Survey Investigation Result

of 1st and 2nd Questionnaires

1. Survey Investigation Result

1) 1st Survey Investigation and Result

- Purpose: Examination on general conditions of the countries in Asia-Pacific region regarding land information management system and its management
- Target: The countries currently acting as a vice-chairman at WG4 of UN-GGIM-AP(total 8 countries)[1]
- Investigation Period: April 1st 2016 ~ April 20th 2016(approximately 20days)

- Survey Construction Method and Contents:
  - The survey was constructed based on Cadastral template 2.0 which summarized cadastre and land related analysis of current state and requirements in accordance with UNRCC-AP's resolution.
  - The survey was an open-type questionnaire to first comprehend each country's current condition. The contents of land related law system, investigation and registration of land, utilization of land information, construction of system and operating method, and etc. were composed of questions regarding land management.

Main Contents of 1st Survey

Classification	Survey Category
Land Related Law System	Construction of Law System
	Ownership and Opearation of Land
	Topographic and Cadastral Map
Land Investigation and Registration	Survey Status and License
	Construction of Land Information
	Construction of Land Map(Cadastral Map)
Utilization of land information	Real Estate Administrative Document
	Contents of Cadastral Map and Land Information
	Types of Civil Service
	Types of Land Administrative Task
Land Management Information System	Operation of Land Information System
	Connection of Land Information and Cadastral Map

1) The countries responded to the survey(in alphabetical order): Seven vice-chairman countries(Brunei, China, Fiji, Kyrgyzstan, Malaysia, Mongolia, Singapore) and Nepal

	The Regions Land Information and Cadastral Map Are Operated
	Management Institution
	Data Format
	System Security

- Survey Investigation Result

· The investigation result showed that all the investigated countries have land related law system and most of spatial information and its related law as well. As for spatial information related law, it is possible for this law to exist as a separate law, but in most cases it is often included in another law as a part of its contents.

· Most of the countries have an unitary datum point system. But, there are many countries using various coordinate systems in a same country meanwhile the others are using an unitary coordinate system.

· As for land survey, either a delegated private institution or a delegated private and government institutions together are conducting land surveys.

· Regarding land ownership, many countries acknowledge an individual person's land ownership and make the registration of land mandatory.

· Regarding land management, there were both opinions proposed that the roles of central government and local government are differentiated and they are identical.

· The countries in Asia-Pacific region initiated the construction of land management system, but there are still many countries unable to construct a completely computerized system.

: Digitalized topographic map is constructed in most of the countries. On the other hand, the digitalization of cadastral map is less progressed comparing to that of topographic map.

: Meanwhile all the countries are making the land registration mandatory, there are countries which can not completely carry out the land registration task through system.

· There are many countries whose agents for managing topographic and cadastral maps differ. Besides, there are several countries whose agents for managing cadastral map and real estate information differ.

2) 2nd Survey Investigation and Result

- Purpose: Making diagnosis of each country's situation in Asia-Pacific region and developing a technique to propose a land infomatization methodology suitable to each country.
- Target: The countries currently acting as a vice-chairman at WG4 of UN-GGIM-AP(total 8 countries)[2]
- Investigation Period: August 1st 2016 ~ August 20th 2016(approximately 20days)

- Survey Construction Method and Contents:
  - · Based on the result of the 1st survey investigation, the questions were constructed, with a minimum number of questions, to comprehend actual conditions of the countries' land informatization.
  - · Investigation on the countries' directions they are currently focusing on, the problems of current land information system and etc. were also carried out.

Main Contents of 2nd Survey

Classification	Survey Category
Fostering Foundation	1. Spatial Information Basic Plan
	2. Land Information System Plan
	3. Land Information Related Law System
	4. Organization Promoting Land Informatization
	5. System Connection, Sharing and Cooperation
	6. System Environment
Requirement Level	7. Major Field of Policy
	8. Land Information and Geospatial Information
	9. Land Information and Real Estate Information
Current State of Construction	10. Degree of Geospatial Information Construction
	11. Degree of Land Information Construction
	12. Registration and Management Function
	13. Land Plan and Administrative Function
	14. The Public Service Function
	15. Problem of System

[2] **The countries responded to the survey(in alphabetical order): Seven vice-chairman countries(Brunei, China, Fiji, Kyrgyzstan, Malaysia, Mongolia, Singapore)**

- Survey Investigation Result

  · In most of the countries, basic legislation and law system for land informatization are constructed.

  · There are many countries thinking land information related country's basic plan should be either revised or complemented.

  · Except some countries, the investigation result showed that most countries did not have any significant problem regarding system connection, mutual data exchange and etc. among various public institutions.

  · As for hardwares or network environment to operate the system is also judged as there is no significant problem.

  · Many countries are pointing out that there is a lot of problems regarding the completeness of data related to land information.

  · Many countries are perceiving a need of improving the functions of their existing land management systems constructed.

  · The investigated countries remark that various administrative services should be carried our though land infomatization and wish land information to be utilized covering the whole region of the country.

2. Development of Framework

- Purpose

The land management system's framework is a standardized land related information model. This will provide a consistent guideline and a system for reference in the process of integrating each developing environment and support to realize services utilizing the standard.

If information resources and service developers refer to the framework, it makes the analysis on the list of standards and the requirements of each development stage easy by providing intuitive and efficient methods. It also can be used as a precedent guideline which enables them to anticipate the examination on interoperability.

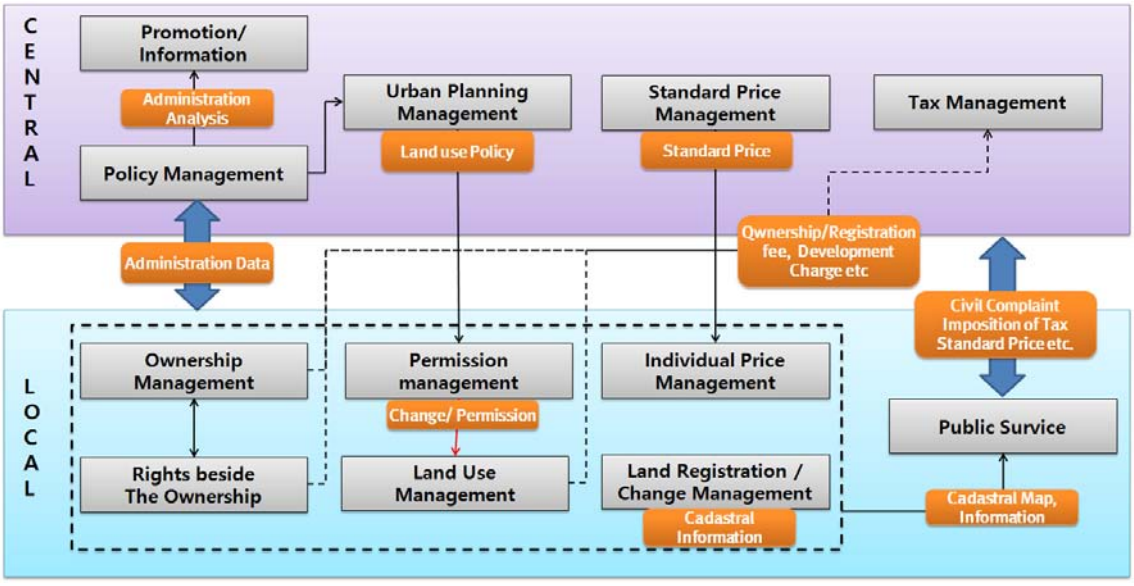
- Key Issues

The characteristics of reference model presented in framework are as follows.

- · By expanding the domain of the system from the system for land management to the system for land administration, generalize the level of land informatization.
- · Construct a system function which can accept the change of the meaning of cadastre as it changes to the concept of property from the concept of parcel.
- · Construct a reference model in the same form of functional construction that international standards or guideline are suggesting.
- · As for the data reference model and technical reference model that each country's construction situation may differ, propose the models by abstraction of the models to upper concept level.

1) Business reference model

The business reference model is a reference model which defines the independent functions of tasks at each organizational unit. The business reference model is made analyzing the roles and the functions of an organization and the overall operation system is constructed by relating them to the functions of the application reference model. The business reference model includes some domains of tasks according to the function of an organization and overall demonstrates the roles, functions, and the flows of information among organizations.



The central government serves to establish policies by analyzing and comprehending the trends of real estate such as land transaction, land development, and etc. In addition, the

central government should serve to support the tasks of city development based on established policies and analyzed information and carry out the services of promoting and providing the information regarding land developments and government policies. Besides, the central government should be constructed to carry out the tasks of imposing land related taxes and setting the standard of land price.

A. Policy support management: The central government analyzes the land administrative works that the local government manages and supervises. Based on the analysis, it establishes policies to support the local government's decision making or prepare materials to be utilized by the local government. Through the analysis of land administrative tasks, the central government arranges control measures to prevent reckless real estate speculation and unauthorized development or supports the tasks of imposing land related tax with fairness and assessment of land price by setting the standard for land related tax and price.

B. Flow of Land Transaction Management: When a transaction of land, building or etc. takes place, the local government sets the ownership and the other rights beside the ownership referring to publicly notified standard and individual prices. In the case of land transaction, a property acquisition tax is imposed and in the case of rent, a charge for the change of ownership and other relevant taxes are imposed. The civil service management of the local government should be supported so that these matters can be applied, issued and inquired through the civil service management of the local government.

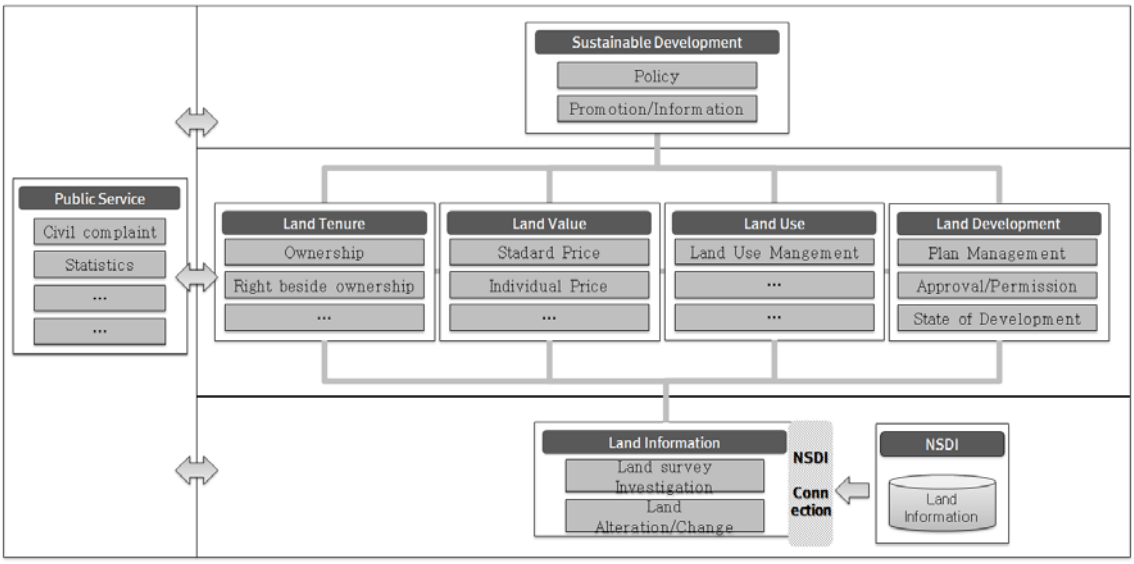
C. Flow of Land Use/Development: The Central Government establishes development plans of each region and each city for the areas where development is needed or for the areas, in contrast, where development should be restricted by analyzing overall land management administrative task related data. This information should be presented to each local government supporting the local governments' decision making regarding land policy. The local government collects opinions about the central government's land policy or independently establishes and manages a city plan and decides and manages the permission or approval relevant to a city plan.

D. Flow of Assessment of Publicly Notified Land Price: A standard area to set a standard price is selected at the central government and a sample land price is assessed and decided through the experts and institutions specialized in price assessment. This standard land price is utilized as one of the price information the local government refers to when the local government assesses an individual price of the land it wants to assess. The local government assesses and decides the individual land price based on the information for standard land price and other individual price assessment. The assessed standard and individual land prices are provided by the government to

civil clients as information regarding land price.

2) Application reference model

The application reference model is a reference model which defines mainly the functions of tasks that should be independently performed from certain institutions. The application reference model is a function-oriented approach which is irrelevant to organization and it could be used as a standard to define other architectures. The application reference model divides the whole task into the domains of a couple of task functions.



A. Sustainable Development : It means the activity and function that foster the environment for implementation of land policy and land management strategy(Land Tenure, Land Value, Land Use, Land Development) which supports sustainable development.

① Policy : A task preparing basic data and materials, by analyzing information based on land administrative task, which can support policies such as restricting the land use or supporting planned city developments of the places where development is needed.

② Promotion/Information : A task promoting polices that the government is carrying out and providing information of notified land price, land use regulation information, city plan and etc.

B. Land Tenure : Divided into functions to process the administrative task for the ownership regarding land right(land and building) and the other rights beside the ownership.

③ Ownership : Composed of functions which can manage the ownership of land and building such as an use of real estate, managing the holder of rights, managing foreigner's ownership and etc.

④ Rights Beside The Ownership : Composed of functions which can manage the rights beside the ownership such as a land rental for the use of land and the building on the land.

C. Land Value: Dealing with the contents related to evaluation of land and property, revenue through taxation and judgement on conflicts of evaluation and taxation.

① Standard Price Management : Composed of functions selecting a standard land which has a representative nature among lands, investigating and evaluating the appropriate price of standard land and assessing and managing the standard price of standard land.

② Individual Price Management : Composed of functions grasping the lands that need a publicly notified land price, assessing and managing the publicly notified individual land price by using the standard price such as publicly notified land price of standard land.

D. Land Use: Composed of functions able to control land use by introducing a planning policy and regulations on land use at the levels of country and region.

 Land Use Management : Composed of functions using lands economically and efficiently and managing the regions decided by the city management plan through restricting the use of land and building.

E. Land Development : Enables the changes in construction plans and land uses to take place by approving the plans and manages the authorization grant of permission.

① Plan Management: Composed of functions judging the appropriateness of laws regarding the land uses and managing the city(or regional) plans to concretize and actualize the long term direction of the city's development

② Approval/Permission Management : Composed of functions to manage the approval/permission information of changes of land uses and development/redevelopment businesses.

③ Current State of Development Management: Composed of functions to manage the information related to development/redevelopment businesses taking place in each region.

F. Land Information : Land Information should be constructed to integrate cadastral and topographic data(including the problems of topography, environment and natural resources) together and connect the natural environment(including legal and social land rights) and construction environment.

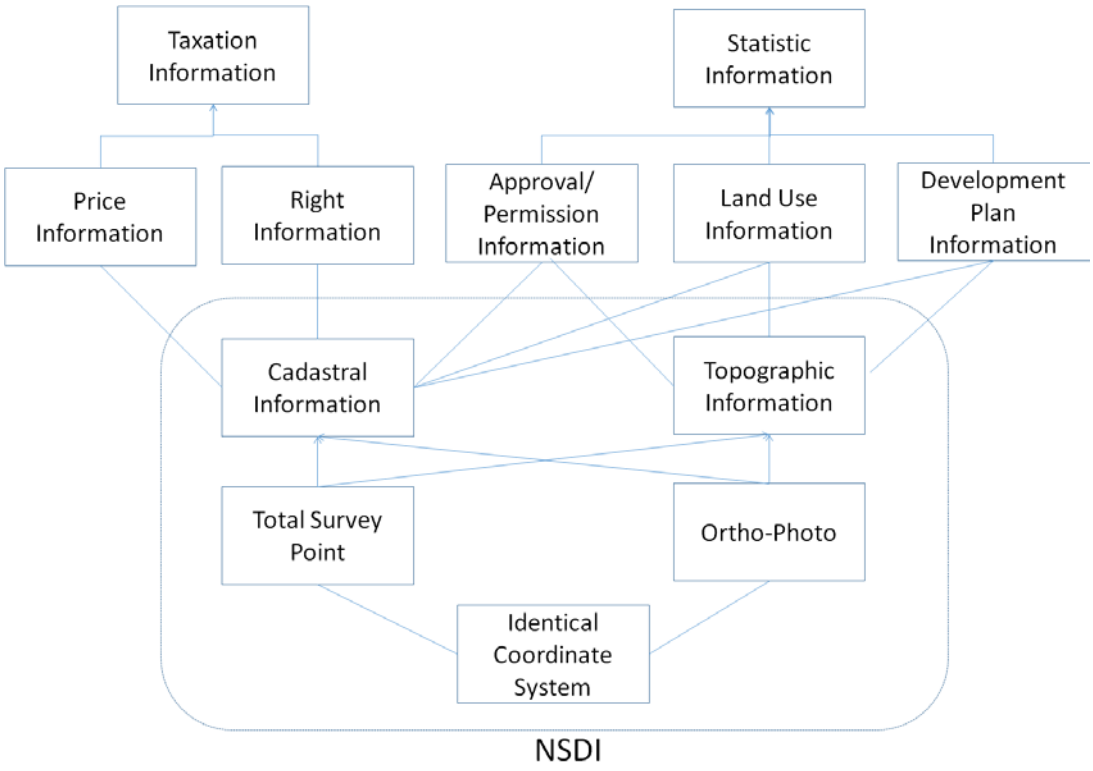
⑤ Land Survey Investigation: Composed of functions entering the creation and result of land related survey task and revising and examining the entered survey result when it differs from the previously existing result.

⑥ Land Alteration/Change Management: Composed of functions to register/revise/delete the topographic information of land or to manage the task of land alteration such as changes of land use information due to city plan and the records relevant to this task.

⑦ NSDI Connection: Composed of functions to use or provide various information of NSDI by establishing the connection to them.

3) Data reference model

The data reference model is a set of standard data to carry out the business reference and the application reference models. It is used to express all the information necessary for land management. In the case of using the data reference model, we can efficiently manage the data, prevent the duplication of data and it can be efficient for making connection to preexisting and external data.



A. Land Infrastructure Information : Land infrastructure information includes the data constructed by NSDI(National Spatial Data Infrastructure), the unique information related to land management and etc. The types of information composing the land infrastructure can be largely divided into topographic information and cadastral information. For the consistent management and utilization of land

information, both topographic and cadastral information can be constructed by site survey or photographic survey based on identical coordinate system. For this, integrated datum point and orthoimage can be used.

B. Price Information : Land price information can be composed of standard price, individual price and real transaction price and the standard for various types of taxation is arranged with these price information. Since the price information changes periodically, it contains the historical information and should be managed keeping consistency with the cadastral information.

C. Rights Information : Rights information includes personal information related to the owner and all the information supposed to be prepared for registration. As for the information regarding restriction and responsibility which are rights beside the ownership, there is a variety of forms of rights exist such as surface right, easement, leasehold right on deposit basis, mortgage, right of lease and etc. and the management of these rights should be feasible.

D. Approval/Permission Information : Information that includes various approval/permission related details linked to land development and transaction.

E. Land Use Information : Land use information is an information which indicates the current state of land uses publicly notified by various laws. This is designated by decree or ordinance at the central or local government and plays a role to restrain the development and use of the country's land.

F. Development Plan Information : Development plan information includes all sorts of information necessary for the land development and operation of population, resources, traffic, building, name of place, environment, city plan and etc. Besides, the information of city plan, city maintenance, management of city infrastructure and etc. is constructed and utilized based on the information of current condition and plan of land development.

G. Taxation Information : Taxation information means the data constructed through the taxation ledger, by connecting previous cadastral, price and rights information, at the time when a taxation takes place. The taxation information is drawn up based on the basic data of current condition, price information and the information regarding the owner of the land. It is constructed in separate data and the record is managed.

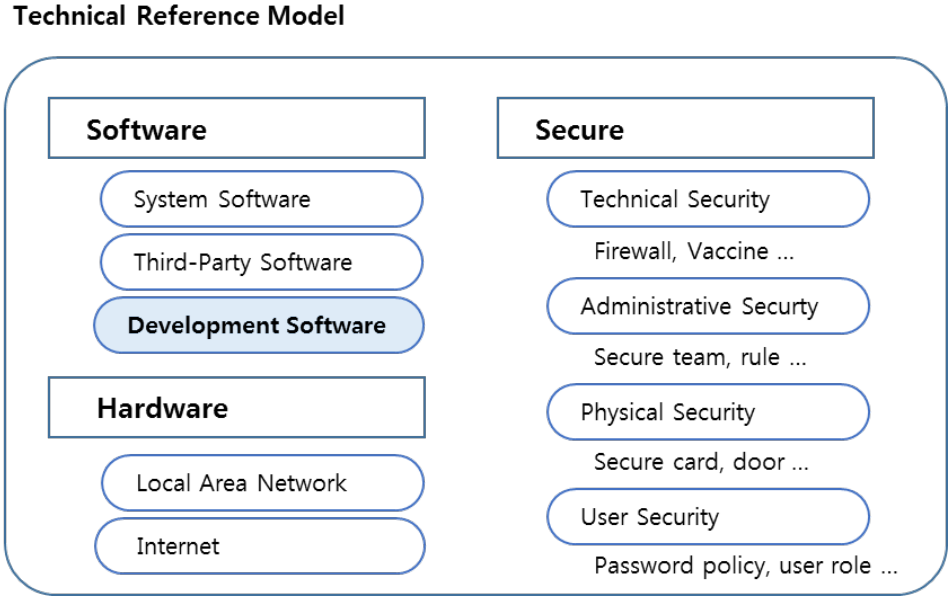
H. Statistical Information : Statistical information is an information which various current conditions regarding land and cadastre are integrated and constructed to a data warehouse(DW) and it is provided in the form of statistical outcome. It provides various statistical information regarding the use

and plan of the country's land and used to enhance the scientification of policies and administrative transparency.

4) Technical reference model

The technical reference model is a standard to operate the land management system and design technical infrastructure and the architectures of the hardware and software. The hardware and software which construct the system should be designed separately. It is hard to generalize the hardware and software architectures since they can be designed differently depending on the circumstance of each country. Therefore, the reference model here is presented to the extent that basic structure and functions are demonstrated.

Technical Reference Model of Land Informatization



A. Software : The software needed for the land management system should be constructed by separating it into system software, common use system and development system.

B. Hardware : By constructing the organization's local area network(LAN) and internet separately, the construction should be made in order that the organization's internal tasks and the following process of information can be efficiently progressed.

C. Security Policy : The security maintenance of local area network to internet is essential. Besides, all the documents of the server should be opened to the clients on internet. Therefore, the security policy should be constructed to assign the users accessible to specific information, not to control or approve the access.

3. Development of Methodology

1) Land Informatization Methodology Outline

The purpose of land informatization methodology is to provide development guides for reducing the cost of construction, improving the development productivity and the quality of development system and systematic management of development process when developing a land management system informatization business by standardizing the process and output of each stage in developing and constructing the land information system.

Land informatization construction methodology is constructed to carry out analysis tasks and the process of documentation according to the base structure of Enterprise Architecture(EA) which is generally recognized as the standard architecture. In the overall process of the methodology, the activities to be carried out and the outputs to be drawn for each stage of the methodology are defined.

2) Process of Construction

The land informatization methodology is the methodology that can be applied to the development of the system related to the land informatization specialized in construction, management and utilization of lands while following the process of information system development methodology. Therefore, understanding of construction methodology of information system and special conditions regarding the land infromatization is necessary.

In order to enhance the understanding of land informatization, we tried various analyses on the previous land information systems and as for the basic methodology, a reference model based on EA and methodology based on component are used. In addition, by presenting various problems or issues that can occur during the process of land informatization, the tasks to be carried out in each stage and etc. and having these composing the details of the methodology, we constructed the methodology so that it can make the most of the distinct characteristics of land informatization methodology.

– Investigation on Previous Systems: On various land information systems developed in Korea(PBLIS, LMIS, KLIS, KRAS), we collected and investigated the outputs related to the functions and the process of the tasks or the construction method of each system.

– Drawing The Category of Basic Methodology: On the basis of EA structure, we define the outputs of each process and draw basic categories for the outputs based on the

investigated contents of previous stage. When drawing the categories of the outputs, it is done based on the task, application, data and technical reference model of framework.

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– Analysis on The Issues of Land Informatization Construction: Through the case investigation of constructing the land informatization system, surveys and seminars are held and the related issues of problems, considerations and etc. are organized to reflect them on the methodology. The issues of land informatization construction are organized on the foundation of 30 years′ experience of land informatization system performed in Korea, sorting the contents to be considered in each stage separately.

– Drawing Up the Details of Methodology: We drew up the flow chart and described the details of performing measures. The detailed activity contents, outputs, issues to be handled and importance level of each category, tips for performing each process of the details and etc. when the details are carried are explained in detail.

3) Structure of Land Informatization Methodology

The land informatization methodology consists of total 6 stages and each constructing stage is designed to be performed only once. Each stage consists of detailed performing activities and if there is a previous system existing, the overall stages should be carried out. If there is no previous system existing, the stage irrelevant to the currents state does not have to be carried out. It can be skipped and proceed to the next stage.

The activity details of the land informatization methodology consist of planning, investigation of current condition, analysis, design, construction, test and diffusion installment. The stages consist of planning stage to decide overall project′s foundation construction, goal and scope, environment investigation stage to investigate the current tasks and environment of system, analysis stage to select the system structure to develop based on the requirements and reference model, design stage to define the output details based on the analyzed result, construction stage to carry out system development, data base construction and etc. based on the design, test & diffusion stage to install and train so that the developed system can be installed and operated.

Each methodology′s detailed structure and performing activity are as follows.

Detailed Performing Activities of Land Informatization Methodology

Stage	Performing Activity	
Stage 1 -	Establishing Project Plan	□ Establishing Vision □ Preparing Environment of Each Stage

Stage	Performing Activity	
Planning	Establishing Land Informatization Plan	□ Establishing Project Detail Plan □ Constructing Organization Structure □ Arranging Law System Relate to Business Promotion
Stage 2 – Current Condition Investigation	Task Current Condition Investigation	□ Defining Task Current Condition □ Current Task Construction
	System Current Condition Investigation	□ Structure and Function of Current System □ Investigation on Current System's Operation Data
	Data Current Condition Investigation	□ Investigation on Current Data's Design Model □ Collection of Existing Data
	Infrastructure Current Condition Investigation	□ Investigation on Current Hardware/Network Data □ Investigation on Possessing Software Data □ Investigation on Security System
Stage 3 - Analysis	Analysis on Land Task Process	□ Investigation on Land Administrative Task □ Current Task Flow Analysis □ Task Process Modeling □ Task Function Division
	Analysis on Requirements	□ Collection of Requirements □ Analysis of Requirements
	Analysis on Land Data Characteristics	□ NSDI Linkage Analysis □ Coordinate System Standard Analysis □ Measuring Quality and Size of Previously Existing Data □ Defining Target Data Set □ Arranging Standard of Data
Stage 4 - Design	Target System Task and Function Construction	□ Component Design □ Class Design □ Interface Design □ System Test Planning
	Data Model Design	□ Logical Data Model Design □ Physical Data Model Design

Stage	Performing Activity	
	Infrastructure Design	□ System Scale Assessment □ Target Hardware/Network Design □ Target Software Design □ Security Policy Design
Stage 5 - Construction	Target System Construction	□ .Net System Construction □ J2EE System Construction
	DB Construction	□ Physical Space Assignment and Element Registration
	Equipment Introduction	□ Hardware, Software Equipment Introduction
Stage 6 – Test&Diffusion Installment	System Test	□ Unit Test □ Integrated Test
	System Training	□ Drawing Up User's Guideline □ User Training
	System Installment and Diffusion	□ System Backup and Installment □ System Operation Test

4) Characteristic of Land Informatization Methodology

As for the characteristic of this methodology, the characteristic is that this methodology is deriving proper changes from the general informatization methodology to fit it into the structure of land informatization construction.

Differing from the construction of the general information system, the construction of land informatization has significantly many issues regarding the data and the application of unique process and standard needed for constructing land information. Besides, there are additional factors to be considered for land informatization such as association with various national institutions, establishing the process of the task for land informatization and etc. These contents

can be learned through the experience of developing land informatization and in this methodology, based on the case of Korea, by handling various experiences and problems of each stage as issues, the methodology was constructed to maintain the activities needed for the land informatization.

The issues to be considered in land informatization are classified, for each domain respectively, as 6 issues related to infrastructure, 12 issues related to data and 22 issues related to tasks. The importance level of the presented issues here may differ depending on the situation of each country and the methodology is constructed to respond to the situations of each country differentiating the importance level of the issues.

Infrastructure	Relationship with NSDI Plan
	Classify roles of private sector and nation
	Inquire the necessity of LSDI consulting
	Verification the willing to do plan and organization
	Neccessity of institutionalization or legisaltion
	Review need to introduce pilot project
Business	Gathering materials of law and guidelines relative to spatial information
	Review the business connection between organizations relative to land information
	Whether exist or not the small system operated individually
	Considering the national ICT infrastructure
	Investigate the network or communication for connecting another institution
	Check national security guidelines/unordinary regulation
	Grasp the connection status of data and business function among institutions
	Business and system is consistent with their regulation
	Business for land administration will be connected with property administration in the long term
	Standardize the terminology and business concept
	Design the system be able to conneced with or include the old system
	Considering international common functions for land administration/management

	Building flexible business processes against changing national policy or rules
	Considering system integration related to spatial information, cadaster and property in the future
	System function should be driven by international standard
	Having legal basis
	Modulation of system function
	Considering system using on web and mobile condition
	Measurement the network capacity of land information system
	Decision the type of system architecture
	Reviewing whether Introduce or not the open-source software
	Security of budget to spread land information system
Data	Investigate regulations for spatial information or data related to NSDI
	Arranging of cadastral non-coincidence
	How to handle the data had not the positional reference
	Quality assurance method for spatial data
	Drive the digital archiving of existing products and documents
	Considering management of time-series data
	Expand to 3D spatial data
	Type of base map
	Meaning of the standard for spatial data
	Considering connected database with spatial information, cadaster and property in the future
	Applying international standards
	External collaboration toward a spot survey and performance inspection

5) Distribution of Land Informatization Methodology

The detailed methodology of land informatization can be found on the homepage http://bsn.ngii.go.kr/un-ggim-ap-wg4

Otherwise, a booklet can be also provided through NGII of Korea.