

# The Overhaul of the Land Information System in Finland

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## Summary

On January 1, 2003, the Act on the Land Information System and Related Information Service came into force in Finland. Under the Act the National Land Survey of Finland (NLS) is responsible for the establishment and administration of a new Land Information System (the new LIS). This marked the end of an era, where the maintenance of the LIS was merely based on a government decision in principle and an agreement between the parties concerned. In 2001 the Ministry of Agriculture and Forestry had commissioned a working group to prepare new legislation to regulate the activities. Around that same time the first steps were also taken to prepare for the technical overhaul of the system.

The technical overhaul of the LIS was thus initiated in 2001. Three separate projects were launched to plan the system architecture, introduce the cadastre component of the new LIS and make the NLS systems and the municipal systems, along with their data contents, interoperable. These tasks were successfully completed, and, as a result, the new LIS could be launched on June 1, 2005.

Until June 1, 2005 there were a total of 87 cadastral units in Finland, whereas the integrated cadastre in the LIS was in legal terms only a copy of these. Under the law the new LIS became the primary legal register for cadastral information, when introduced. In contrast to the previous LIS, the system also includes spatial data on all cadastral units.

In the development of the new LIS the main objective was to provide an information service giving easy access to all cadastral data in Finland, along with the related spatial data. This required the development of an integral cadastre with nationwide coverage and containing spatial and attribute data, and a complementary system for updating the data. Of key importance are the standard XML interfaces enabling data exchange between the cadastre component of the new LIS and the systems used by the municipalities and external systems.

The cadastre component of the LIS is maintained and updated by the NLS District Survey Offices and the 86 towns (of a total of 450 municipalities) that have undertaken to keep a cadastre in the area under their jurisdiction covered by a town plan. The LIS holds information on 3.0 million real estate units, of which about 2.6 million are registered in the NLS cadastre (98% of the Finnish territory), and the rest in cadastral units kept by the towns (2% of the Finnish territory).

## The Previous Land Information System

In Finland official real estate data were for a long time scattered in various registers. The planning of an integrated land information system commenced in the 1970s in the form of committee work. The actual starting point for the development of the system was, however, a government decision in principle taken in 1979.

In 1979 - 1984 a number of test projects supervised by the Ministry of Finance were accordingly launched with the aim of finding feasible computer-based solutions and testing various methods of storing data. The long-term work of constructing a land information system and storing data on a larger scale was initiated following a government decision in principle taken in 1984. The responsibility for the realisation of the system was transferred to the administrative authorities concerned, i.e. the survey administration, the municipalities and the judicial administration, each respectively responsible for the cadastre, lists of titles and data on titles and mortgages. To provide a legal foundation for the trilateral cooperation the following legislation was enacted, requiring the use of a computerized system: the Real Estate Register Act in 1985 and the Act on the Register of Titles and Mortgages in 1987.

In 1994 the storing of real estate data in alphanumeric form in a computerized cadastre was completed at the NLS, and three years later also in the cadastre-keeping municipalities. In the judicial administration the storing of title and mortgage data, providing nationwide coverage, was completed in 1998. The cadastre was developed under the supervision of the authorities, and the data were extracted from paper records and stored locally. The system was introduced in stages in 1985 - 1998 in one municipality at a time.

The cadastre component of the previous LIS has been maintained and updated by the NLS District Survey Offices and the 86 towns that keep a cadastre in their jurisdictions. The District Courts are responsible for updating the Land Register. Specifically, the courts enter data on titles, special rights and mortgages in the Land Register. Each record is coupled with the identifier of the cadastral unit concerned or a part of it (a share, lease area). Figure 1 below illustrates the structure of the system.

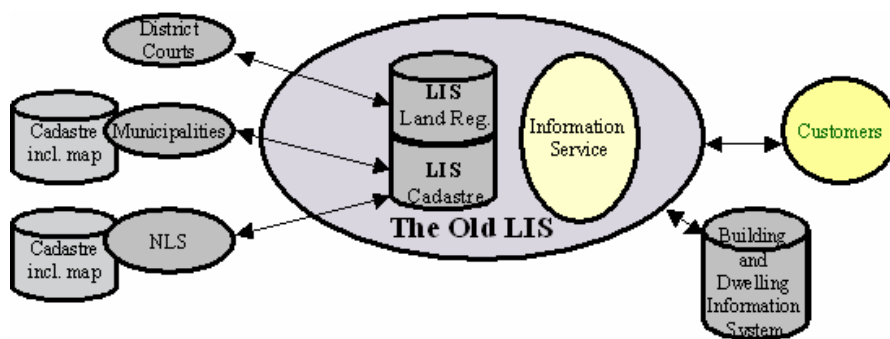


Figure 1

The location of a real estate unit is usually shown on a cadastral index map available in each cadastre. The technical solutions for the cadastral index maps used by the cadastre keepers vary. A cadastral index map covering the rural areas of Finland was completed in 1998 at the

NLS, and corresponding cadastral index maps used by the municipalities were also largely completed in the 1990s. The previous LIS did not as such include any map data (spatial data) on the register units, wherefore map data on a register unit had to be separately acquired from the NLS or the municipality concerned.

The functions for maintaining the previous LIS have been partly outsourced. The system software and hardware are supplied by a private enterprise. The company is also entitled to offer the LIS information service as a part of its own service package, although it is obliged to account for revenue from the LIS to the LIS authorities. The invoicing and user administration have been contracted out to a further company. These partners were both chosen on the basis of an open competition.

The most important form of information service is the provision of official extracts and certificates required by the register holders themselves or requested by customers. In this context the unit identifier is used as a search key. The number of LIS users total over 10,000. About 4.5 million printouts are made annually, and approximately 70% of these are required for examining applications for titles and mortgages. The web service is provided both through web sites maintained by the system supplier and a site used by the LIS authorities.

### **The New Act on the Land Information System**

Prior to the new LIS the situation was characterized by a lack of unity. Various data on a cadastral unit were maintained by the NLS, the municipality concerned, the Population Register Centre, the taxation authorities and in the LIS. This caused problems with reliability and overlapping in the data administration. Furthermore, the NLS and municipal cadastres also overlapped with the LIS in terms of data content.

One of the main objectives of the new legislation was to move from a situation, where the maintenance of the cadastre was based on an agreement, and to establish a statutory national register and information system. In the government's draft bill, it was emphasized that the state should be responsible for the development and maintenance of the system. It was also stated that the aim was to provide error-free data, and that the efforts should thus focus on improving data quality and currency.

The maintenance and provision of real estate data were to be organized so that it would be possible to obtain all data on real estate units from one integrated system. The most important new feature was the incorporation of spatial data in the cadastre.

Furthermore, the information service and availability of information needed to be further improved. Into the new LIS information must be loaded and updated by the authority that produced it. The NLS is, however, responsible for the establishment, maintenance and development of the LIS and for the related information service, as it was appointed as the sole administrator.

An important aspect to note is that by virtue of the Act on the amendment of the Real Estate Register Act, which came into force on the same date as the Act on the LIS, the new LIS became the primary legal register for cadastral information, when introduced on June 1, 2005. Until that date the cadastre incorporated in the LIS was only considered a copy of the 87 primary cadastres it replaced.

### **The New Land Information System**

The three project groups set up started their work in 2001 by preparing requirement specifications and project orders. In 2002 and 2003 the focus was on specifying and planning

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the system structure. The final development phase for the first parts was initiated in the winter of 2002 - 2003, and in February 2005 the entire system was ready for the loading of data held by the municipalities. After the loading each municipality started to update its data in the new LIS. The loading as a whole was successfully completed by June 1, 2005, at which time the new information service tools were also available.

The system development was carried out by the so-called tool project group at the NLS Development Centre, whereas the responsibility for launching the system was assigned to the launch project group. The tasks of the tool project group included specifying, planning and building the required databases and applications. The third party engaged in the project was the municipality project group, whose real estate experts co-operated closely with the NLS and the system suppliers of the municipalities.

In technical terms, the new LIS was realized as an extended version of the NLS cadastre application, the previous major undertaking at the NLS. The cadastre application allowed attribute and spatial data on real estates to be stored in an integrated, seamless database (1998).

### The Structure of the System

The NLS and the 86 cadastre-keeping towns jointly maintain the new LIS. Any data changes made by the users in the daytime are registered in the system the following night. The cadastre component of the old LIS will, however, be kept in operation for the time being, and its data updated from the new LIS every night. The data in both systems are thus identical during one day. This solution was decided on, as a new Land Register will not be incorporated into the new LIS until 2010 at the earliest. Until then the Land Register in the old LIS will continue to be used. All other data updates will, of course, be performed by use of the new LIS. Figure 2 illustrates the Land Information System following its overhaul.

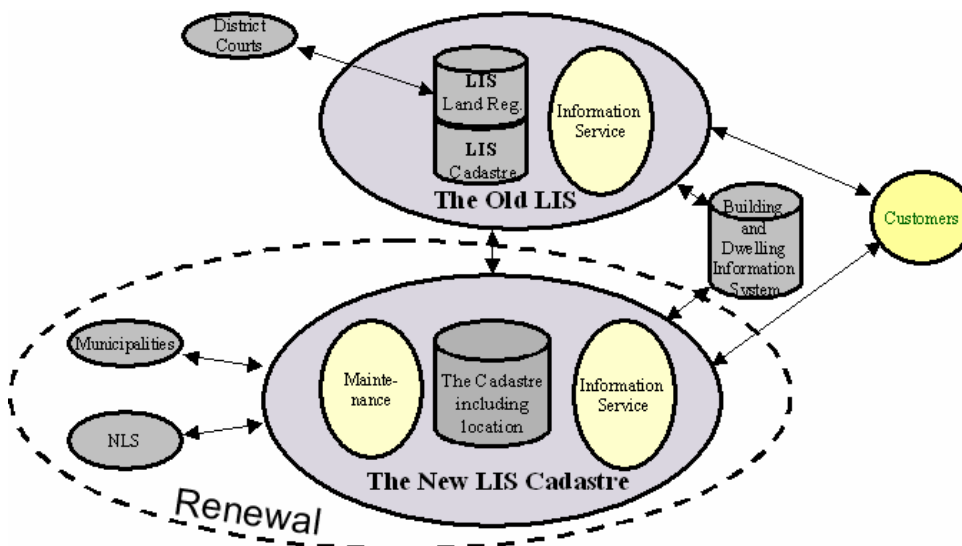


Figure 2

The new LIS includes a digital cadastral index map. Spatial data were loaded from both the NLS cadastre and the cadastre maps of the cadastre-keeping towns. The new LIS provides consistent spatial data on real estates with nationwide coverage.

The data were checked for any discrepancies and inconsistencies with a control tool. The loading application was used for loading attribute data from the old LIS and spatial data from municipal cadastral index map data systems. For updating the cadastre component a maintenance tool has been provided, and an information service tool has been made available to the register authorities to enable them to serve their customers. Other organizations can also be allowed access to the information service application provided that specific requirements prescribed in the legislation are met. External systems will be able access the new LIS through interfaces.

### **Preliminary Inspections of the Data**

All data needed to be checked before being loaded into the new LIS. The data held by the municipalities and the NLS contain references to the other party's data. In addition, the data partly overlaps. Spatial data on, for instance, an area along a boundary between two jurisdictions may be inconsistent. Malfunctions or errors may also have occurred during the transfer of data to the old LIS.

To ensure the best possible data quality, quality controls were also performed on the transferred data. The municipalities received instructions in the spring of 2002 on how to check their map data and correct any errors discovered. The following spring the tool project group performed automated quality controls on the attribute data. NLS data and LIS data were compared against each other, as were data provided by a municipality and LIS data. The efforts focused on crosschecking identifiers.

### **The LIS Cadastre Database**

The database in the new LIS was built by use of the NLS cadastre database, in which changes and extensions were made in compliance with the new LIS specifications. Old data were loaded as such. In the new system, however, a higher standard of reliability and consistency is required in the data maintenance. Some structural changes were also made in the new LIS to achieve improved consistency in the attribute data supplied by the NLS and the municipalities. Thanks to the previous LIS the attribute data describing real estate units registered by the NLS and the municipalities were more consistent, which considerably facilitated the incorporation of the different-source data in a single database.

The spatial data presented a greater challenge, as a number of different spatial data systems were used by the municipalities, and the data recorded by the municipalities were in the local coordinate system. Also, the storing and classification of the data varied depending on the system used and the municipality.

The database of the new cadastre component contains attribute and spatial data, as provided by law, on real estates, commonholds, public roads, parcels, usufruct units and building prohibitions, and spatial data on the outer boundaries of a planned area.

The system also gives access to a range of raster data and other additional data needed. The raster data of various scales held by the NLS are used in maintenance applications and information service applications for overview maps. The most accurate raster data are the NLS topographic map data (scale 1:5000 - 1:10 000) and the map data held by the municipalities (scale 1:500-1:2 000), which are not only used in interfaces but also as background maps for map printouts. The place name and address data are also used in the information service.

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The database for the new LIS was built and data held by the NLS were converted for the first time in the spring of 2004 prior to the test loading of data held by the municipalities. The final conversion was carried out in the winter of 2005 and followed by the actual loading.

### **The Data Loading**

The loading application was only used in the NLS launch project to load data recorded by the municipalities into the database of the new LIS. It was used for loading both attribute data and spatial data into the system. Attribute data in ASCII format were loaded one municipality at a time from the old LIS. The loading of spatial data from the municipal systems was carried out using an XML protocol.

To ensure that the final loading would run smoothly, it was decided to carry out a test loading of data from all the municipalities. The test loading turned out to be a vital phase, since it allowed the project group to test the loadability of data and the municipalities to make changes in their data, where necessary. Also, the loading application itself was tested, and, as an additional advantage, the project group obtained a realistic batch of data, which could be used for the trial and test trial of the maintenance and information service application.

The loading application combined the attribute data and spatial data for each register unit into a consistent entity. The spatial data from different municipalities and the NLS proved compatible. It should be noted that a number of different coordinate systems have been in use in the municipalities, and the measurements have relied on different control point networks. The municipalities themselves converted their spatial data into the national coordinate system and supplied them in standard XML technology-based format. Data loaded from a municipality was stored in the new LIS maintenance database. Once these steps had been completed, the municipality started to update its data in the new LIS on a regular basis.

By use of the loading application it was thus possible to combine the real estate data held by the NLS and the 86 municipalities. The loading of the data holdings of one municipality took two to four weeks. For some groups of data, such as easements, spatial data are not yet comprehensively available; however, the data are supplemented in connection with maintenance and the continuous improvements made.

### **Maintenance**

All data that must be entered into the cadastre by virtue of law are stored and maintained by use of a register-keeping application developed specifically for joint use by the NLS and the municipalities. All real estate data, including the associated spatial data, are maintained with the application. It is possible to transfer data from a municipal system in digital XML format for use as the initial data in a registration transaction. A municipality can thus use data in the municipal system, which reduces duplicative efforts and the risk of error.

The workstations used for the purpose at the NLS at a total of about 35 locations operate in one data communications network and communicate directly with the application server. The municipalities, however, have different operating systems, wherefore special arrangements have been required to enable the use of the application. Workstations used by municipalities cannot communicate directly with the NLS data communications network, nor with the system in the network. The solution is to allow the application to be accessed over the Internet by use of so-called terminal server technology. A Citrix client installed on a workstation used by a municipality is used to access a Citrix server at the NLS end over the Internet. The display image and user commands are transferred between the municipalities and the NLS, whereas the processing takes place on the servers at the NLS end.

At the NLS the application has a total of about 1,200 users, and in the 86 municipalities approximately 250 users. Prior to the launch of the application the users in the municipalities received a two-week training in its use provided by the launch project group.

### **The Information Services**

The information service will be used by the authorities for performing their specific tasks and by service personnel at customer service points. Commercial users, such as banks and real estate agents, will also be able to use the service over the Internet.

In the information service the small-scale maps are used for orientation, and topographic raster and municipal maps as background information. The user can conduct searches by identifier – or alternatively by location, whereby a point, a line or an area is indicated on the map. The location of a cadastral unit can be viewed on a background map, and various printouts can be made.

The official products and services provided by the system include extracts on cadastral units, cadastral index map extracts, certificates from the Land Register and printouts of unseparated areas. The information service is connected to the Land Register and the Building and Dwelling Information Register, where it is possible to obtain a cadastral unit id using the address of a building as a search key.

External applications can also access data in the new LIS. An added-value service provider, for instance, must in this case build a corresponding function in the application used at their end. The Web Service is an Internet-based service designed to provide online information in XML format from a database.

Many municipalities, in particular larger ones, continuously require up-to-date real estate data in order to be able to carry out various functions, and in some cases these data need to be available in the system used by the municipality. A data service application has accordingly been incorporated into the system to transfer modified real estate data in XML format to the municipality during the night. The entire data holdings of the municipality were transferred to the municipality immediately after having been loaded into the new LIS and used as the initial data. For these purposes, the systems used by the municipalities also underwent extensive development carried out by the system suppliers.

### **Funding**

Under the law the NLS is obligated to fund the system. It is, however, entitled to a share of the revenue from the information service to cover the costs. The building and launching of the system required approximately 100 man-years and an investment of 10 million euro by the NLS. The other parties cover their costs in a similar manner. The surplus is divided between the parties. A revenue of 8.8 million euro accrued in 2004. However, the revenue is expected to increase, as the system can now be used to produce and deliver a range of map-based products.

### **The Land Information System included in the Finnish Base Register System**

Information on the basic units of society is collected, stored and updated in so-called base registers, which include the Land Information System. The base registers are the Personal Information System, the Business Information System, the Building and Dwelling Information Register and the Land Information System consisting of the Cadastre and the Land Register.

The base registers hold data vital to individuals (natural persons), corporations (legal persons) and society at large, and thus underpin for their part the functions of society. The base registers are characterized by broad coverage, reliability and versatility. Data protection also applies to all the registers. A further characteristic is that they are all governed by legislation. An effective base register system with broad coverage offers a multitude of real economic and functional advantages. Figure 3 below describes the possibilities of integrating different registers.

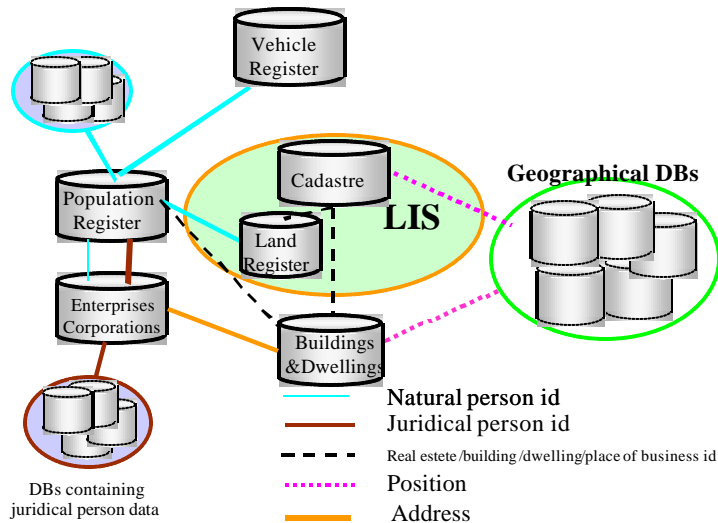


Figure 3

### Closing Remarks

The overhaul of the LIS as a whole presented great challenges to all parties involved: the NLS, the expert groups of the municipalities, the municipalities themselves, the system suppliers and other authorities engaged in the project. The challenges lay equally in building the LIS, developing the municipal systems and launching these. Overall, the project involved the integration of a number of large data systems and the functional processes of the NLS and municipalities. Both the data holdings and data systems underwent major changes.

Owing to the magnitude of the project there were some differences in opinion, as could be expected, but these were overcome, as were the cultural barriers. All the organizations made concessions. This major project was thus recently completed in good spirit. The collaboration between the NLS, the municipalities and other authorities concerned continues in the form of system maintenance. The next major co-operation project planned is the incorporation of the Land Use Plans and Restrictions in the LIS.