# A Review of 3D Cadastre Pilot Project and the Policy of 3D NSDI in the Republic of Korea

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**Key words**: 3D Cadastral Survey, Registration, Land Management, 3D Cadastral Data Model, 3D Prototype

**SUMMARY**

Recently, due to rapid urbanization, industrialization and population growth, the structures of cities are changing rapidly; multi-purpose three dimensional facilities above and below surface have been increased. Despite the three dimensional space registration such as building and basement facilities is necessary, it is impossible to represent those right in the 2D Cadastre. We can say that it's time to introduce 3D cadastral system for registration of land in the 3D space.

The government of Seoul Metropolitan City pushed ahead a 3D cadastre pilot project from 2009. Also the Korean Government has a policy of development of a 3D National Spatial Data Infrastructure (NSDI) as an innovation to the spatial information industry to establish a base for future growth. In this paper, the result of the pilot project is reviewed. We expect that identified problems can be solved, and the 3D cadastre can be settled in the near future successfully.

**요 약**

토지가격의 상승과 토목・건축기술의 발달로 토지의 입체적(지하, 지표, 지상)공간 활용도가 증가하고 있다. 그러나 2 차원 평면지적으로는 효율적인 토지관리 및 정보 제공이 곤란하다. 또한 지상 및 지하 공간시설물에 대한 권리설정이 요구되고 있음에도 불구하고 지상 및 지하 공간 시설물에 대한 권리의 범위를 지적도면에 표시할 수 없다.

서울특별시에서는 이러한 문제점을 해결하기 위하여 2009 년부터 입체지적 기반조성 시범사업을 추진하고 있다. 국가적인 차원에서도 3D NSDI 구축을 통한 공간정보시장 활성화를 위한 정책을 추진하고 있다. 본 연구에서는 그 동안 추진한 시범사업의 결과를 고찰하고자 한다. 이를 기반으로 문제점을 지속적으로 보완하고 향후 입체지적이 성공적으로 정착되기를 기대한다.

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## 1. INTRODUCTION

The 2D current cadastral system has been operated aiming at the support of efficient land management and protection of ownership based on surveys with registrations in a land information system from where services are provided.

Recently, due to rapid urbanization, industrialization and population growth, the structures of cities are changing rapidly; multi-purpose three dimensional facilities above and below surface have been increased. Despite the three dimensional space registration such as building and basement facilities is necessary, it is impossible to represent those rights in the 2D Cadastre. We can say that it's time to introduce 3D cadastral system for registration of land in the 3D space.

In 2006, Seoul Metropolitan City modified its regulations on three-dimensional land use to prevent duplication of facilities according to city planning and to define the scope of three-dimensional boundary determination. Seoul set up a basement space master plan in 2007, and an action- and security plan in 2008; but a detailed 3D land management plan is not sufficient.

Many 3D cadastre studies have been presented during events of the International Federation of Surveyors (FIG). Stoter et al (2002) suggested three methods for registration of 3D legal objects and proposed solutions for 3D cadastral system, including technical aspects. Further, Stoter et al (2004) compared and analysed a conceptual 3D cadastre models and registration methods from Norway, Sweden, Australia and Canada.

Pilot projects of many countries have been introduced. Aydin et al (2004) introduced the 3D cadastre and GIS integration in Turkey. Hassan et al (2010) explained Malaysia's 3D cadastre construction from the perspective of the data model and DB model. Vandysheva et al (2011) introduced 3D cadastral modeling for registration of building and pipelines in Russia. Aien et al (2011) introduced 3D cadastre for constructions like basement garages in Victoria (Australia). Utesnan (2011) discussed the possibilities of the introduction of 3D cadastre for Thailand through cases adopted from other countries. Van Oosterom et al (2011) inspected 3D cadastre status and expectations for 2014 worldwide based on a questionnaire.

The purpose of this pilot project is to provide the foundation for the ubiquitous 3D cadastre by defining the right relationship of land space and by suggesting a registration and management scheme.

Therefore, we want to make a 3D cadastre registration which applies to the land administration and could be used as service to the citizen in the future - through registering the right relationship between facilities and buildings constructed on the land surface, above and below surface. If the reference (point or border) of the spatial right relationship is available (through surveying) and the condominium leasehold registration map is improved, citizens could relate their property right more easily and government can manage land more efficiently.

## 2. PERFORMING METHOD

In this pilot project, the target site selection is very important because the introduction of a concept for 3D cadastre is the first in Korea. The main contents, the overall stream of the project, the site selection process and the results are explained in this chapter.

### 2.1 Project overview

This project has been performed in several regions of Seoul from March to December 2009. For site selection, candidate sites were recommend from the autonomous 25 districts of Seoul and some of them passed through the documentation and field check. Finally project sites are selected by the selection committee.

We perform the complete process to establish a 3D cadastre. We have conduct 3D cadastral surveys at the selected sites, install RFID (Radio Frequency Identification), design surveyor's manual and registration methods, establish a legal and systemic basis upon which introduction of a 3D Cadastre can be based, make a medium and long-term road map and lastly, we construct the DB and develop the full 3D prototype system.

The action plan of this project is shown in figure 1. It can be seen from this figure that steps were site selection and data collection: survey control points near the sites have been placed using RFID chips to the newly installed points.

After the 3D survey, supported by RFID tags, we have put the results of the survey into the DB through data processing and object modeling.

But also an analysis of 3D cadastre data and registration system, based on needs of users, is done. We also construct the DB after designing the data model and the database scheme. Then the 3D cadastre system developed as a prototype has been connected with the 3D object DB.

The legal and systematic strategy for improvement and road map for the 3D cadastre continuous proceed is made by considering the results of the pilot project (product and difficulties) and a plan to solve the problems.

Finally, we agreed on appropriate conclusions for the introduction of a 3D cadastre for Seoul.

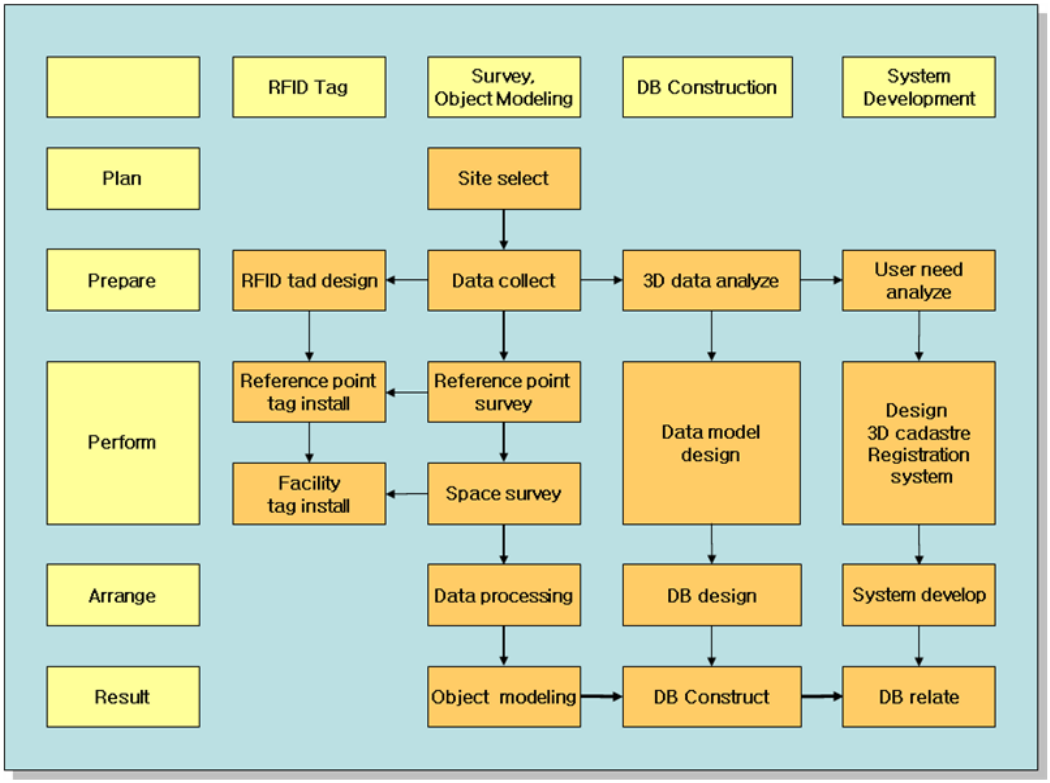


**Figure 1. Flowchart of pilot project**

## 2.2 Selection of project site

For site selection, the Seoul city government and the KCSC (Korea Cadastral Survey Corporation) participate in field checking together. For the recommended 17 candidate sites, certificated documents are used to check issues such as existing cadastral records, registered building data, land use plan confirmation note and real estate register. Also interviews with the officer in charge are carried out.

Each candidate site is discussed with the management agency, and the related institutes (Korea Legislation Research Institute etc.) have been consulted on legal review items when 3D cadastre would be introduced.

Candidate sites have been selected through putting the result of inspection together and submit that to the selection committee which was composed of Seoul government officers and experts of the academic world.

Among the recommended sites is a subway rail road, a road tunnel, an aerial pathway, a subway station and shopping mall, and the 'cadastral confirmation survey region' has been selected. A power transmission line is added by a selection committee because it could maximize 'ripple' effect of the project result when it is spread to the whole country.

Table 1 shows final 8 regions that the site selection committee has confirmed in the many concerned regions.

**Table 1. Result of 3D cadastre pilot project site selection**

| Num | Site | Location | Situation | Reason |
|---|---|---|---|---|
| **1** | **Subway tunnel Magok-Balsan st.** | Gangseogu | subway tunnel | set up condominium leasehold scheduled |
| **2** | **Sangdo tunnel and above parcel** | Dongjakgu | tunnel | set up condominium leasehold need |
| **3** | **St. Paul's hospital** | Dongdeamungu | aerial pathway | management 3D cadastre need |
| **4** | **Sinlim station** | Guanakgu | basement pathway | management 3D cadastre need |
| **5** | **Basement shopping mall at Cheonho station** | Gangdonggu | shopping mall | management 3D cadastre need |
| **6** | **Gasan digital area station** | Geumcheongu | subway station and connected building | resign condominium ownership and 3D land use |
| **7** | **Mokdong power transmission line** | Gangseogu | power transmission tower and parcel below | region could spread success to the whole country |
| **8** | **Eunpyong new town** | Eunpyonggu | apartments and stores | region carry out urban development project |

## 3. CONTENTS OF THE PROJECT

In this chapter, we want to present the contents of the pilot project with a focus on the results of each sub project.

### 3.1 3D Cadastral survey

#### 3.1.1 Survey procedures

The data collection method in the detailed survey procedure is similar to the general (2D) cadastral survey method, but measured values have 3D coordinates and the collected datum is used to the object modeling process, so from that perspective there are differences between the conventional 2D and the 3D survey approach.

For 3D cadastral survey, all spatial data like a design drawing, topographic map, DEM (Digital Elevation Model), and aerial photo should be collected as far as possible in advance. In the data processing, synchronization of the survey result with the facility drawings and topographic maps is needed by superimposition of data, also in addition to cadastral map. Table 2 gives an overview of a survey process applied to the subway tunnel between Magok station and Balsan station.

**Table 2. An example of 3D cadastral survey process (subway tunnel between Magok st. and Balsan st.)**

| Task | Details |
|---|---|
| **Scope decision** | - Decide the scope (about 1km of subway tunnel between two stations) |
| **Data collection** | - Collect subway facility sectional design drawings, topographic map, DEM, aerial photo, cadastral map, etc.<br>- Obtain parcels' information being incorporated in the subway route with help of Seoul Metro co. |
| **Control point survey** | - Draw the benchmark and control point network<br>- Install new minor control points and supplementary control points<br>- GPS observation of control points |
| **Detailed survey** | - Transformation of cadastral map's coordinates to ITRF (International Terrestrial Reference Frame) and prepare the survey map<br>- Connect control point's coordinates on the ground to the subway platform using traverse methods<br>- Survey temporary reference point with regular distance and observe tunnel section point at that point<br>- Close traverse to the ground control point and check accuracy<br>- Survey parcels boundary, buildings and facilities on the ground |
| **Data processing** | - Display observed points on the cadastral map and insert line between points<br>- Join sectional design drawings based on surveyed result<br>- Decide line shape and error check using the captured field photo's and topographic maps |
| **Object modelling** | - Create faces using design drawings, cadastral maps and topographic maps overlapped based on the surveyed data<br>- Perform texture mapping using captured field photo's<br>- Generate the 3D object model |

### 3.1.2 Survey reference and height observation

"The act on land survey, waterway survey and cadastre" defines that locations must be expressed with a longitude and latitude, surveyed based on the ITRF (International Terrestrial Reference Frame), and height from datum. ITRF permits other coordinate systems in case of need for cartography and so on.

Therefore the survey results of cadastral control point and supplementary control point should be presented in the ITRF. Separately, their height (from the geoid) is calculated from difference between benchmark's ellipsoidal height and known height of the national benchmarks near the project sites. In the same way we got the each benchmarks' geoid height and then calculated unknown point's geoid height by applying inverse distance weighting.

### 3.1.3 Detailed survey method

The targeted facilities in this project were a subway, a tunnel, a power transmission line, an aerial pathway, a basement pathway, a basement shopping mall and a cadastral confirmation survey region. Usually, control points are not available at a basement site such as a subway, so supplementary points should be installed near the subway entrance to survey to reach there.

And the surveyor should survey at no traffic time; if there is no subway train, no working vehicle or working people it will support 3D survey results being more accurately and the survey is more safely. Surveying target points should be selected by a facility's lay out. If the tunnel's section is box-style, then you just observe each section edge; or if it is circle-type, then observe arcs with appropriate regular distances based on the radius for collecting accurate of boundary points and getting pictures. When observations are done from the top of a wall or ceiling part, the no prism mode of instrument (total station) is used and pictures can be collected too.

Where the object's shape or height is irregular, the surveyor should observe representative points and use to the object modeling. When surveying the ground facilities, not only needed points to the 3D object modeling should be observed but also wall- and building-corner point sufficiently.

### 3.1.4 Surveyor's manual for 3D cadastral survey

3D cadastral survey methods and approaches for public facilities lay on the ground surface, below and above ground have been described in a Surveyor's manual.

**Table 3. Contents of surveyor's manual for 3D cadastral survey**

| Part | Items | Details |
|---|---|---|
| **General Provisions** | Goal | - Manual's legal basis and goal |
| | Application scope | - Apply 'cadastral survey' in the Enforcement regulations |
| | Terminology | - 3D cadastral survey, objects, network-RTK survey, etc. |
| **3D cadastral survey** | Classification | - Control point survey and detailed survey |
| | Reference frame | - Parcel's boundary point restoration and building corner point survey from that based on ITRF<br>- Height value to the parcel's boundary points in case needed |
| | Marker of control point | - Dimensions of control point's marker and facility RFID tag |
| | Coordinate transformation | - Coordinate transformation by using appointed program |
| | Preparations and cautions | - Preparations and cautions for the 3D cadastral survey |
| | Detailed survey method by site | - Survey methods for different sites (subway railroad and tunnel, basement and aerial pathway, power transmission line and tower, basement shopping mall, road tunnel and above parcels) |

| | | |
|---|---|---|
| | Result calculation | - Calculate survey results based on ITRF |
| | Generation survey result drawings | - Result data should be available in a GIS common format<br>- Display surveyed objects and related parcels location on the result drawing |
| | Qualification | - 3D cadastral survey should be performed by a cadastral surveyor<br>- Control point survey and result evaluation should be conducted by committee where both cadastral surveyor and geodetic surveyor are included |
| | Result evaluation | - Result evaluation is available |

### 3.2 Development of data model and 3D cadastral prototype system

Within the 3D cadastre we classified 3D parcel, 3D space by facilities and 3D physical object. To design 3D object model which can be applied at the 8 sites commonly, we made object models of each project site, and integrated them together as shown in Figure 2.

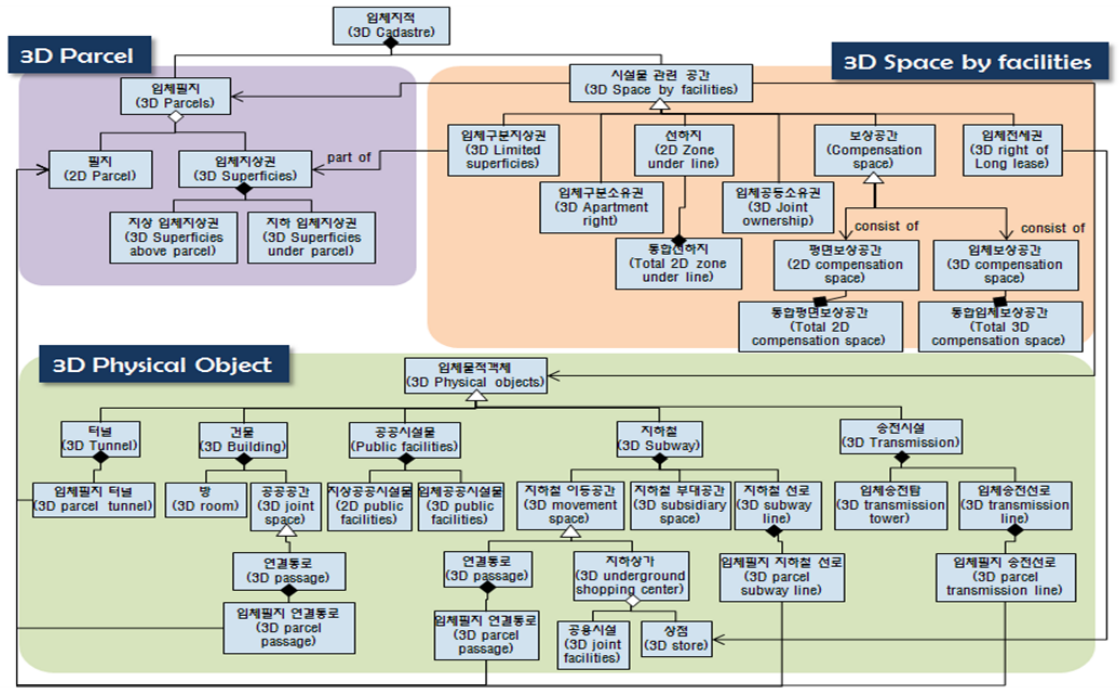


**Figure 2. UML diagram of the integrated object model**

The sub-classes of 3D_Space_by_Facilities class inherit attributes and behavior of 3D_Space_by_Facilities, and the class 3D physical object has facilities of each site as sub-class.

The 3D cadastre prototype is a system to service basic information: displaying 3D cadastral objects from the DB properly, inquiring basement space records or 3D cadastral records and

looking for history of condominium leasehold registration etc. To meet these purposes we have developed full 3D display methods for effective presentation of 3D cadastral information.

**Table 4. Inner-structure of the prototype system**

| Category | Contents |
|---|---|
| **OS** | - Based on MS Windows<br>- Develop language: C#, C++ |
| **Database** | - DBMS: Oracle 10g<br>- DB designing and data modeling according to the object or site |
| **Operation** | - Realize Full 3D GIS<br>- Construct 3D geo-space based on DEM<br>- Construct 3D object space based on 3DS data |
| **Function** | - 3D query (Move, Zoom, Rotation etc.)<br>- Inquiry and print of 3D cadastral records<br>- Evacuation route simulation in the basement space |

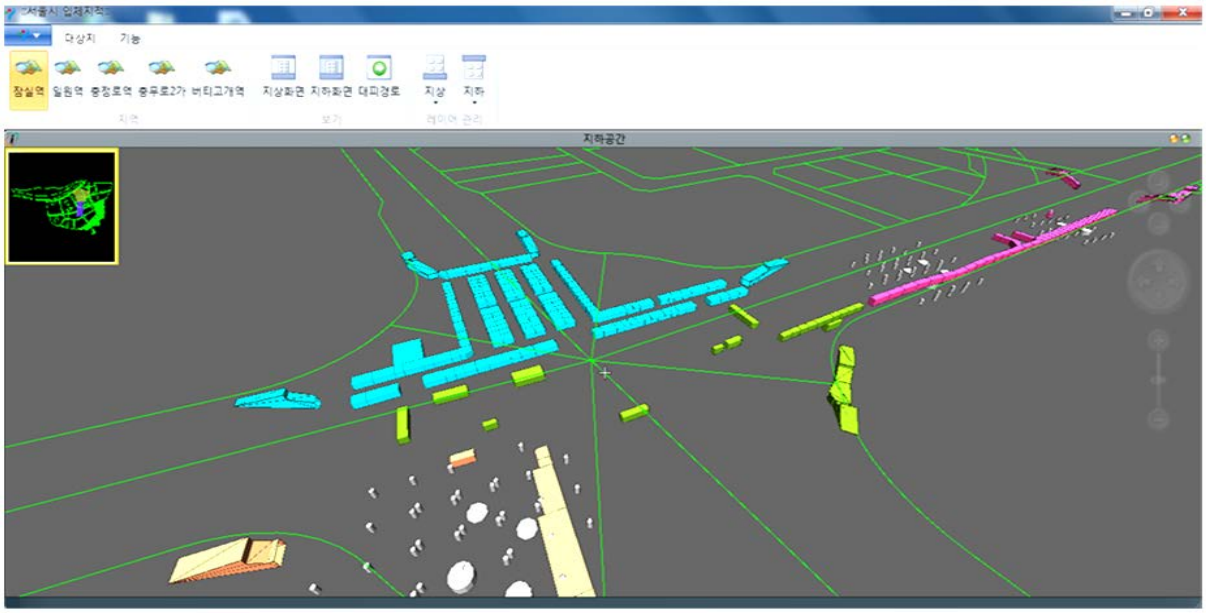

**Figure 3. Screen shot of prototype system (basement shopping mall)**

### 3.3 Attaching manner improvement of drawing

The article 62 and 63 of the Real Estate Registration Regulations is defined as “In case of an established leasehold right, right of superficies and/or servitude is part of a parcel or a building, it should be attached to the cadastral map or drawing of the building, and this way display that location”.

But in the future, it should be revised to attach drawings as a result from cadastral status survey about the parcel on which leasehold right, right of superficies, servitude or condominium leasehold are set up newly. And the cadastral surveyor must present survey results and 3D drawing data to the authorities and the person requesting setting up

condominium leasehold at the same time. Figure 5 shows an example of a (suggested) 3D cadastral drawing to be attached to the registration document.

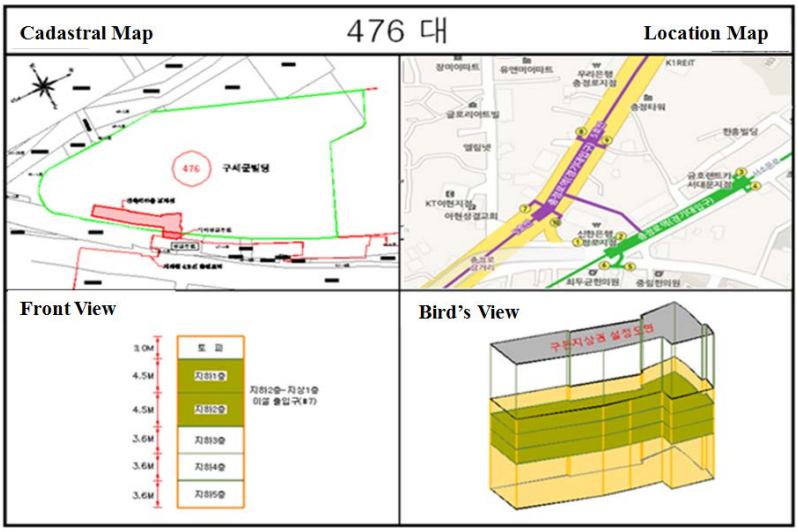


**Figure 4. An example of suggested 3D cadastral drawing**

## 4. APPLICATIONS

Although, the 8 sites were surveyed and constructed as a 3D cadastre in the pilot project, only a construction process and a result of survey and object modeling of the 2 leading sites are presented in this chapter.

### 4.1 Site that right registration is important(Sinlim basement pathway)

Sinlim basement pathway is a path connecting the Sinlim Station of the second subway line and the Renaissance complex under the road and pavement.

We looked for registration information of the private parcel (No. 1422-5) above the basement pathway, after this it could confirmed that the condominium leasehold right was set up to the entrance of the subway and pathway by the Guanakgu (municipality) and Seoul Metro Co. (which is the authority of subway second line). Therefore, we can say that the object which registered as physical model is the Sinlim Station and the subway entrances No. 7 and No. 8, and, on the other hand the registration right is just entrance No. 7 and a part of pathway because for the two objects there is already established a condominium leasehold right (see Figure 7).

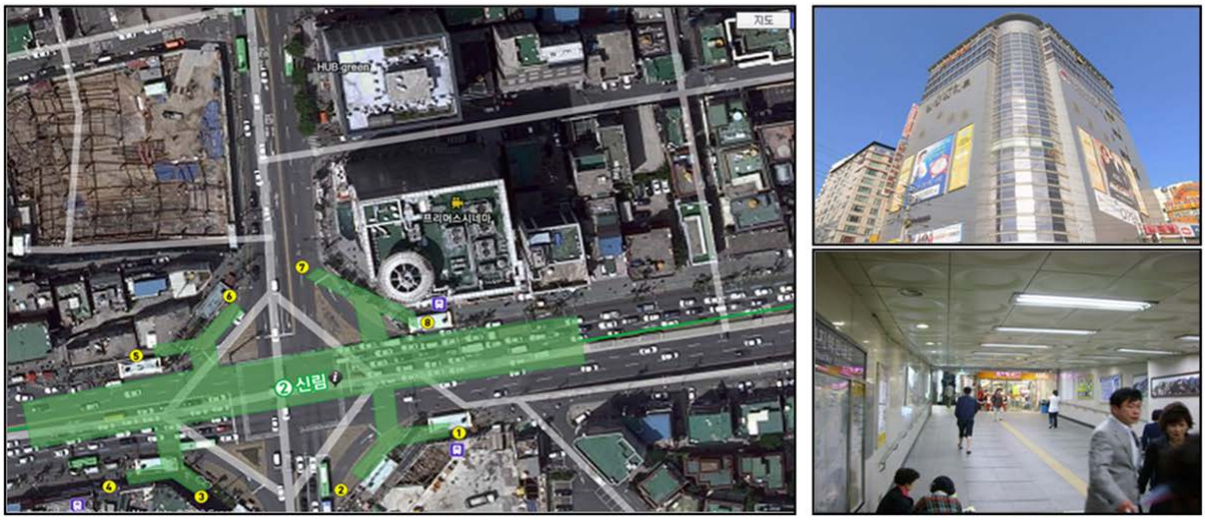


**Figure 5. Basement pathway of Sinlim Station**

Also, for the parcel no. 1422-43 there is not established a condominium leasehold right yet, but according to the registration history, the other part of the pathway-object is registered physically is lied under the parcel. Also we could find out that the range of the right-reached is bigger than physical boundary as surveyed in 3D. The system is prepared for anyone who wants to know about specific parcel for which condominium leasehold is established or not. But for many cases, drawing is not preserved well. In cases of the Sinlim Station, we could not retrieve the drawing at the registration office.

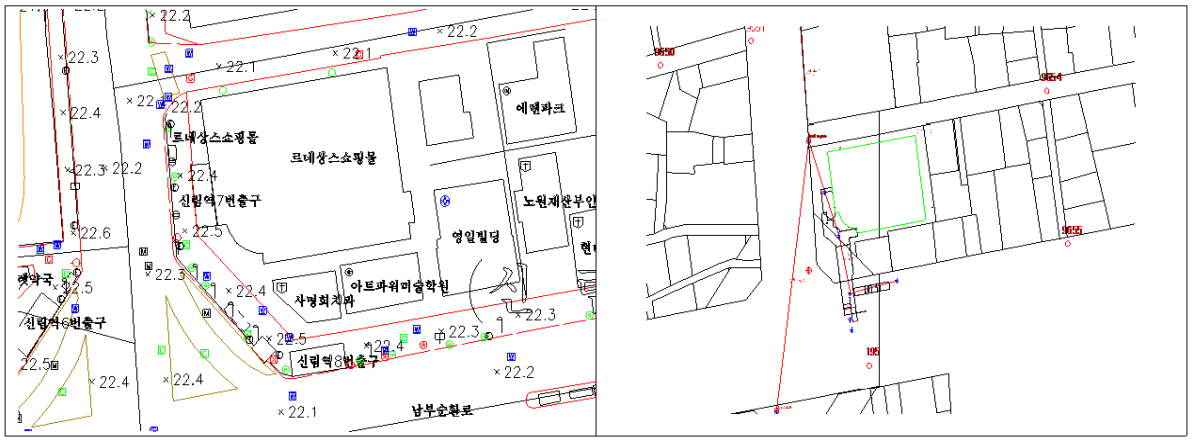


**Figure 6. Topographic (left) and cadastral (right) map of Sinlim Station**


**Figure 7. Lines on the cadastral map (left), physical model and right space in the 3D cadastral prototype system(right) for the right registration**

## 4.2 Site that physical model is important (Basement shopping mall at the Cheonho Station)

The Cheonho Station basement shopping mall is situated under a wide road and connected to a department store, supermarket and a huge basement public parking lot. The shopping mall in the station is managed and operated by the Seoul Metropolitan Rapid Transit Co. and the other part of the station is managed by various authorities.

**Figure 8. Basement shopping mall at Cheonho Station**

Fortunately, the drawings attached to the registration book existed in the registration office, but it is just a simple sketch. In this site, just superficies are established at the entrance, which is connected to the department store.

The basement space of Cheonho Station is a transfer station, a station at line No. 5 consisting of three basement floors and 24 shops in the first and second basement. And a station at line

No. 8 consisted of two basement floors and two shops in the first basement. The public basement parking lot near the station consists of two very large basement floors.

The registration object for the right is a connecting stairs from the department store to the station. And right of the superficies is established already, and concerns an area of 233.63 ㎡ of a total area 5,846 ㎡. We can say that the other part, 2 subway stations (line No. 5 and 8) and parking lot are physical registration objects. In case of the basement shopping mall, we can treat it as an object for a right registration, but the right relation is not exist in the registration book, so we can say that "It is an object for physical registration".

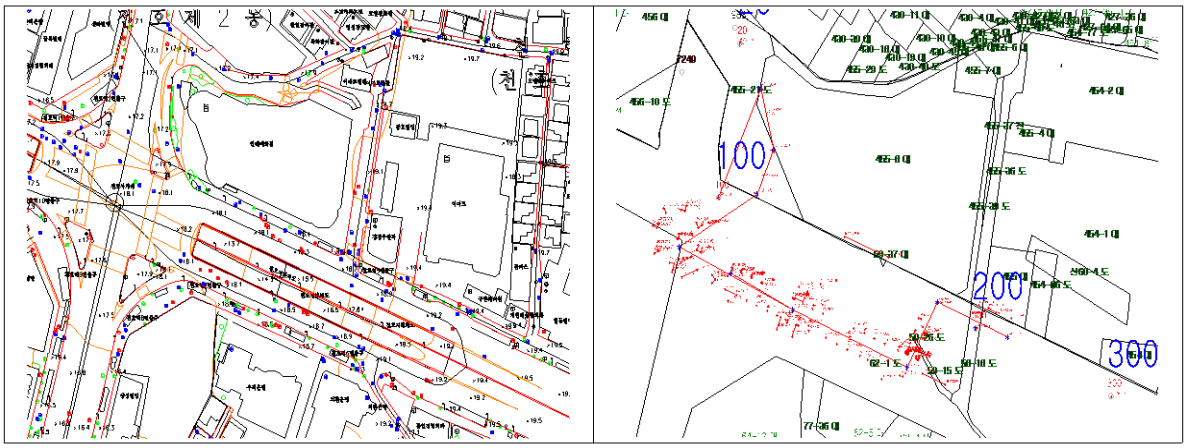


**Figure 9. Topographic (left) and cadastral (right) map of Cheonho Station**

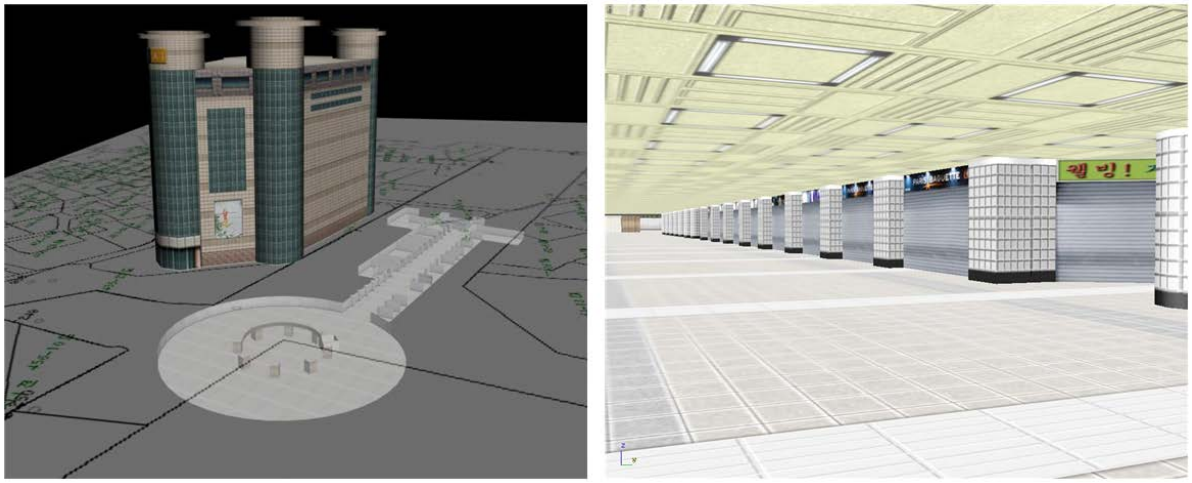

**Figure 10. 3D models of basement shopping mall at Cheonho Station**

## 5. RESULT AND APPLICATION STRATEGY

The pilot project result was analyzed and an application strategy for introduction of 3D cadastre was suggested. And a gradational action plan was prepared to realize it.

### 5.1 Analysis

All of targets of this project found limitations in registering on the current cadastral map. Due to these reason, it is true that they have been managed with a non-defined accuracy for the location or border. So we need to increase the management efficiency by constructing a 3D spatial information system. It is expected that the land management ability of Seoul could step up to next stage through 3D registration based on surveying of the space occupied by the facilities.

Therefore, the kind of applications should be diverse and should include objects which are not registered at the cadastral map yet, so: basement public facilities such as road and pavement, emergency equipment, preservation facility and parking lot could be selected as a target. Currently the range of right is represented as horizontal area with related height, but in the future this should be changed to volume representations in case of establishment of a condominium leasehold right. For the requested registration, improvement for the attached registration document is possible; and it should be attached to the registration book and it should be based 3D cadastral survey result.
As for the object model, for the efficiency reasons and for avoiding data duplication, it is desirable to utilize the existing data rather than to build a new object model, because 3D physical object data is considered as not a 3D cadastral object but as reference data.

3D cadastral prototype data should be integrated with the data of the current cadastral systems through connectivity analysis with those current cadastral systems. Also, a systematic cooperation (ex. data exchange etc.) is needed with the related other agency of Korea or Seoul government. By using current data to 3D system, efficiency of cadastral management work could be increased consequently.

The Ministry of Land, Transport and Maritime Affairs pushing ahead the Cadastral System Advancement Project and it should be used as a fundament to the cadastre reform project. The cadastre reform project of Korea will be performed over 20 years starting from next year, and it contains 3D cadastral surveys to specific basement facilities in addition to the improvement of the current 2D cadastral map, so a relation between those projects is needed for sure.

### 5.2 Introduction objectives and application strategy

There are three objectives of introduction of a 3D Cadastre: the first objective is use for land administration such as establishment condominium leasehold rights or generating 3D cadastral records; the second objective is a basis for 3D city models and ubiquitous city planning and design and construction, and the third is suggesting of basic data to the National Spatial Data Infrastructure which is under construction.

Through it, Seoul expect tax income by establishing rights of superficies to the occupied facilities in the 3D space, and could define standards in the 3D space by the reformation of

cadastral records. Due to these reasons the introduction of a 3D cadastral system shall contribute to the development of 3D survey technology and expansion of the geo-spatial information market. And, from the inner point of view, it can be used to the management authorities of cadastre, building, facilities etc. and also from the outer point of view, it can be used to the authorities of civil services, public institutions (electric power, gas line, water utility) and Supreme Courts (registration of right).

### 5.3 Future action plan

To raise needs of 3D cadastre introduction, Seoul city carried out several researches about efficient 3D cadastral register model until 2008. Based on these researches, the 3D cadastre pilot project had been proceed two years from 2009 on. Through two year project, the project sites are selected through field check, 3D cadastral survey and modeling are performed, the basement space record form is prepared, the attachment manner of condominium leasehold right is improved, the level of detail is classified and the prototype system is developed.

Two years from 2011 to 2012 are the 'apply and use' period, so we are on going 3D construction project at the basement space (basement shopping mall of the Seoul Square → basement shopping mall of the Uljiro → Dongdaimun historic culture park station) of the central area of Seoul. In this year, we are pushing ahead the improvement of the condominium leasehold right register really and will suggest 3D cadastre DB design as a standard of Korea TTA (Telecommunications Technology Association) and we have a plan to spread the 3D cadastre nationwide through applying to the cadastre reform project.

And also to bring this "apply and use" to success the managerial aspects of the 3D cadastre should be introduced to the Seoul basement master plan and the Magoc development area basement master plan by the Seoul government.

**Tabel 5. Step-by-step action plan for the introduction of 3D cadastre**

| Era | Goal | Action |
|---|---|---|
| **~ 2008** | Research | - Raise necessity of introduction of 3D cadastre |
| **1st step (2009-2010)** | Create foundation | - Select pilot project sites and apply<br>- Modeling 3D cadastre/construct DB/develop prototype system<br>- Define terminology and concept |
| **2nd step (2011 ~ 2012)** | Construct foundation | - Suggest 3D cadastre application model<br>- Suggest legal and systemic align strategy<br>- Form a consultative board of related authorities<br>- Hold a public hearing/public relations |
| **3rd step (2013 ~ 2015)** | Apply and use | - Apply to the Cadastral Reformation Project<br>- Apply to the Cadastral Reformation Project<br>- Construct nationwide 3D cadastral system |

## 6. POLICY OF 3D SPATIAL INFORMATION

The policy of a 3D NSDI (National Spatial Data Infrastructure) is to further industrialize the spatial information industry by establishment of a fundament for future growth. It can result in about 25 billion dollar profit, 120 thousand employment and 10 billion dollar market expect by 2020 which can develop international competitiveness. To establish a base to be valuable new industry by combining spatial information and IT-mobile, we are planning to support creative ideas by using high quality of spatial information which is constructed and administered in public sector centrally.

For this, first, it is planned to expand open access to make an easier approach of spatial information possible. In case it causes personal protection or national protection problems, aerial photogrammetric, an image of 3D is planned to be public with measures.

Secondary, a spatial information open platform will be constructed to establish friendly distribution structures and easy, user friendly application systems and a precise 3D map will be possible to be updated in real time and an administrative civilian platform will be established.

Lastly, it is planned to build up a global brand. This will power and enhance overseas expansion of the "3D Business" to establish a durable foundation and to enter global market. Training human resources and cooperation and research and development will continuously be pushed ahead.

## 7. CONCLUSIONS

This is the project to construct infrastructure of 3D cadastre introduction that aimed on tree-dimensional land management. The "3D Cadastre" has been studied continuously in the international academic world but it is not realized yet in Korea because it is not yet legally supported nor by a systematic approach.

But considering the current situation that the three-dimensional use of land is increasing continuously, the introduction of 3D cadastre is needed; not only for the management of public facility but also for the preservation of people's ownership. Thus, in this project, we suggested a systematic improvement scheme for preparation and introduction. And a future action plan is prepared for the stable settlement of a 3D cadastre. Also learned from the experiences of the introduction at 8 sites, in these sites there are difficulties using the current 2D cadastre for management and also there are difficulties when people want to register rights.

We surveyed all sites and made surveyor's manual to maintain consistency of survey methodology. Results of survey are processed (adjusting, editing, object modeling) and inserted into the database, and displayed on the full 3D cadastre prototype system. That system was developed adopting to the land management task of the Seoul government. It has functions such as inquiring, 3D viewing and space analysis.

In conclusion, the following should be considered to solve the problems as appeared in the project.

1. Space - right relation should be cleared for the survey result of pilot project sites.
2. The registration method of condominium leasehold right should be improved.
3. The type of 3D cadastre construction options should be diverse.
4. 3D cadastre information services should be developed.
5. Connection with the current land related systems is needed.
6. Relation with the projects being performed by Korea government.

Through this project, we could meet to ask by the land administration part to serve 3D cadastral map, preserve people's property rights, and increase utilization of land information services.

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