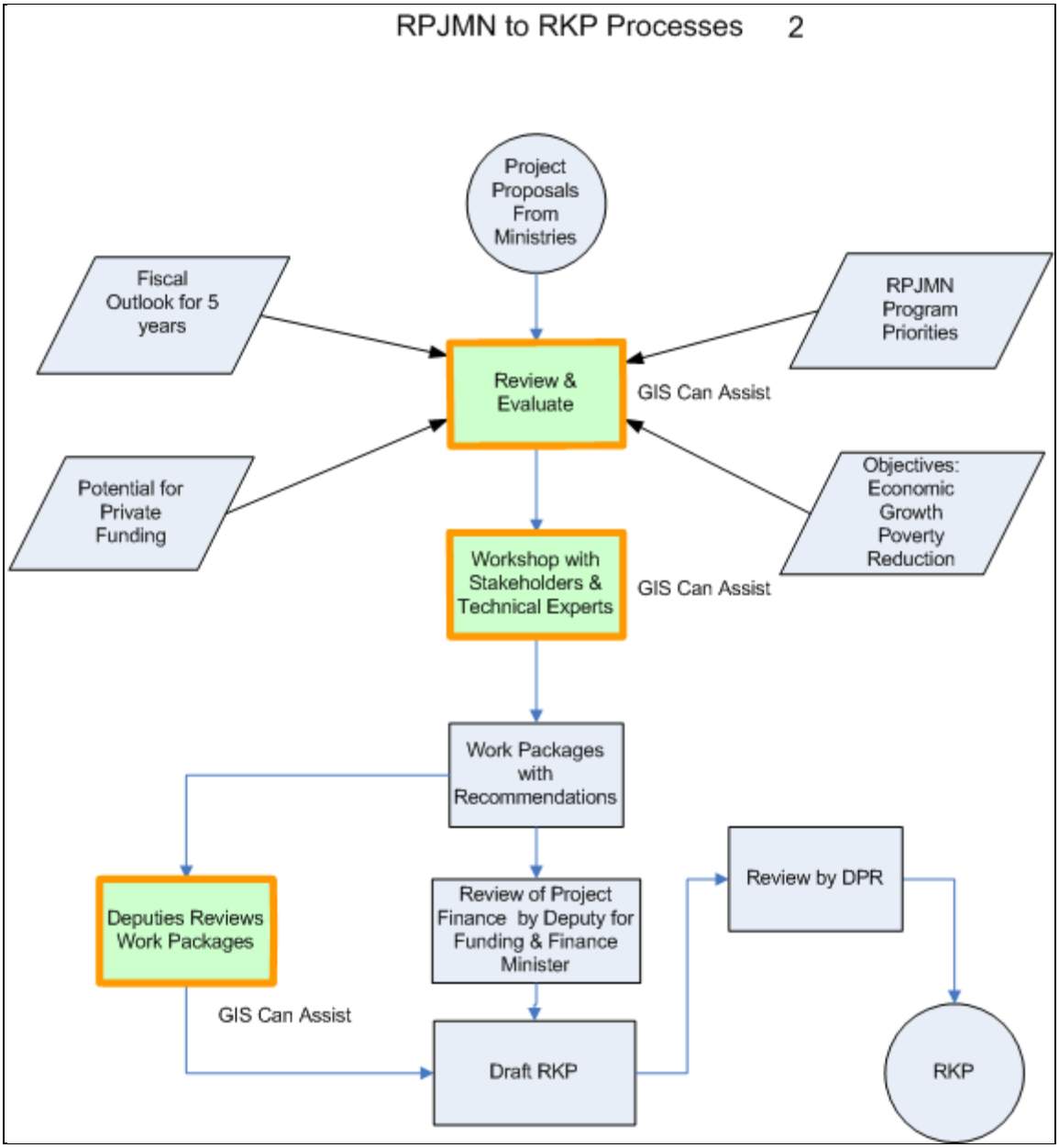
Figure 4.2 (above) illustrates influencing factors in the formulation of the RPJM for the Transport Directorate. The RPJM would provide the framework and guidelines for line ministers for the development of their strategic development plan (*Renstra*). GIS can be used to make this process clearer, more transparent and auditable, promoting "good governance" in infrastructure planning and project selection.

4.3. Project Evaluation

Once Bappenas has finalised the RPJMN, line ministers prepare their development program proposals. When completed, the program proposals are submitted to the respective divisions within Bappenas (for example, Infrastructure Division) for review and evaluation. The division evaluates each program proposal against a number of criteria: RPJMN program priorities and specific objectives (for example, 20 percent of the APBN is set aside for education), while the Deputy of Funding and the Minister of Finance review the source and methods for project funding. The draft implementation plan and funding (RKP) are submitted to the House of Representatives (DPR) for input.

Figure 4.3 illustrates this process and identifies where GIS can support it.

Figure 4.3: Project Evaluation Process

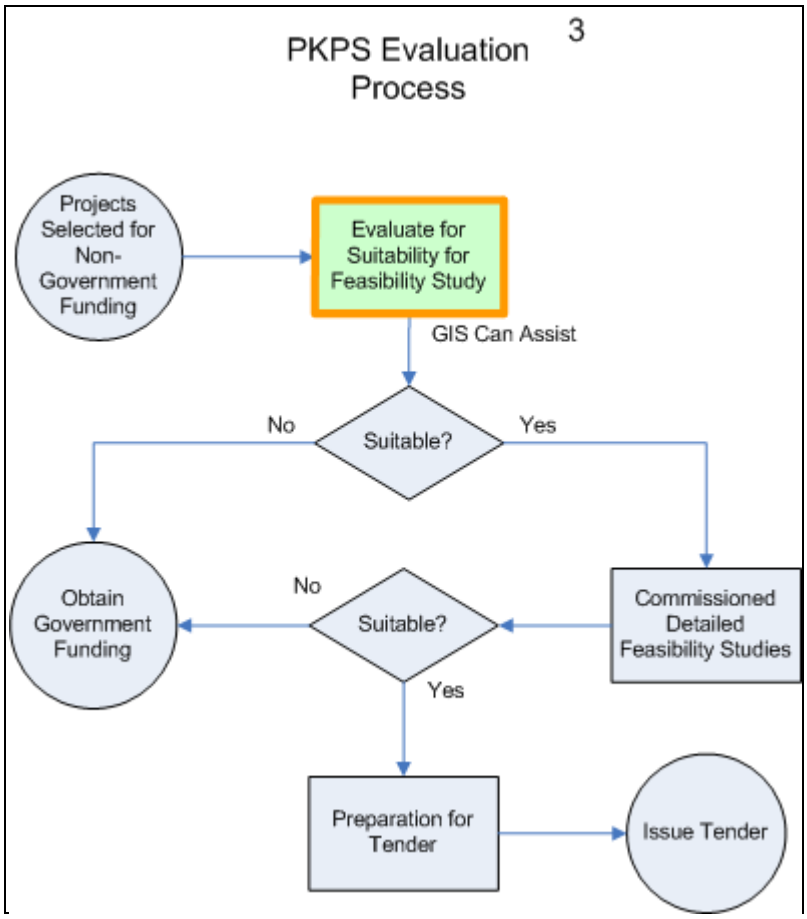


4.4. PPP Projects

Projects that require nongovernment funding can be financed through loans, grants or private partnerships. The Public-Private Partnership (PKPS) directorate reviews project suitability for private funding before commissioning detailed feasibility studies.

GIS can support the evaluation and feasibility studies and monitor their progress.

Figure 4.4: The Evaluation & Funding Process for PPP Projects



5. BENEFITS OF GIS

This section summarises some of the issues facing Bappenas, how GIS can assist to resolve them and its benefits and the risks associated with GIS implementation.

5.1. Summary of Issues

The situational analysis identified a number of issues that impact on how Bappenas carries out its mandate both now and in the future. They include:

- ***Data Silos:*** Each directorate collects and maintains the data it requires to carry out its duties. This has resulted in a large number of disparate databases. This data is typically not managed using best practice procedures, is unknown to other sections of Bappenas and, hence, there is little opportunity for data sharing.
- ***Insufficient Data:*** Because of time and resource constraints, Bappenas staff often have to rely on the information provided as part of the proposal to evaluate the proposal. At times these data are inadequate and inaccurate, making it difficult to undertake an independent review.
- ***Government Decrees:*** Recent government and presidential decrees have placed an increased burden on Bappenas to locate, evaluate, coordinate and monitor projects. This will only increase over time.
- ***GIS Islands:*** There are a few isolated instances of GIS use at Bappenas. This is resulting in solutions being developed on different platforms and significant duplication of effort.
- ***GIS Knowledge:*** There is limited knowledge of, and skill in using, GIS technology at Bappenas. In fact, some staff consider it will be a cure-all for many of their problems.
- ***Central IMS:*** The new integrated decision support and data management system currently being designed for Bappenas needs to include spatial information within its architecture. This implementation should include guidelines for data management.
- ***NSDI:*** Plans to implement an NSDI may make more data available for Bappenas. Bappenas should be actively involved in the VPN project currently being implemented.
- ***DesInventar:*** As a couple of groups within Bappenas currently use DesInventar, its appropriateness for extended use at Bappenas needs to be considered.
- ***Google Earth/Bing Maps:*** As the information from these sources becomes more current, they become more viable as alternatives for providing base data for overlaying project/proposal information.
- ***Information Sharing:*** Some directorates within Bappenas are often loathe to share data and can be secretive regarding applications they have developed. An improved information-sharing culture and associated policies will improve the effectiveness of Bappenas.

5.2. Strategic Benefits

Bappenas's mandate requires it to prepare new five-year plans (RPJM), evaluate previous RPJMs, prioritise projects for implementation and identify suitable funding models. This is currently achieved by relying on information provided to them in a variety of hardcopy documents and through limited field investigations. Frequently they are unable to verify the information that has been provided and project evaluations are undertaken in isolation of one another.

GIS is a tool that provides information integration, as well as analysis, and can provide access to corporate information through a single point. The benefits it provides to Bappenas are identified in Table 5.1.

Table 5.1: Benefits of GIS for Bappenas

Activity	Benefits
Project Evaluation and Monitoring	• More accurate information coming from source agencies • Integration of information acquired by different methods (from agencies, through field trips, imagery) • Evaluations are more credible and auditable • Process is quicker and more effective • More effective monitoring of post-project benefits • Ability to undertake independent reviews of projects
Project Planning and Identification	• Identify areas where projects are required (gaps) • Understand regional impacts of projects • Ability to see "whole picture" and make more informed decisions
Project Prioritisation	• Ability to see and understand inter-relationship of projects (based on location) • Understand whether projects complement or conflict with one another • Identify where there are gaps • Fosters good governance processes
Funding and Promotion	• Easy access to information for stakeholders • Potential partners can see the complete picture • Improved public participation
Spatial Planning	• Improved compliance with regulations • Integration of spatial plans from provinces • Identify inconsistencies
Disaster Response	• Improved response times • More accurate assessments of damage and impacts • More reliable decisions

Activity	Benefits
Corporate	• "Single point of truth" that is used throughout Bappenas, resulting in more reliable decisions • Less duplication of data and effort • Improved data management • Improved quality of reports • Increased sharing of information among directorates • Elimination of data silos • Improved ability to "discover" data available • Greater productivity from existing staff • Fosters inter-agency collaboration • Reduction of long-term costs • GIS provides a platform on which business applications can more readily be built

5.3. Risks/Constraints

No project is without risks and there are a number that may hinder and constrain the implementation of GIS at Bappenas if they are not identified and contingency plans developed. Some of these risks are beyond the scope of Bappenas, yet their impact needs to be considered. Table 5.2 below identifies some of the risks, their potential impact and proposed mitigation actions.

Table 5.2: Risks

Risk	Impact	Action
Ability to share information within Bappenas.	High	• Develop and implement guidelines for better data management • Successful pilot projects to identify benefits
Protectiveness of some directorates with respect to what they have and what they are doing.	Medium	• Clear directives from senior management • Successful pilot projects to identify benefits
Availability of data from other agencies in appropriate formats.	High	• Continue to develop mutually beneficial relationships with key agencies • Provide information back to agency, where appropriate
Low level of GIS skills and understanding at Bappenas.	Medium	• Training needs assessment required • Ongoing training programs need to be implemented
Expectations too high.	Medium	• Workshops on GIS for senior management
Integration with new IMS not successful.	Medium	• Spatial architect needs to be engaged at beginning of project to ensure spatial issues are considered when designing IMS architecture

Risk	Impact	Action
NSDI not implemented.	High	• Bappenas staff should be actively involved in this initiative to help drive its delivery • Develop MoUs with key government agencies to share data

6. SUMMARY

Bappenas is typical of most GoI ministries with respect to its acquisition and management of information. Over time, it has developed a number of operational and divisional databases to meet specific needs. This information typically resides in data silos, with the result that it is not easy to integrate the different databases and there is some level of duplication. Most of this information is in hardcopy format (or scans of the hardcopy).

Bappenas's mandate requires it to prepare new five-year plans (RPJM), evaluate previous RPJMs, prioritise projects for implementation and identify suitable funding models. This is currently achieved by relying on information provided to them with the proposals and through limited field investigations. They are frequently unable to verify the information that has been provided, thus, the independence of project evaluations is jeopardised.

GIS is a tool that provides information integration, as well as analysis, and can provide access to corporate information through a single point. While there are some examples of GIS use at Bappenas, they are isolated and restricted to a few units. There is, however, scope to increase this use throughout the ministry and this will result in significant benefits and efficiencies, while helping it to meet the objectives of its mandate.

We recommend that Bappenas develops a staged plan to implement a corporate GIS, commencing with pilots in the Infrastructure Division.

Pilot projects are recommended because they are a cost-effective way of demonstrating the benefits of GIS, while resolving any issues that may arise. A number of potential pilot projects have been identified and confirmation regarding which ones should be implemented first is required.

ANNEX 9: LIST OF PEOPLE CONTACTED

Bappenas staff visited and contacted for this report:

Contact Name	Organisation
Dr. Ir. Bastary Pandji Indra MSP Sunandar M.Sc. Yudo D. Priaadi Ir. Rahmat Mardiana MA.	Public Private Partnership Development (PPPD)
Dr. Ir. Oktorialdi Gatot Pambudhi S.Kom. MPM Asep Rooslina Tampubolon MSc. Arief (Divusi ITB)	Data and Information Centre (*Pusdatin*)
Mira Tayyiba MSEE Andianto Haryoko Yusuf Suryanto Jadhi J. Ardajat	Directorate for Energy, Telecommunication and Informatics
Ir. Bastian MBA Ikhwan Hakim	Directorate of Transportation
Ir. Hari Kristijo M.Sc. Fatty Rachma	Directorate of Settlement and Housing
Ari Zaenal Arifin ST	Directorate of Land Administration and Spatial Planning
Uke M. Hussein M.Sc.	Directorate of Regional Development
SIDIK, IKA	Deputy for Poverty, Labour and Small-scale Business
Ir. Juari Fandi Nurzaman Budi Wibowo	Directorate of Water Management and Irrigation
Agus Setiadi	Deputy for Performance Evaluation

Persons from outside Bappenas visited and contacted for this report:

Contact Name	Organisation
Ir. Bebas Purnawan M.Sc. Ir. M. Arief Syafi'I M.Eng.Sc. Mulyanto Darmawan M.Sc.	Bakosurtanal
MESRA EZA	Coordinating Ministry for Economic Affairs Republic of Indonesia
Ridwan Yunus; Sidik	UNDP
Ir. Djoko Prasetyo	National Electricity Company (PLN)
Hernadi Tri C. Sri Subekti Boedi Santoso Heru Wisnu Wibisono	Ministry of Transport
Ir. Haryatno Sumarman M.Sc. Max Antameng; Satrio;	Ministry of Public Works
Saman	BPS (Central Bureau of Statistics)
Abdurrahman Rinaldi Adam	Ministry of Energy and Mineral Resources
Suyus	BPN (National Land Administration)

ANNEX 10: QUESTIONNAIRE

GIS and Data Questionnaire:

Jawablah beberapa pertanyaan dibawah ini dalam Bahasa Indonesia atau Bahasa Inggris – manapun yang anda lebih menyukai. (Please answer in English or Bahasa Indonesia – whichever you prefer.)

Pertanyaan ini hanya memerlukan beberapa menit waktu anda dan diharapkan bisa membantu Bappenas dan NGIS dalam memahami sejauh mana teknologi GIS dapat membantu aktifitas pekerjaan anda. (This questionnaire will only take a few minutes of your time and is designed to help NGIS and Bappenas better understand how GIS technology can help you with your work activities.)

Nama (Name): _____ Departemen (Dept): _____

Q1. Sebutkan tipe aktifitas yang anda lakukan sepanjang waktu kerja anda? Contoh perencanaan, monitor, evaluasi, mencari data, analisa. (What type of work activities do you do – planning, monitoring, evaluation, looking for data, analysis, other.)

_____

_____

_____

Q2. Informasi-informasi apakah yang anda inginkan untuk melakukan pekerjaan-pekerjaan anda? (What information do you need to do your work?)

_____

_____

Q3. Dari manakah anda mendapatkan informasi atau data tersebut (dari bagian lain di lingkungan Bappenas atau dari departemen lain)? Yang mana saja? Dalam format apakah data yang anda terima? (From where do you get the information – from other sections of Bappenas or from other government agencies?) Which ones? In what format are the data?)

_____

_____

_____

Q4. Bagaimana anda menggunakan data tersebut? Apakah ada analisa (jika ada) yang anda lakukan? Apa yang anda hasilkan dari informasi yang anda gunakan tersebut? Untuk siapa output tersebut (internal, departemen lain, umum)? (How do you use the data? What sort of analysis (if any) do you do? What products do you produce that use the information? For whom (internal, other government agencies, the public)?)

_____

_____

_____

Q5. Apakah ada kendala dengan data yang anda terima? (Misalnya: Sulit untuk mendapatkannya, tidak akurat atau tidak lengkap, tidak up-to-date, susah untuk melakukan analisa.) (Are there any problems with the data you receive? Example: hard to get, not accurate or complete, not up-to-date, difficult to analyse.)

_____

_____

Q6. Informasi apakah yang sekiranya dapat membantu dalam pekerjaan anda? (What information would help you to do your job more efficiently?)

_____

_____

Terima kasih atas bantuan anda. Kembalikan lembar questionnaire yang sudah anda lengkapi ini ke Pak Sunandar (Direktorat Pengembangan Kerjasama Pemerintah dan Swasta) dalam dua hari ini.

(Thank you for your help. Please return the completed questionnaire to Pak Sunandar (Directorate of Public Private Partnership Development) within 2 days.)

ANNEX 11: SPATIAL DATA USED BY BAPPENAS

This appendix describes the spatial data we identified that Bappenas staff are using and the agencies that provide it.

Description	Supplier	Custodian	Comments
Electricity transmission, power generators	PLN	Dept Mines & Energy	no/min attribute
National Road, Collector, Secondary	Dept Public Works	Dept Public Works	Detailed info; may require MoU
Toll Roads	Bina Marga	Dept Public Works	Detailed info; may require MoU
Water supply	Local Water Corp	Dept Public Works	no/min attribute
Waste disposal sites	Dept Public Works	Dept Public Works	no/min attribute
Rivers	Dept Public Works	Bakosurtanal	width, length
Dams	Dept Public Works	Dept Public Works	Detailed Dams capacity info etc
Economic Indicators	BPS	BPS	Detailed info
Poverty	BPS	BPS	Detailed info
Population	BPS	BPS	Detailed info
Administrative Boundaries	Bakosurtanal	Bakosurtanal	Detailed info; require MoU
Land Parcel	BPN	BPN	Detailed info; require MoU
Sea ports, Air ports	Dept of Transport	Dept of Transport	no/min attribute; require MoU for full detail access
Spatially enabled BPS data (BPS linked to Bako admin bdy)	UNDP (Pak Ridwan)	BPS	Pak Ridwan require letters from Deputy before he can grant access
Land Use	Bakosurtanal	Bakosurtanal	Detailed info; require MoU
Satellite Imagery	Bakosurtanal	Bakosurtanal	Can use Google Earth/ Bing Maps for low accuracy studies and request
Aerial Photos	Bakosurtanal	Bakosurtanal	Detailed info; require MoU
Gas, Oil pipe lines	Pertamina	Dept Mines & Energy	Detailed info; require MoU
Project Proposals	Line Ministers	Directorates in Bappenas	Could be spatial enabled
Geological	Dept Mines & Energy	Dept Mines & Energy	Detailed info; require MoU
Forest convservation areas, forests	Dept of Forestry	Dept of Forestry	Detailed info; require MoU
Spatial Plans	Bappeda	Dept Public Works	Detailed info; require MoU; pak Uke already has the data but need to confirm
Agriculture landuse	Dept of Agriculture	Dept of Agriculture	Detailed info; require MoU
Rail network	Dept of Transport	Dept of Transport	Detailed info; require MoU
Environmental data (variety)	Dept of Environment	Dept of Environment	Detailed info; require MoU

ANNEX 12: ATTENDANCE AT WORKSHOP

This appendix identifies the attendees at the workshop that discussed the interim report on 30 July 2009 at Bappenas. Other GoI government agencies were well represented.

ABSENSI RAPAT

Subject : **Pembahasan Interim Report Review of GIS Requirement**
Day/Date : Kamis, 30 Juli 2009
Time : 10.00 - selesai
Place : Ruang Rapat 301, Bappenas

NO	NAMA	POSISI/INSTANSI	TELPHONE	TANGAN
1	Yudo D. Prisadi	Bappenas	387	
2	SUNARNOAN	Dit. PKPS	PJ. 382	
3	Paul Harris.	NGIS		
4	Nicky Suwandy	NGIS		
5	Ali Suwanto	NGIS	08124138	
6	BEBAS PURNAWAN	BAKOSURTANAL	0818898843	
7	DIMAS YOGA R.	DIT. TRP	085685779530	
8	Indra	Dit TRP	555	
9	Arianto Wibowo	Indii - Bappenas	08114770	
10	Kawik	Sek KKPPI	0811 250 591	
11	Karim	Dit PK	864	
12	Rinaldi	Dep ESDM	340357 2888	
13	Wicas	Indii - Bappenas		
14	Boshan	Dit Transmisi	3146550	
15	RIKY ADIMA N	PUSDATA, PU		
16	ANDIRI K	PUSDATA, PU		
17	Gratam Jackson	Ind II		
18	David	"		
19	M. Arsyi	DIT ETI	553	
20	IKHWAN H	Dit. Transport		

NO	NAMA	POSISI/INSTANSI	TELPHONE	TTANGAN
21	HERMADI	KSBPJ - PUSDATIN DEPHUB	3456703	
22	Dewanto Tri S	Kasubid Pusdatin Dephub	3456701	
23	Hengki A	Ksb PK	-	
24	Gatot Pamudji	Pustan Kabid	3834977	
25	Zaimah Shofa	DESDM	70660802	
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