

## Space & Environment

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# A Study on Social Value and Publicity of Geospatial Information: Focusing on Engagement of the People Disadvantaged in Using and Accessing Geospatial Information

**HaeKyong Kang**

## 1. Outline

### Research purpose

"In the information era, knowledge is the core of power and the source of wealth,"<sup>01</sup> and information gaps can lead to gaps in the quality of life. Thus far, spatial information, as a portion of information, has contributed to promoting public interests and the development of communities (Gang Shinwon 2001, 38). However, although the Framework Act on National Spatial Data Infrastructure (regarding welfare related to spatial information) states that anyone should be able to access and use spatial information easily, there are practical limitations to making it accessible to everyone. In particular, socially vulnerable groups, such as the disabled, the elderly, and children, face formidable barriers to using spatial information due to the inadequacy of policies designed to support them. Therefore, this study aims to propose an inclusive information policy that can contribute to the government's efforts to realize social value by recommending support measures for spatial information-poor groups, such as the disabled and the elderly, who have been largely excluded from spatial information policies.

### Research scope and methods

This study consists of four components: 1) a theoretical review and conceptual framework regarding the social value and publicity of spatial information, 2) an investigative analysis of the current state of the social value of spatial information, 3) an analysis of domestic and overseas cases of spatial information services provided to the spatial information-poor and their implications, and 4) a recommendation of policy measures for supporting the spatial information-poor.

The concepts of "social value of spatial information" and "spatial information-poor" used in this study were defined based on the concept of social value used in academic and policy circles. The current state of the spatial information-poor, including their populations (the policy target's size) and spatial distribution, was analyzed using a statistical analysis and GIS tools. The types of spatial information provided to the spatial information-poor and their difficulties in using this information were analyzed through on-site interviews with the spatial information-poor groups. The cases of spatial information services were divided into overseas (Missing Map, OneMap, Google Maps) and domestic cases (Community Mapping, Wezon), and their implications were then derived and examined. Moreover, this study intended to increase the effectiveness of the proposed policies by proving the feasibility of their specific measures through a collaborative study with experts. Based on the analysis results, an inclusive spatial information policy is proposed to support the spatial information-poor.

## 2. Main Concepts: The Social Value of Spatial Information and the Spatial Information-Poor

The most important concepts used in this study are the social value of spatial information and the spatial information-poor. These concepts were operationally defined based on the concept of social value as generally used in academic and policy circles (Song Yonghan 2014; Park Guangon 2017; Yoon Taebeum 2017). Social value is defined as financial and non-financial benefits generated by a range of activities that encompass the production, management, distribution (access),

01. "The power they seize is dependent on sophisticated data, information, and know-how, not just bags of capital" (Toffler A. 1990, 48).

and consumption (utilization) of spatial information in an open and shared manner to promote community interests, including the provision of opportunities to the socially weak, social integration, and facilitation and restoration of communities, and enhancement of the public interest.

This was followed by an examination of the government's legal system to identify spatial information-poor groups. In terms of the consistency of beneficiaries, the spatial information-poor were separately defined in consideration of the existing legal system. The term "spatial information-poor" used in this study refers to the disabled, low-income groups, citizens aged 65 and above, and residents of farming and fishing villages, who cannot directly use spatial information services or products and have difficulty purchasing them at market prices.

### 3. Policy Direction and Tasks for Enhancing the Social Value and Publicity of Spatial Information

#### Policy direction and characteristics: from central government- and business-centered to region- and community-centered policies

The policy direction proposed in this study encompasses three main actors that can support the spatial information-poor: local governments, map communities in which local residents participate, and regional social enterprises. Based on this framework, support measures for these three main agents are proposed. This is because there is a limit to the government's ability to consistently provide spatial information to the spatial information-poor. It is imperative that spatial information be generated with the participation of local residents who have a good understanding of their regional conditions and can promptly update information whenever there is a change in their actual living spaces.

Generating information for the spatial information-poor with the participation of local residents can have a series of policy effects that can contribute to the realization of the following types of social value: Type 8 (community restoration), Type 9 (regional economy), and Type 12 (participation).

**Table 1.** Policy direction for enhancing the social value and Publicity of spatial information

Types of Social Value		Social Value of Spatial Information	
		Key Implications	Cases
Type 5: The Socially Weak	Provision of opportunities for the socially weak and social integration	Promotion of policies through which citizens who cannot make a living independently, including women, elderly people, youths, and people with disabilities, can also enjoy the benefits of spatial information in daily life	- Ministry of Land, Infrastructure, and Transport (Braille maps) <sup>02</sup>
Type 7: Job Creation	Creation of quality jobs that enable people to enjoy a decent life	Job creation, job sharing, expansion of quality jobs, and reduction in temporary positions in the field of spatial information	- Hiring senior lecturers in Nowon-gu 50+ Center's community mapping (for the operation of the Senior Academy) <sup>03</sup>
Type 8: Community Restoration	Regional revitalization and community restoration	Resolution of pending regional issues and community revitalization based on spatial information	- Construction of a map with the participation of citizens (Pyeongchang Olympics Barrier-Free Map) <sup>04</sup>
Type 9: Regional Economy	Contribution to the local economy through the return of gains from economic activities to local communities	Promotion of the regional economy for a balanced development of regions and elimination of negative effects caused by the capital area's congestion	- Regional locations Map services for people with poor mobility provided through social enterprises and cooperatives (Wezon Cooperative's Jikhaeng Platform) <sup>05</sup>
Type 12: Participation	Promotion of democratic decision-making and participation as civil rights	Improvement of government operations in a manner that expands citizens' participation in the decision-making process for spatial plans and establishment of a participatory platform	- Statistics Korea's "Statistical Communication Map" <sup>06</sup>

**Source**

The author's own work.

02. National Geographic Information Institute's baro eMap portal site. <http://map.ngii.go.kr/mn/mainPage.do> (Accessed May 20, 2019).

03. Community Mapping Center. <http://cmckorea.org/history> (Accessed October 30).

04. Ministry of Culture, Sports and Tourism. "The Ministry of Culture, Sports and Tourism, the Ministry of Government Administration and Home Affairs, the Ministry of Land, Transport, and Maritime Affairs, Pyeongchang Organizing Committee, Gangwon-do, etc. create a barrier-free tourist city – The 2018 Pyeongchang Winter Paralympics signs a memorandum of understanding for 'a barrier-free tourist city'". Press Release. <http://www.korea.kr/common/download.do?fileId=184767991&tblKey=GMN> (Accessed December 1, 2019).

05. Wezon Jikhaeng Platform. [https://jikhaeng.kr/app/map/index?md\\_id=free](https://jikhaeng.kr/app/map/index?md_id=free) (Accessed March 10, 2019).

06. Statistics Korea. Statistical Communication Map. <https://sgis.kostat.go.kr/edu/jsp/sub05.jsp> (Accessed March 10, 2019).

Furthermore, support for local residents' activities in map communities can contribute to realizing Type 7 social value (job creation) by creating jobs for elderly people, women, etc. in their regions, as shown by the example of hiring senior lecturers (for the operation of the Senior Academy) in Nowon-gu 50+ Center's community mapping. **Table 1**

### Considerations for policy planning to support the spatial information-poor

In this study, two factors were considered in policy planning: first is the lifecycle of spatial information and second is sustainable policy measures.

Regarding the lifecycle of spatial information, policy measures to support the spatial information-poor by increasing the accessibility and use of spatial information in each phase of the lifecycle (establishment → connection/integration/management → utilization/services) are proposed with the aim of including all necessary spatial information for each spatial information-poor group. Table 2 shows the items for each group that require policy support. **Table 2**

Measures for supporting regional and self-governed private actors were considered for developing a sustainable policy. Due to their nature, spatial information-poor groups are

likely to spend more time traveling; therefore, it is of cardinal importance to provide them with the most up-to-date and accurate information. The frequent collection of information entails a significant financial burden on the government. Consequently, the government will update the information only periodically. On the other hand, local private companies have a good understanding of their regions through their day-to-day operations. Therefore, they can collect information more easily and frequently, quickly make decisions and swiftly allocate budgets, and contribute to their regions' economic development through job creation, providing direct employment to the spatial information-poor (e.g., disabled people). Therefore, regional and privately operated provision of services can be longer lasting than government-led centralized efforts.

Regional and private service actors can be classified as traditional companies and social enterprises. The measures proposed in this study are focused on supporting regional social enterprises, which emphasize the creation and delivery of social value, rather than on traditional companies, which prioritize making profits. This is because spatial information services for the spatial information-poor have a strong public character with an emphasis on providing policy support for the socially vulnerable.

**Table 2. Framework for policy support considering the lifecycle of spatial information**

Spatial Information-Poor Group	Policy Support for the Spatial Information-Poor			Note (Policy Tasks)
	Establishment	Connection/Integration/Management	Utilization/Services	
Citizens aged 65 and above	No need for separate policy measures (It is only unnecessary to implement separate measures in the case of using the same content as the general public.)	No need for separate policy measures (It is only unnecessary to implement separate measures in the case of using the same content as the general public.)	<b>Policy on spatial information utilization services</b> (It is necessary to develop special technologies for content access and provide education.)	- Developing and distributing special technologies - Education (training related workers to spatial information)
People with disabilities	<b>Policy on the accumulation of spatial information</b> (It is necessary to create new amenities and travel path-centered barrier-free spatial information.)	<b>Policy on the connection and integration of spatial information</b> (It is necessary to develop standard guidelines for accumulating barrier-free spatial information, building information platforms, etc.)	<b>Policy on spatial information utilization services</b> (It is necessary to develop special technologies for content access and provide education.)	- Establishing a legal system and an implementation framework - Accumulating spatial information - Developing and distributing special technologies - Supporting service providers - Education (training workers related to spatial information)
Low-income groups	No need for separate policy measures (It is only unnecessary to implement separate measures in the case of using the same content as the general public.)	No need for separate policy measures (It is only unnecessary to implement separate measures in the case of using the same content as the general public.)	No need for separate policy measures (It is not necessary to implement separate measures because these groups can use the same content as the general public.)	(N/A)
Farmers and fishers	No need for separate policy measures (It is unnecessary to implement separate measures because previously generated information is available.)	<b>New policy measures</b> (It is necessary to implement new policy measures by connecting the existing services operated by different ministries.)	No need for separate policy measures (It is not necessary to implement new policy measures due to existing support policies.)	- Establishing an implementation framework

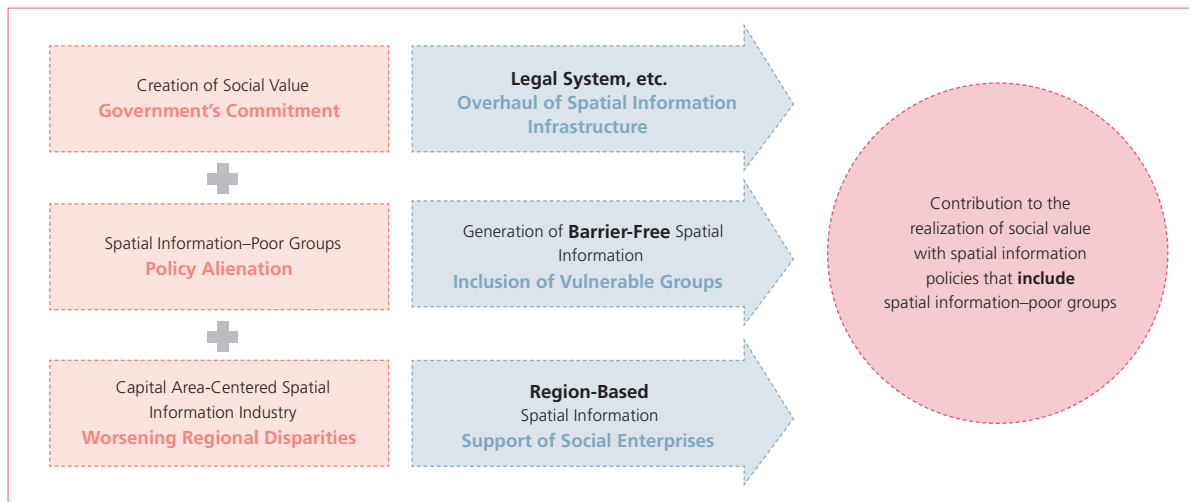
**Source** The author's own work.

### Policy objective and major policy tasks for supporting the spatial information–poor

The proposed spatial information policy for the spatial information–poor groups is focused on the provision of reliable customized services by supporting regional economic players. To achieve this objective, five primary policy tasks are proposed: 1) measures for generating and updating customized spatial information, 2) development and distribution of special technology-based public goods that facilitate the access to and use of spatial information, 3) policy research projects, including surveys, 4) support for regional social enterprises, and 5) improvement of legal systems. **Figure 1**

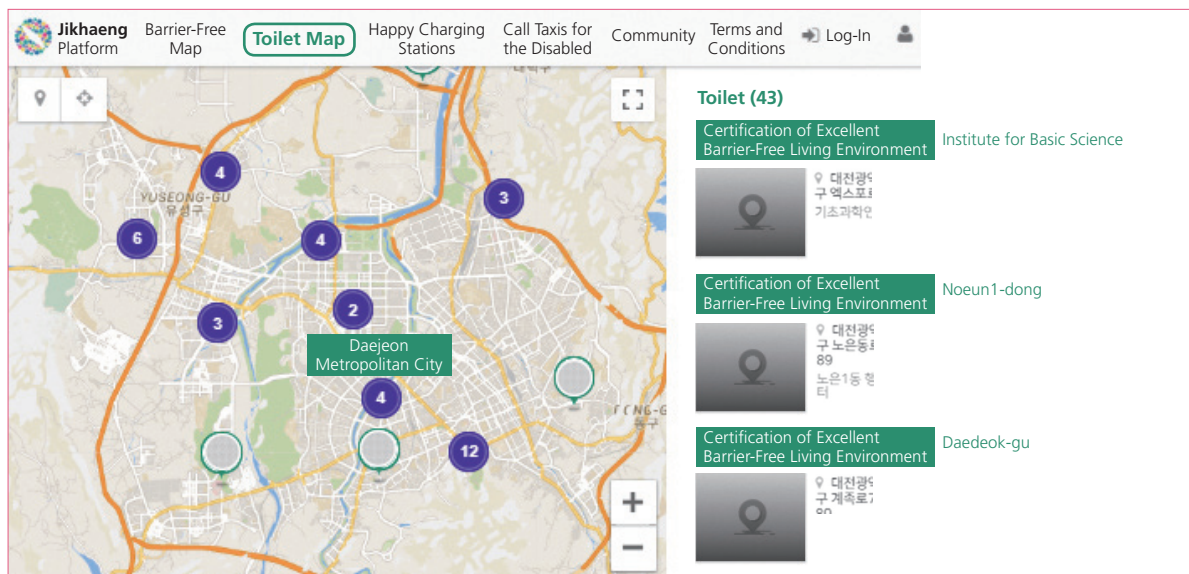
The first policy task is to generate spatial information customized for the spatial information–poor. Of the four spatial information–poor groups, it is necessary to generate new spatial information for people with disabilities (including people with poor mobility). The most urgent spatial information for the disabled (“barrier-free” spatial information) includes amenity locations and travel paths. To achieve this goal in a cost-effective way, this study proposes a “generation and update of barrier-free spatial information based on public data” measure. Figure 2 shows the results of a demonstration of the study’s proposal in collaboration with external experts. The findings suggest that data accumulation and testing expenses

**Figure 1.** Spatial information policy objective that is inclusive of the spatial information–poor groups



**Source**  
The author's own work.

**Figure 2.** Cases of generation of public data–based barrier-free spatial information in Sejong and Daejeon



**Source**  
The outcomes from these collaborative studies<sup>07</sup>.

07. Jikhaeng Platform. [https://jikhaeng.kr/app/map/index?md\\_id=toilet&category\\_code=77](https://jikhaeng.kr/app/map/index?md_id=toilet&category_code=77) (Accessed October 11, 2019).

can be reduced by over 30% if barrier-free spatial information is generated by geocoding information (e.g., facility name and address) in the public sector, such as barrier-free information on living environments provided by the Ministry of Health and Welfare (Korea Disabled People's Development Institute). It was also recommended that this task be undertaken by local social enterprises. **Figure 2**

The second policy task is to support the development and distribution of special technology-based public goods that facilitate the generation, access, and use of customized spatial information by the spatial information-poor. It is necessary to provide open-source spatial information software free of charge, such as the K-Light app, developed by Kookmin University. It is also essential to develop special equipment that automatically generates information in the form of a "wheelchair view," like the "road view" service provided by map services. At present, wheelchair views for the disabled are manually built by wheelchair users wearing a camera on their chests and moving their wheelchairs themselves, as shown on the left side of Figure 3. Special devices should be developed to automate this process. For example, it is possible to develop state-of-the-art wheelchair-sized robots to perform regular and economical collection of information on wheelchair-accessible paths and facilities. Furthermore, it is important to develop technologies to make access to spatial information more user-friendly, such as audio tactile maps and augmented reality-based wayfinding. **Figure 3**

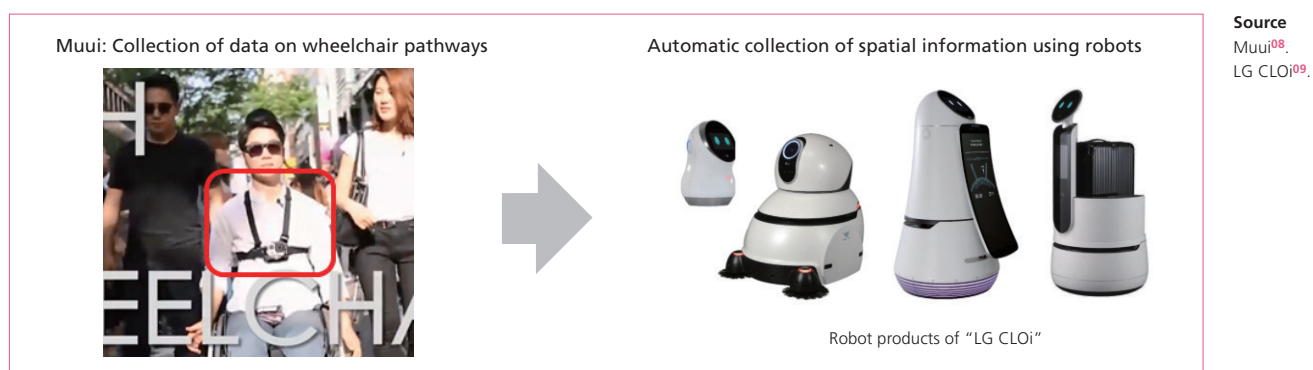
The third policy task is to expand projects aimed at supporting policies for the spatial information-poor. It is essential to examine their disparities with the general public and monitor the actual conditions of their use of spatial

information. It is also necessary to establish general quality standards that are necessary to create and provide services customized for the spatial information-poor.

The fourth policy task is to support social enterprises that can provide regional spatial information services. Support measures include the designation of preliminary social enterprises by the Ministry of Land, Infrastructure, and Transport and local governments, training social venture businesses revolving around regional universities and experts, and supporting social enterprises and cooperatives with a focus on local spatial information-poor residents (beneficiaries).

The fifth policy task is to develop plans for improving the current spatial information law and systems to build a foundation for the continuous implementation of policy projects that support the spatial information-poor. Most importantly, it is necessary to improve the Framework Act on National Spatial Data Infrastructure enforced by the Ministry of Land, Infrastructure, and Transport. This will require the addition of provisions for the spatial information-poor and specification of the scope of support. Additional provisions should include 1) support for the generation of spatial information, 2) provision of spatial information services and devices that can improve the quality of life and mobility of the spatial information-poor, 3) assistance in technology research and development aimed at improving access to spatial information, 4) establishment of standards and certification systems for content, services, etc. for the spatial information-poor, 5) support for companies that offer assistance to the spatial information-poor, and 6) support for local communities and social enterprises. Moreover, new provisions on the release of information on barrier-free amenities should be incorporated into the Act on the Guarantee

**Figure 3.** Examples of automatic spatial data collection devices



08. Muui. <https://www.wearemuui.com> (Accessed June 2, 2019).

09. LG CLOi. <http://www.aitimes.kr/news/articleView.html?idxno=12523> (Accessed February 5, 2019).

10. Scope of the service (web portals, apps): Google Maps, Naver Map, T-Map, Kakao Map, Kakao T, Kakao Navi, Smarter Subway, Kakao Bus, and Kakao Metro.



of Promotion of Convenience of Persons with Disabilities, Elderly People, Pregnant Women, etc. and the Rules on the Certification of a Barrier-Free Living Environment.

#### 4. Conclusion

Over the last 20 years, ordinary citizens' use of spatial information has increased considerably, as shown by the latest figure of approximately 40 million<sup>10</sup> map service users (WiseWeb 2018), promoted by government-led implementation of spatial information policies. With population aging, the share of people with disabilities is increasing among citizens aged 65 and above. This will lead to a considerable increase in the demand of people with poor mobility for map services. However, spatial information services for these vulnerable groups are economically infeasible, and thus the country's biggest players, such as Naver and Kakao, offer few services to the public free of charge. Therefore, the government should provide policy support that can maximize the public interest of spatial information. It is also necessary to shift the direction of the country's spatial information policy to effectively respond to the changing policy environment in pursuit of social value and help increase social willingness to realize it.

This study aims to help realize the social value of spatial information and enhance the public interest by proposing spatial information policy measures inclusive of spatial information-poor groups such as the disabled and the elderly,

who have thus far been largely excluded from such policies. To that end, a spatial information policy based on local governments and the participation of citizens is proposed to incorporate spatial information-poor groups. Sustainable measures for supporting local and self-governed private actors are proposed. Schemes for improving the current legal system and organizing a policy implementation system are proposed for a transition to a spatial information policy that embraces spatial information-poor groups. A policy direction is proposed to contribute to particularly five of the 13 types of social values that have been excluded from spatial information policies: the socially weak (Type 5), job creation (Type 7), community restoration (Type 8), regional economy (Type 9), and participation (Type 12).

As society progresses, care and consideration are recognized as important values. Given that the United Nations also emphasizes the importance of inclusive cities that care about the socially weak, Korea should seek spatial information policies that contribute to this goal. The growing importance of social value is manifested not only in the government's commitment reflected in its policy objectives, but also in policies around the world. This study's significance lies in the fact that it proposes a policy that is inclusive of spatial information-poor groups. The study also has implications for the country's overall information policy in terms of proposing measures designed to respond to the changing global environment.

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# A Study on Improvement of Regulation for Vitalizing Spatial Information-based Convergence Industry

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## 1. Background & Need

### What is the spatial information-based convergence industry?

The spatial information-based convergence industry refers to a technical convergence industry that is effective in realizing a digital new deal to pioneer a new market by combining spatial information with other fields of technologies or services. In particular, as mobile devices were equipped with positioning functions such as GPS, the service market using personal location information has rapidly increased since the 2010s. There are location information-based platform services in various fields, such as Uber, Airbnb, Kakao Taxi, and The Nation of Delivery. Also, digital new deal-type service markets, which combine spatial information such as autonomous vehicles, smart cities, and digital twins, have been significantly expanded around the world.

### Data economy promotion and spatial information

In recent years, countries around the world have made efforts to build a strategy for data economy promotion. The Korean government is also committed to improving data regulation based on personal information use. In particular, Korea has established a national strategy, such as data highway for data economy promotion led by the Presidential Committee on the Fourth Industrial Revolution (PCFIR). The country has also implemented a regulatory sandbox and made various attempts to alleviate data-related regulations, such as the revision of three data economy-related acts, namely, the

Personal Information Protection Act, the Act on Promotion of Information and Communications Network Utilization and Information Protection, and the Use and Protection of Credit Information Act. However, there is still a lack of discussion on regulatory improvements in relation to the use of spatial information. Although the National Spatial Data Security Management Regulations and Act on the Protection and Use of Location Information have been amended in 2017 and 2018, respectively, to promote the use of spatial information, it fails to satisfy the spatial data consumers. The lack of understanding of the characteristics of spatial information has resulted in the failure to derive suitable policies for the promotion of spatial information use and regulatory improvement measures.

## 2. Current Status of Spatial Information-related Regulations and the Problems

### National Spatial Data Security Management Regulations

The National Spatial Data Security Management Regulations are administrative rules<sup>03</sup> that stipulates the requirements for conducting security tasks with national spatial information. The Organizations that produce and manage the national spatial information hold the National Spatial Data Security Management Regulations for each organization to do the security tasks on national spatial information in charge. The main content of the regulations includes the security management system of spatial information, classification criteria and management procedure of responsible spatial information, measures to protect spatial

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03. National Spatial Data Security Management Regulations of the Ministry of Land, Infrastructure and Transport. 2017. Directive No. 949 (December 28, Abolished and newly established). Article 1, Chapter 1.



information, and disclosure requirements and procedures. The institutions in charge of the management and production of national spatial information provide the detailed classification criteria for national spatial information in accordance with the National Spatial Data Security Management Regulations. Thus, responsible spatial information is classified and managed into three classes: Non-disclosure, Disclosure-restricted, and Disclosure.

However, the National Spatial Data Security Management Regulations have the following problems in terms of effectiveness and logical viewpoints. First, from the viewpoint of the mitigation process of the detailed classification criteria of national spatial information in the National Spatial Data Security Management Regulations, questions are raised whether the basis of the classification criteria is scientific and reasonable. Second, the National Spatial Data Security Management Regulations are administrative rules that aim to regulate government agencies that produce, manage, and disseminate spatial information. However, the regulations practically regulate private industries as well. Third, when converging disclosed spatial information of the National Geographic Information Institute (NGII) and overseas spatial information providers, more detailed spatial information can be produced than data classified as the Disclosure restricted in the detailed classification criteria of national spatial information. Thus, the effectiveness of the regulations is brought into question. Fourth, although non-disclosure spatial information may be disclosed if it is masked according to the Act on the Establishment and Management of Spatial Data, the current masking method may produce side effects in that the locations and boundaries of the security facilities are easily exposed.

### **Act on the Protection and Use of Location Information**

The Act on Protection and Use of Location Information has been enacted to protect the privacy from leakage, misuse, and abuse of personal location information and vitalize the use of location information by creating a safe use environment.<sup>04</sup> The act has outlined the legal definition of location information and the scope of protection and utilization as well as the basis on which service providers can conduct location information businesses and location-based services.

However, the Act on Protection and Use of Location Information has several problems because it was enacted before

the spatial information technology became much advanced. First, due to the difference in the information technology environment between the time when the Act on Protection and Use of Location Information was first established and the present, the content of the act includes some entry barriers and duplicate regulations, which are not quite compatible with the current era. Second, it has excessively complex regulation with regards to location information, focusing on the protection of location information, and yet lacking the details on how to utilize the information. Third, there is a difference between the regulation content prescribed in the law and the decision made by the Korea Communications Commission, which is the operating body of the laws and regulations regarding location-based service providers.

### **3. Trend of the Improvement in Spatial Information Regulation**

With the change in the technical environment and increase in data use, improvements in data-related regulation environments have been steadily conducted overseas. One of the typical examples is the General Data Privacy Regulation (GDPR) in the European Union (EU), which is an integrated personal information-related act. The GDPR not only reinforced the protection of privacy but also expanded the use of personal information by specifying the scope of the use of data.

In order to vitalize the data economy and ease regulations for the use of personal information, Korea adopted a special recommendation for the protection and use of personal information by the PCFIR in 2018. The special recommendation proposed the use and promotion of personal information by defining the concept of personal information and pseudonymous data and detailing the supply and use of pseudonymous personal information. Accordingly, the amendment bill of the data economy-related three laws, including the Personal Information Protection Act, was passed and enforced on August 5, 2020. The amendment bill of the Act on Protection and Use of Location Information was also prepared in 2019 to specify the definition of location information and lower the entry barrier for location information-related businesses. However, this bill has not been passed yet.

04. Act on the Protection, Use, etc. of Location Information. 2020. Law No. 17347 (June 9, Amended by other laws). Article 1, Chapter 1.

The 2017 amendment to the National Spatial Information Security Management Regulations relaxed the spatial resolution criterion for aerial photographs, which can be disclosed from 50cm to 25cm. In the case of 3D spatial information, even if the resolution is more precise than 90m and 3D spatial information including 3D coordinates is released, when there is no risk factor for national security, it has been relaxed to allow disclosure. This revised measure aims to improve the use of 3D spatial information so as to implement related technologies in the Fourth Industrial Revolution, as shown in the development of a sophisticated digital road map.

#### 4. Suggestions for Improvement to Vitalize the Spatial Information-based Convergence Industry

##### Suggestion for improving the National Spatial Data Security Management Regulations

The detailed classification criteria of national spatial information in the National Spatial Data Security Management

Regulations require the resetting of the criteria through discussion and demonstration between related organizations. Specifically, this initiative aims to eliminate the ambiguity that arose from the criteria initially set forth. This study proposed improvements in the detailed classification criteria by referring to the globally disclosed spatial information and disclosure level of spatial information in other nations around the world. It is necessary to discuss the setup of reasonable criteria between related organizations based on the improvements. Also, it is vital to increase the effectiveness by adopting various masking methods, such as virtual facilities, buildings, forests, and farmland, which would consider the land use of surrounding regions rather than enforcing a single masking method (forest) to use non-disclosed spatial information. [Table 1](#)

##### Suggestion for improving related laws to promote the use of location information

Under the revision of the data economy, three laws were enforced from August 5, 2020. The contents of these regulations covered the measures to use and provided the pseudonymous information that should be included in the Act on the Protection

**Table 1. Suggestion for improving detailed classification criteria on the National Spatial Data Security Management Regulations**

Existing detailed classification criteria			Improved criteria (draft)	Source National Spatial Information Security Management Regulations of the Ministry of Land, Infrastructure and Transport. 2017. Directive No. 949 (December 28, Abolished and newly established). Reorganized by the author.
Aerial photograph	Disclosure restricted	<ul style="list-style-type: none"> <li>Data whose resolution is more precise than 30m, including 2D coordinates (longitude and latitude)</li> <li>Data whose resolution is more precise than 90m, including 3D coordinates (longitude and latitude)</li> </ul>	<ul style="list-style-type: none"> <li>Data whose resolution is more precise than <b>12cm</b>, including 2D coordinates (longitude and latitude)</li> <li>Data whose resolution is more precise than <b>25cm</b>, including 3D coordinates (longitude and latitude)</li> </ul>	
	Disclosure	<ul style="list-style-type: none"> <li>Aerial photograph and image other than those subject to “non-disclosure” and “disclosure-restricted”, 3D stereoscopic data (coordinate display not allowed in the internet, navigation, and mobile phones)</li> </ul>	<ul style="list-style-type: none"> <li><b>All data except for those subject to non-disclosure and disclosure-restricted</b></li> </ul>	
Satellite image	Disclosure restricted	<ul style="list-style-type: none"> <li>Data whose resolution is more precise than 30m, including precision-corrected 2D coordinates</li> <li>Data whose resolution is more precise than 90m, including 3D coordinate</li> </ul>	<ul style="list-style-type: none"> <li>Data whose resolution is more precise than <b>15m</b>, including precision-corrected 2D coordinates</li> <li>Data whose resolution is more precise than <b>30m</b>, including 3D coordinate</li> </ul>	
	Disclosure	<ul style="list-style-type: none"> <li>Satellite images and 3D satellite data except for those subject to “non-disclosure” and “disclosure-restricted”</li> </ul>	<ul style="list-style-type: none"> <li>All data except for those subject to non-disclosure and disclosure-restricted</li> </ul>	
Other spatial information	Disclosure restricted	<ul style="list-style-type: none"> <li>Data whose resolution is more precise than 90m and 3D spatial information including 3D coordinate</li> <li>Note that road regions out of the spatial information whose resolution is more precise than 90m and including 3D coordinates are disclosed if no national security threat is involved after a security check.</li> </ul>	<ul style="list-style-type: none"> <li>Data whose resolution is more precise than <b>30m</b> and 3D spatial information including 3D coordinates</li> <li>Note that road regions out of the spatial information whose resolution is more precise than <b>30m</b> and including 3D coordinates are disclosed if no national security threat is involved after a security check.</li> </ul>	
	Disclosure	<ul style="list-style-type: none"> <li>3D image data in general regions without coordinates</li> <li>Stereoscopic data whose resolution is lower than 90m with 3D coordinates</li> </ul>	<ul style="list-style-type: none"> <li><b>All data except for those subject to non-disclosure and disclosure-restricted</b></li> </ul>	

##### Note

This is the improvement (draft) proposed by the author considering the local and overseas disclosed data level as a starting point to discuss the improvement of the detailed classification criteria of national spatial information. It must include a procedure to derive the agreed results through demonstration and verification processes via the participation of related institutions, such as the National Intelligence Service, the Ministry of Defense, the Ministry of Land, Infrastructure and Transport, and private experts.

and Use of Location Information, which would serve as the basis to use in gathering personal location information. The contents of the revision in 2019, which define the location information clearly and lowers the entry barrier to location information businesses as the main subject, should be considered as well.

Furthermore, this study proposed the de-identification method<sup>05</sup> of personal location information as a guideline (refer to Table 2). This study proposed a measure for service providers to convert personal location information to anonymous information as much as possible and expand the possible use of information. **Table 2**

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**Table 2.** Suggestion of guidelines for de-identifying personal location information

Handling method	Use example		Detailed technique
Space-based k-anonymity	Fixed cell method	<ul style="list-style-type: none"> <li>Only the location information in a specific cloaking region is provided to de-identify the accurate personal information of user A, and k-1 users such as B, C, D, E, and F within the same region are added.</li> </ul>	k-1 increase in a specific space region, increase in Pseudo k, assignment of Pseudo location, etc.
	Variable cell method	<ul style="list-style-type: none"> <li>As the size of the space unit changes variably, the set k-1 is included in the cloaking region.</li> </ul>	Change in the cell size
Space-based l-diversity	<ul style="list-style-type: none"> <li>Making it impossible to know which building user A is located in by arranging similar N facilities, etc. Additionally, in the cloaking region to which user A belongs, along with the space-based k-anonymity.</li> </ul>		Addition of random building/facility

**Source**

The author's own work.

05. For de-identification method of personal location information, there are space-level-based models such as space-based k-anonymity and l-diversity.

## References

- National Spatial Data Security Management Regulations of the Ministry of Land, Infrastructure and Transport. 2017. Directive No. 949 (December 28, Abolished and newly established). Article 1, Chapter 1.
- Act on the Protection, Use, etc. of Location Information. 2020. Law No. 17347 (June 9, Amended by other laws). Article 1, Chapter 1.

# Developing Interactive Land Monitoring Reports as Data-driven Communication Tool for National Land Policy

**Youngjoo Lee, Bokyeong Lee,  
Changwha Oh, Jaesoen Son**

The policy paradigm is changing from the top-down policy implementation in the past to a cooperative implementation method based on evidence-based transparent administration and communication with the public. In order to diagnose and find solutions to problems in regions that are mutually independent and organically intertwined, cooperative diagnosis and prescription through participation and communication of stakeholders in various fields are essential. The utilization of data should be expanded as a communication tool to change A transition is needed in the existing national land policy communication method to be “evidence-based”, and data utilization should be expanded as a tool for communication to understand and find solutions to problems facing the national territory.

## 1. Change in the Policy Delivery Method Following the Change in the Communication Method

When ‘communication’ is said to be alleviating conflicts and eliciting understanding and empathy, communication can be regarded as a process<sup>01</sup> of sharing thoughts and feelings through various tools, forming a bond of sympathy, and trying to understand each other. As technologies advance, social culture is changing, and communication methods are evolving according to changes in media. As IT technology innovation permeates society, a culture to raise and engage in social issues through smartphones, etc. is spreading, and the demand for the development and utilization of various channels and tools

that will enable everybody to communicate and engage in problems from the stage of recognition -to problem solving is also increasing. Whereas traditional media such as newspapers and broadcasting played the role of major information sources in the past, in recent years, communication structures and methods have been changing from one-way to two-way ones following the activation of new media such as social media and Youtube. The spread of these new communication methods activates people’s participation in policies, and the government is developing new communication methods and tools to enhance the legitimacy of policies based on the people’s understanding of and cooperation for the policies.

The government has established dedicated organizations (digital communication team, etc.) to strengthen communication with the public, and is making efforts to communicate policies using various media contents. However, many ministries use the dedicated organizations for just making press releases into digital content and they have limitations in discovering messages that meet the public at their eye-level or producing planned content (THE PR NEWS 2019). As for policy communication to the public, it is necessary to discover messages that arouse interest based on evidence on the subjects of interest to the public. There is a need to develop a communication tool with which to move away from the top-down approach to information delivery in the past to a bottom-up approach, in which public debate is enabled based on data and diverse sets of information are gathered so as to draw a reasonable conclusion in a cooperative manner. It is important to create a platform where communication can be started based on data instead of presenting the results of data analysis as a conclusion.

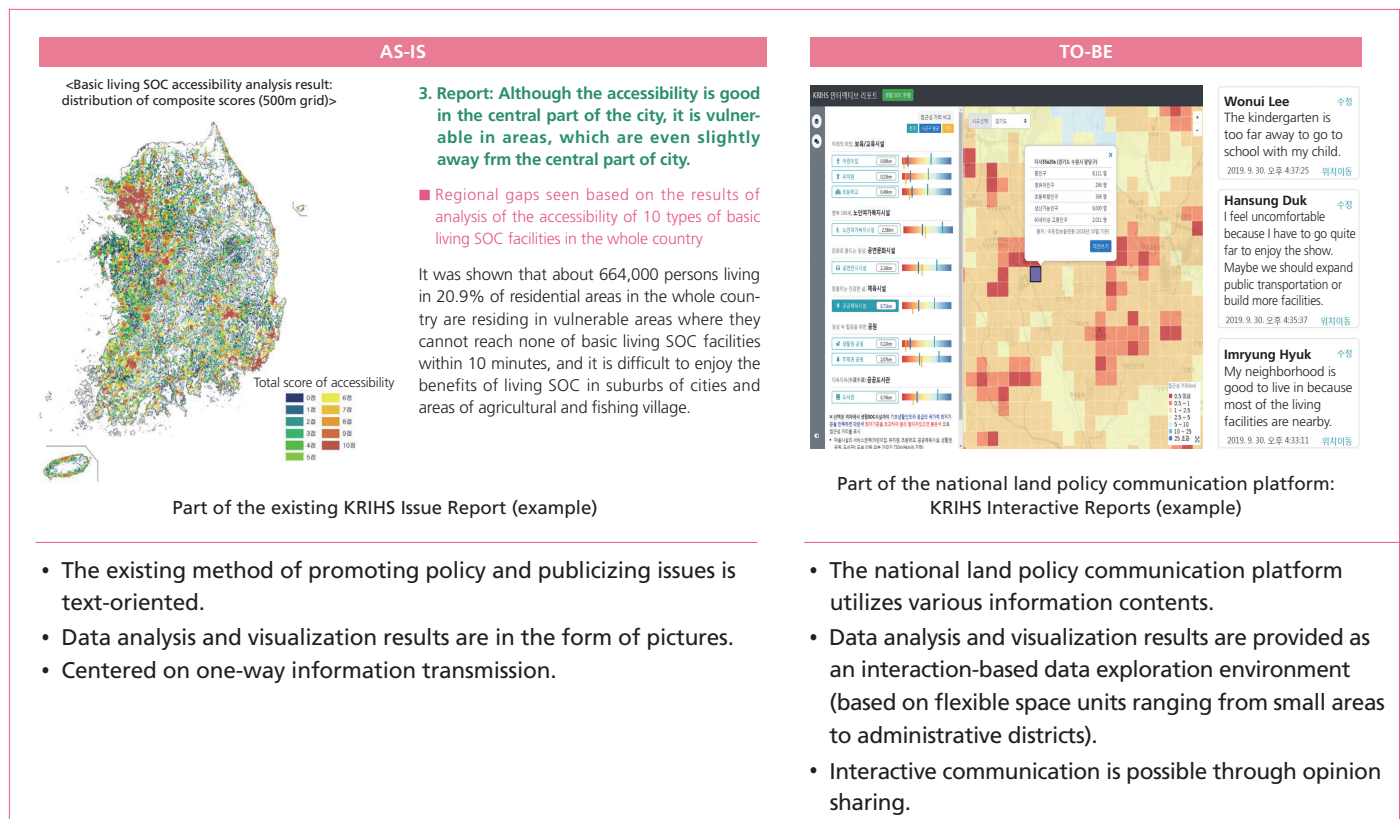
01. Ministry of Culture, Sports and Tourism. 2012. Online policy communication 2008-2012. Seoul: Ministry of Culture, Sports and Tourism.

Japan has established the Regional Economy and Society Analyzing System (RESAS) to support voluntary and efficient policy making reflecting regional characteristics by accurately grasping the present situation and actual state of the region and objectively predicting the future outlook of the region<sup>02</sup>. The diverse data provided by the RESAS play the role of a “common language” for diagnosing regional problems and promoting cooperative and rational problem solving by policy stakeholders. What is necessary to cooperatively diagnose problems in response to various issues surrounding the national territory and to form a bond of sympathy about the necessity of policy promotion? Although the knowledge based on the experience of experts is necessary, a communication tool for recognizing the problems faced by national territory from diverse perspectives and positions and finding solutions is necessary. In other words, a transition is needed to a data-based communication method.

## 2. Data-driven National Land Policy Communication Tools Should Be Developed and Utilized

In order to establish national territorial policies with which the people sympathize, valuable information for effective communication and participation should be produced. By converging different types of data based on “locations” and visualizing them on a map, policy stakeholders in diverse fields responding to national land policy issues can be enabled to intuitively grasp regional problems and easily form a bond of sympathy with the policy promotion process for solving problems. In particular, in place of the existing static content such as policy maps that deliver basic administrative data and results of empirical analysis in one direction, web-based platforms using interactive maps as an interactive communication system in which users can actively search for necessary information and input data and opinions are increasingly being used. **Figure 1**

**Figure 1.** Characteristics of the national land policy communication platform



02. Japan Regional Economy and Society Analysis System. <https://resas.go.jp>

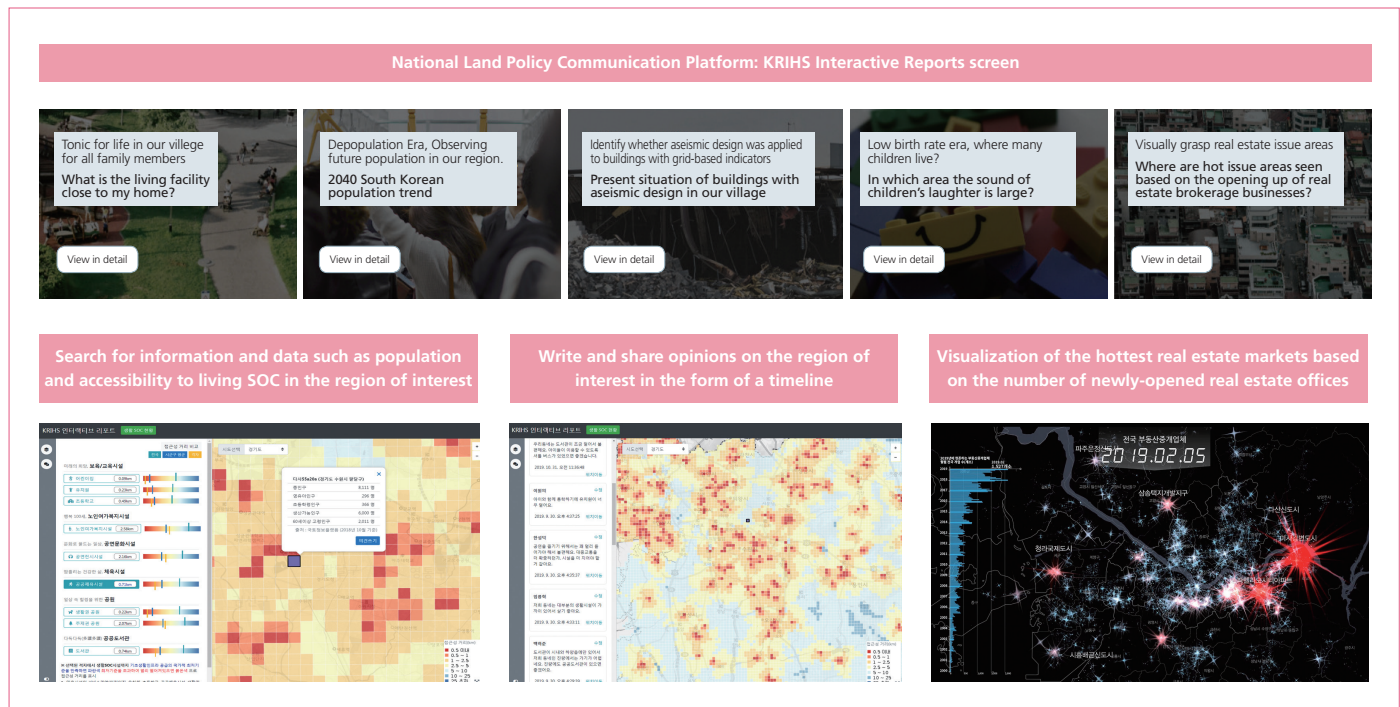
The promotion of data-driven public debates can induce the participation of stakeholders in policy processes and diverse views and information can be collected through crowd sourcing. A bond of sympathy with policy promotion should be formed, policy issues that must be publicized should be selected from related issues, and diverse data that can explain the policy issues should be converged and utilized to provide interactive content that can be explored by users and a platform environment where communication is possible. By enabling data collection simultaneously with providing information, participation in policies can be increased based on data and the rationality of policy promotion can be secured. In addition, the establishment of a virtuous cycle of policy communication/promotion in which policy demand can be collected and reused as data can be supported. As such, the existing national land policy promotion and communication method should be changed into data-driven 'evidence-based methods' and interaction-based new information sharing/communication channels that will promote data communication/convergence among diverse policy stakeholders should be developed and utilized. **Figure 2**

### 3. Social Innovation by Sharing National Land Issues with the People and Solving Them through Communication

In order to diagnose mutually independent and organically intertwined regional problems and find solutions to the problems, a new methodology is needed to promote the participation and communication of policy stakeholders and to improve the rationality of policy implementation. Communicative and tangible land policies can be implemented by proving information on diverse issues surrounding national territory through the process of 'data sharing-communication-collaborative problem assessment' together with an interaction-based data search environment and a function to share public opinions. A communication platform that will enable active participation of people in the national territorial policy promotion process should be prepared by breaking away from unilateral media manipulation to publicizing national land policy issues based on data, and sharing the results of analysis of related data in an exploratory environment.

The foregoing platform can be used as a useful tool for

**Figure 2. National Land Policy Communication Platform: KRIHS Interactive Reports**



#### Note

The 'National Land Policy Communication Platform: KRIHS Interactive Reports' (<http://interactive.krihs.re.kr>) is a data exploration and interactive communication platform using interactive map technology that shares the results of analysis of pressing national territorial policy issues, in the forms of dynamic maps, graphs, and videos instead of the previous one-way transmission of information in the form of figures (KRIHS 2019).



discovering regional problems at the stage of diagnosing the current state of the national territory, helping to build a public consensus on the issues and making their impact be better felt by the public by promoting data-driven public debates. In the policy implementation stage, it can be used as a venue for information sharing and communication by providing relevant information, and thus serve as a tool for cooperative problem solving. In the policy effect monitoring stage, it can support the realization of the diagnosis-analysis-return system as a data-driven communicative national territorial policy promotion tool, for determining the effectiveness of a policy or discovering other issues, etc.

The data-driven national territorial policy communication tool can be used as a venue where diverse stakeholders can identify regional problems cooperatively, interest and participation in issues can be triggered to support and promote

communicative and tangible national policies, and information can be effectively shared and communicated. In particular, it will play the role of a starting point for communication to resolve problems of national lands such as cooperative discovery of regional problems and conflict management, tangibility monitoring of people's feeling to the changes, and support for national territorial education. **Figure 3**

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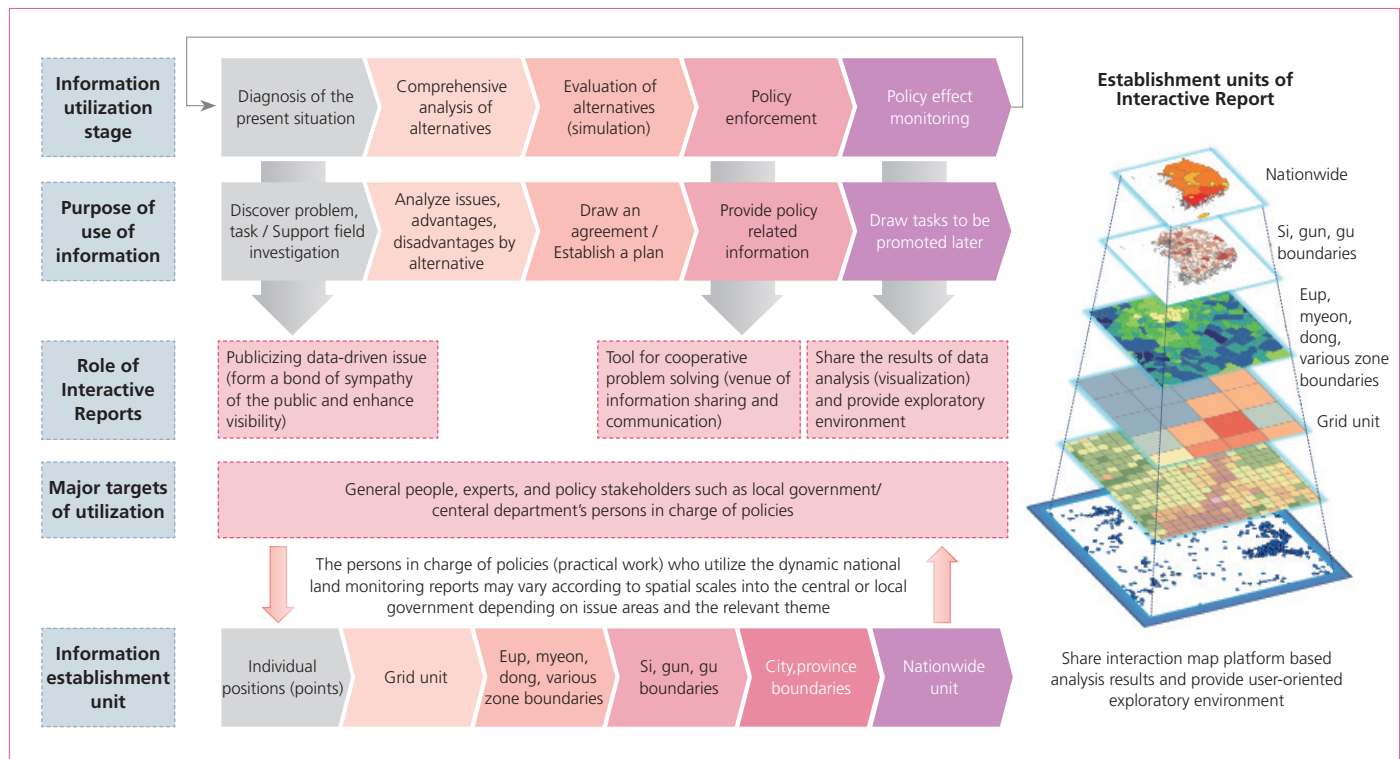
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**Figure 3. National Land Policy Communication Platform: Interactive Reports utilization stage**



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- Japan Regional Economy and Society Analysis System. <https://resas.go.jp>
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# Strategies for Innovating the Geospatial Information Production System to Encourage the Data Economy

Mijeong Kim, Yong Huh

## 1. Background and Purpose

Coupled with the smartphone-based mobile revolution, the development of technologies driven by the fourth industrial revolution, such as artificial intelligence, big data, the Internet of Things, cloud computing, and 5G, is accelerating our society's digital transformation. Amid this transformation, global IT companies such as Google, Amazon, Facebook, and Uber are rapidly growing into platform providers, and our society is moving toward a digital economy in which everything such as products and services is traded on the platforms that they provide.

In this digital economy, the information necessary for trade-related decision-making becomes meaningful commodity. This is because the products and services on the platforms are

tremendously various and their conditions are continuously changed so that cannot be manually analyzed and controlled. For this reason, data business systems composed of data collection, process, and analysis have grown up to provide the above information. Similar systems for product advertisements or recommendations based on customers' data also have been existed, however, they operated within limited e-commerce platforms or customer relationship managements. Meanwhile, as demonstrated by Uber, quick and accurate connections between demands and supplies for individual products or services in the real world require real-time analyses in the virtual world and incorporation of these results into the decision-making in the real world. This real-time process relies on data, so that data oriented business system, data economy makes an entrance.



In this new economy, geospatial information performs a key function when people and objects attempt to make accurate decisions by connecting data according to locations or spaces. Therefore, geospatial information is evolving into a data platform for the convergence of various mapping datasets to record the locations of geographic features. In an era in which the capacity for data collection, process and analysis equals competitiveness, it is necessary to examine how geospatial information can respond to and facilitate the data economy and, based on the results, establish a new definition of geospatial information and innovation strategies for its production system.

Thus, this study aims to define the forms and roles of future geospatial information in promoting the data economy and identify the directions, implementation strategies, and tasks necessary for the development of the geospatial information production system.

## 2. Emergence of the Data Economy and Changes in the Role of Geospatial Information

### Moving into the data economy and the value of data

With advances in digital technologies, our society is

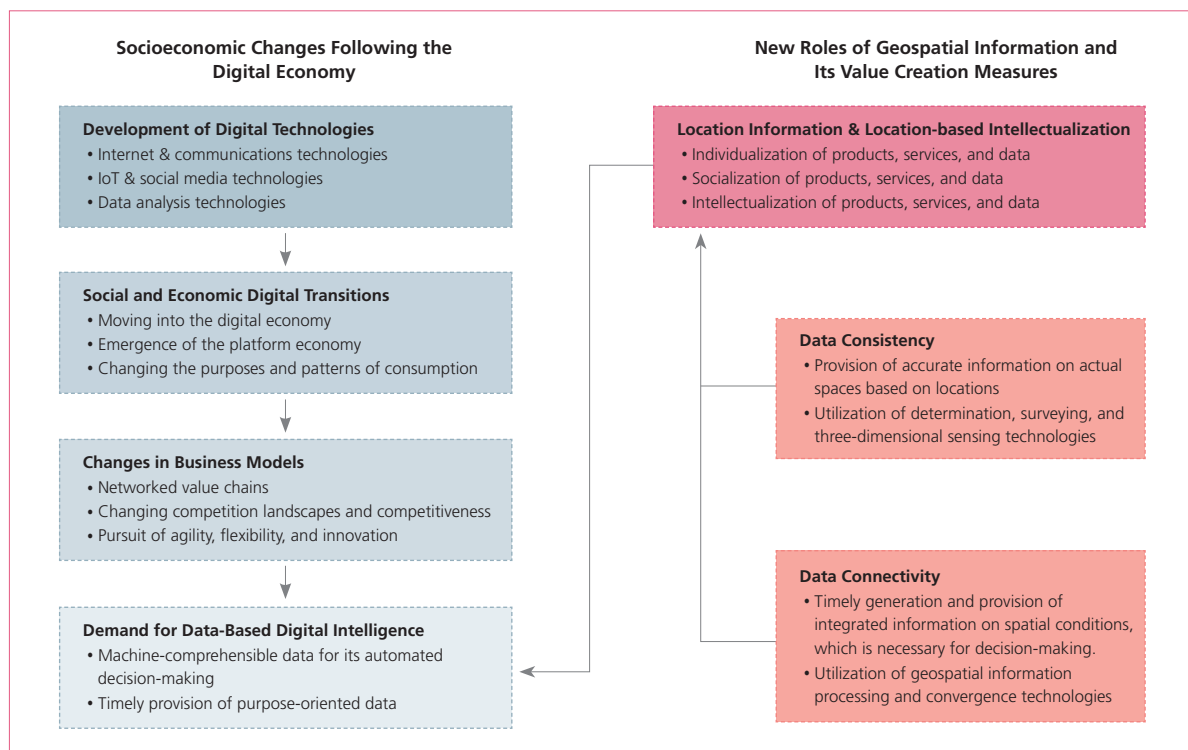
moving into a platform-based digital economy in which producers' and suppliers' market entry costs and consumers' service access costs are both reduced, and participants rapidly increase through network effects. In this economy, corporate competitiveness is determined by data-based decision-making capabilities. Accordingly, data for actionable decision-making have begun to acquire economic value and be traded as goods. In other words, the economic value of data is created through the timely provision of high-quality data that enable systems and machines to recognize them and make the best decisions.

### Value of data and changes in the role of geospatial information

In the above economy, the role of geospatial information is shifting toward adding location information to data to enable their intellectualization and the facilitation of location-based intellectualization to aid in making decisions through collecting and integrating various types of information in adjacent spaces. This provision of location information and location-based intellectualization is realized by placing new value on products, services, and data through individualization, socialization, and intellectualization.

To this end, geospatial information should have 1) consistency to ensure that it corresponds to the real world and

**Figure 1.** New roles of geospatial information and its value creation measures in the digital economy



**Source**  
The author's own work.

2) connectivity to enable it to connect various types of information. Consistency refers to accurate geospatial information that is consistent with the locations and borders of actual spaces in which people or objects are present. Connectivity points to the generation of analyzable geospatial information through the collection, connection, and integration of various datasets that are required to formulate the necessary comprehensive conditions for decision-making in a timely manner. **Figure 1**

### 3. Innovation Strategies and Tasks for the Geospatial Information Production System

#### Basic directions

In the future economy, geospatial information should be transformed into a form that is consistent with the real world, connects every dataset, and is comprehensible by people and machines. To this end, the innovation of the geospatial information production system should be aimed at a cooperative production system that is based on data development and sharing, a horizontal production system that encourages participation from both the public and private sectors, and a convergence-based production system that utilizes various technologies. These directions for innovation should additionally consider various aspects such as products

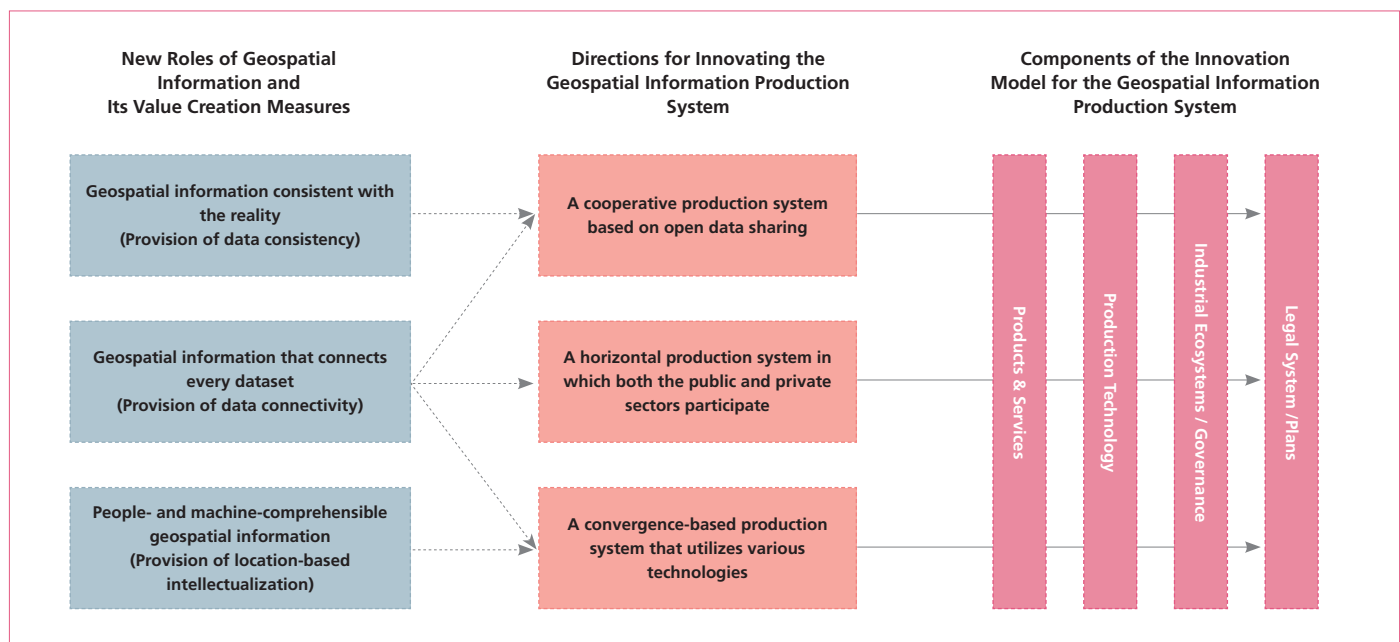
and services, production technology, industrial ecosystems and governance, and legal systems. **Figure 2**

#### Required tasks for building an innovative geospatial information production system

The following tasks should be performed following the basic plan building an innovative the geospatial information production system.

First, demand-based customized geospatial information should be generated to build a digital twin of products and services. It is inefficient to render every object in the real world as three-dimensional geospatial information to create a virtual world that is identical with the reality. For this reason, key geospatial information on areas that are commonly utilized in various fields, such as transportation, construction, topography, and water systems, should be generated as a priority. Regarding how detailed the expression of geospatial information should be, the Level of Detail (LoD) 2 is recommended because geospatial information at LoD2 can be generated at minimum cost in a short period of time and be utilized for monitoring, analysis, and simulations. In addition, standards for stronger connectivity should be developed and applied. Specifically, standards for the modeling and sharing of metadata and the visualization of geospatial information are required, along with standards for the quality of three-dimensional geospatial information.

**Figure 2.** Directions for innovating the geospatial information production system and components of the innovation model



Second, a quality certification system should be introduced that contains items related to locational and temporal accuracy to assess the compliance of geospatial information with its quality standards and increase its usability in various fields for connecting with other types of information to ultimately lead to an innovation in the production and renewal procedures related to production technology. Moreover, it is necessary to build a platform with functions such as data collection, loading, and renewal to be used in administrative tasks and new technologies (e.g., sensors) and by the private sector based on the already generated three-dimensional geospatial information, enabling the provision of consumer-oriented services, instead of the conventional supplier-oriented one-way provision, and the real-time renewal of information.

Third, it is recommended that a cooperative private-public production system be built in which both the public and private sectors can actively participate. In other words, a data governance system should be built to promote the active participation of stakeholders in the production and utilization of geospatial information, various problems should be defined through this governance, and measures for resolving them should be developed.

Fourth, the country's pertinent legal system should be overhauled to lay a foundation for the implementation of new production strategies, and research and development efforts should be made to ensure technical access to the geospatial information. To realize the digital twin, new provisions should be incorporated into the legal system, including the purpose and definition of three-dimensional geospatial information, production and renewal standards, procedures, and guidelines, as well as a public-private cooperative system that enables decentralized management by the public and private sectors. Moreover, it is recommended that the necessary technologies for building the digital twin and converging and connecting various datasets be developed and that empirical research be conducted to enable the application of these technologies to the digital twin.

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**KRIHS** (Korea Research Institute for Human Settlements) was established in 1978 in order to contribute to the balanced development of national territory and the improvement of the quality of life of people by conducting comprehensive policy-oriented research in the efficient use, development, and conservation of territorial resources.