

# Maps and geographic information – essential elements in a well-functioning society

Public mapping strategy 2001 – 2010  
Finland



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– essential elements in a well-functioning society**

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Summary	<p>Public mapping comprises the basic public service of gathering, administering and updating national basic topographic data, producing general topographic maps, and making topographic maps and data available to the public.</p> <p>The overall aim of these public mapping activities is to promote the well-being of the population and business competitiveness, and to help to ensure good administrative practices by providing versatile, high-quality maps, topographic data and geographic information services. The research and development done in conjunction with public mapping should have a sound theoretical basis and produce solutions that can readily be applied in practice.</p> <p>The public mapping strategy provides guidelines for the production of general topographic maps and data covering the whole country, and related services, in 2001-2010. Special attention is given to improving the availability, uniformity and quality of geographic information and the application of solutions supporting international standardization.</p>			
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# Maps and geographic information

## – essential elements in a well-functioning society

For centuries, maps have been used to illustrate and document national and regional boundaries, settlements, transport networks, contours, and other important aspects of land ownership and land use, and topographic features. The quality and availability of such maps is often used as a measure of a nation's level of development, efficiency and educational standards.

As societies have developed, the location of various events, phenomena and geographic features, and the way they relate to their overall environment have assumed an ever greater importance. At the same time, geographic information (data resources incorporating positional data) has found a growing number of applications in a number of fields, such as general information management and planning processes.

Though most aspects of land surveying and mapping are still national responsibilities, expanding international cooperation is putting pressure on individual countries to harmonize the ways in which they gather and process geographic information. This is particularly true in Europe. There are a number of international projects under way aimed to create and manage common data resource networks, and make them more compatible.

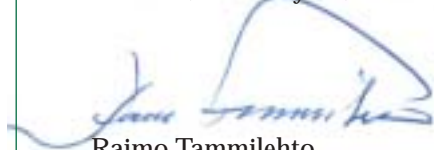
Technological advances, expanding international cooperation and new ways of using cartographic material mean that more is expected of maps and geographic information intended for general use, in terms not only of their quality and availability, but also the aspects they cover. In addition to providing a general presentation of topographic features, bodies producing maps that encompass entire countries

are now also expected to record and manage attribute, positional and history data on individual topographic features in greater detail than before, and to keep it up-to-date.

In a country as large as Finland, map production and updating national topographic data are long-term commitments which must consider the work map makers have carried out during the past few decades, advances in technology and the available resources, as well as user needs. Those involved in map making must also be able to anticipate the changing demands made of maps and geographic information as a result of new technologies and requirements.

The public mapping strategy provides guidelines for the production of general topographic maps and data on the whole country, and related services, for the next few years. There is a special focus on improving the availability, uniformity and quality of geographic information and the application of solutions supporting international standardization.

Helsinki, February 28, 2002



Raimo Tammilehto  
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## Public mapping

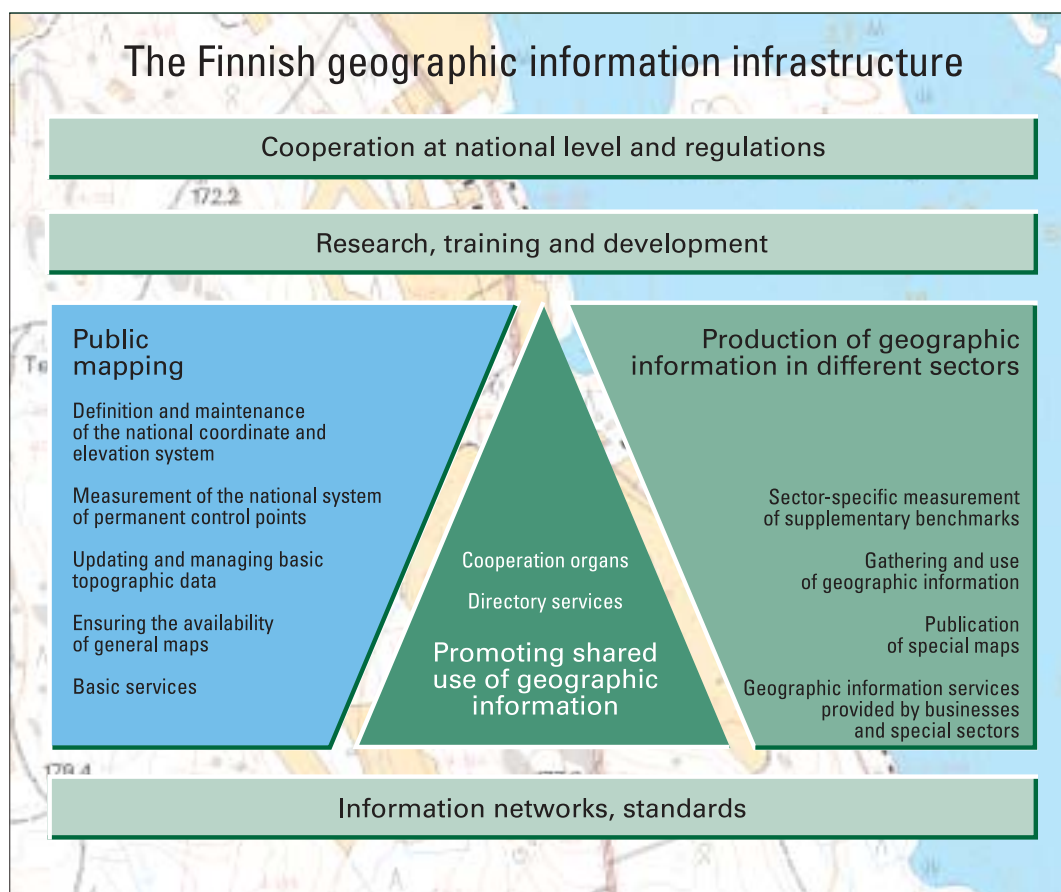
Public mapping comprises the basic public service of gathering, administering and updating national basic topographic data, producing general topographic maps, and making topographic maps and data available to the public.

The data resources, products and services generated and maintained as part of public mapping are intended to benefit as many users as possible and to provide Finland's public and private sectors and individual citizens with equal access to a comprehensive and reliable supply of maps and geographic information.

As maps are intended for general use, the main purpose of public mapping is to

register and present permanent and generally-known features of the terrain and living environment without emphasizing any particular topographic aspects.

There is no legislation in Finland on public mapping, so the sector is mainly regulated through standards, and resource and result management. Long-term programmes with relevance to public mapping include the Kartta 2000 (in 1987), Teemakartta 2000 (in 1990) and the geographic information strategy for the administrative sector of the Ministry of Agriculture and Forestry (in 1998).



**Figure 1. Public mapping as part of the national geographic information infrastructure**

## Sectors of public mapping

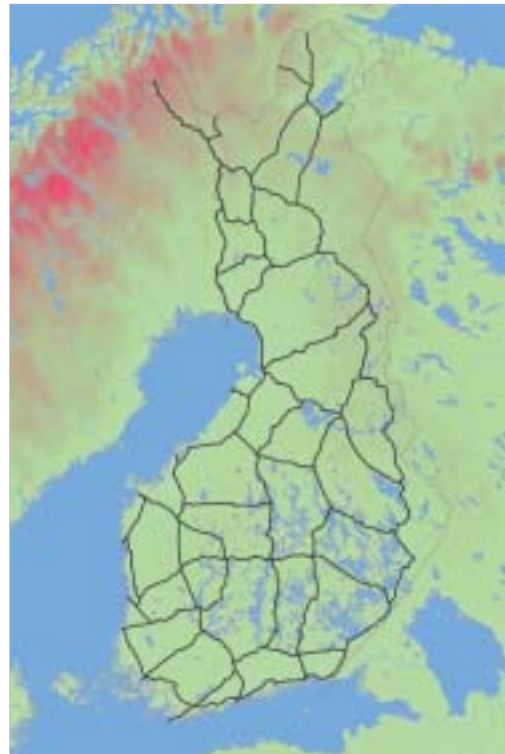
- Definition and maintenance of the national coordinate and elevation system.
- Measurement of the national control network and benchmark register.
- Producing and updating basic national topographic data, and managing the topographic data system.
- Producing specific general map products and ensuring their availability.



*Figure 2. FinnRef, the Finnish permanent GPS network maintained by the Finnish Geodetic Institute (roundels), the national EUREF-FIN coordinate system (red triangles), and the triangulation network, I order (yellow triangles).*

- Making basic topographic data and map products generally accessible as electronic basic geographic information services.

Promoting shared use of geographic information is an activity separate from public mapping. It is intended to increase general awareness of the geographic information resources and services available in different sectors, make the information more compatible, and ensure that existing material is used more efficiently.



*Figure 3. The third precision levelling of Finland – state of field work at the end of 2001.*

## Relationship between public mapping and the production of other types of map and geographic information

Public mapping helps to ensure the availability of national basic geodetic data forming a basis for the production of almost every other type of map and geographic information on Finland. Basic geodetic data comprises the geodetic model, benchmarks, coordinate and elevation systems, map projections, and transformation models between coordinate systems.

Not all maps are produced as part of public mapping, and there are many organizations that make use of geographic information and produce maps. The requirements regarding the positional accuracy and validity of the geographic information used, and the way topographic features are presented, differ greatly between different sector-specific projects.

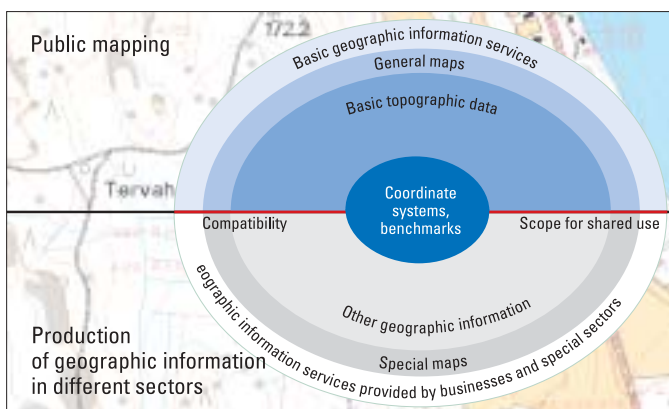
The Topographic Service, the mapping agency of the Finnish Defence Forces, supplies the military with maps, and produces and updates the topographic maps on northern Lapland as part of public mapping. Responsibility for gathering and updating the basic topographic data on this part of Finland will be transferred to the National Land Survey of Finland when the national topographic database is set up.

The Finnish Maritime Administration is responsible for producing and updating nautical charts on sea areas and a number of

lakes, mostly for the use of waterborne traffic, while the Geological Survey of Finland produces geological, geophysical and geochemical basic data for practical applications. Both the nautical charts supplied by the Finnish Maritime Administration and the maps of Finland's quaternary deposits supplied by the Geological Survey of Finland are special products based on public mapping work.

Local authorities produce topographic data and base maps for planning, construction and environmental protection. Their positional accuracy requirements are stricter than those for maps produced as part of public mapping. In the coming decade, putting cooperation between local and central government in the shared use and updating of geographic information on a better footing will be a major challenge for Finnish mapmakers.

Mapping companies and a number of public-sector organizations also produce special maps and provide geographic services, either as commercial products or in conjunction with other activities (such as the promotion of tourism). Most of these products and services are generated by processing the material produced as part of public mapping.



*Figure 4. Public mapping is the core of national geographic information production.*

# Relationship between public mapping and basic registers

Basic registers are official registers of population, buildings, properties, and businesses that are continuously updated, in which the features covered (such as buildings and properties) are given official identifiers. This arrangement makes it possible to identify features unequivocally and combine them with data in other registers. Positional data have been or can be integrated into most basic register data.

Basic topographic data gathered as part of public mapping and general maps derived from them provide a data resource that supplements commonly used basic registers and that enables many pieces of basic register information to be linked to their actual geographic surroundings. Topographic data and basic register information should be based on positional and identification links that make them compatible and facilitate the shared use of geographic information.

## Economic importance of public mapping

Finland spent an annual sum of about 16 million euros on public mapping in the 1990s. The digital topographic data system, which was mostly built up during that decade, has been a major public boost to development of the national geographic information infrastructure.

In the 1990s, annual revenues from sales of products and services derived from public mapping came to about 3 million euros. This means that the updating of topographic data and map production done at national level are not profitable. In fact, public mapping should be seen as one element in maintaining a national infrastructure that generates benefits for individual citizens, businesses and government, while also helping to maintain a high level of crisis readiness.

During the last twenty years, a number of Finnish and foreign studies have tried to assess the importance of maps and basic topographic data for the national economy. None of them has been able to produce a clear analysis of their economic costs and benefits, however.

The report on the role of geographic information technology in Finnish society and the opportunities it has helped to create (PROGIS, 1997) concludes that geographic infor-

mation technology is often used in long-term projects and that the benefits have wide-ranging impacts on a large number of parties. Thus, it is often impossible to give an accurate account of the benefits generated by investments in such technology. Many applications produce strategic benefits, and in their case the conclusion is that operations would no longer be possible without geographic information technology.

Number of international studies on the benefits of the geographic information infrastructure suggest that the cost-benefit ratio of geographic information production is about 1:4. The benefits are considered to be shared among a wide range of fields such as electricity, gas and water utilities, agriculture and forestry, mining and environmental protection.

In Finland, too, there are sectors - such as forestry - in which maps and geographic information can help to generate savings and benefits that are many times higher than the cost of purchasing the material and systems. It is also possible to estimate the benefits reaped by individual map users in areas such as property administration and maintenance, hiking, berry-picking, hunting and other activities taking place in an unfamiliar environment.

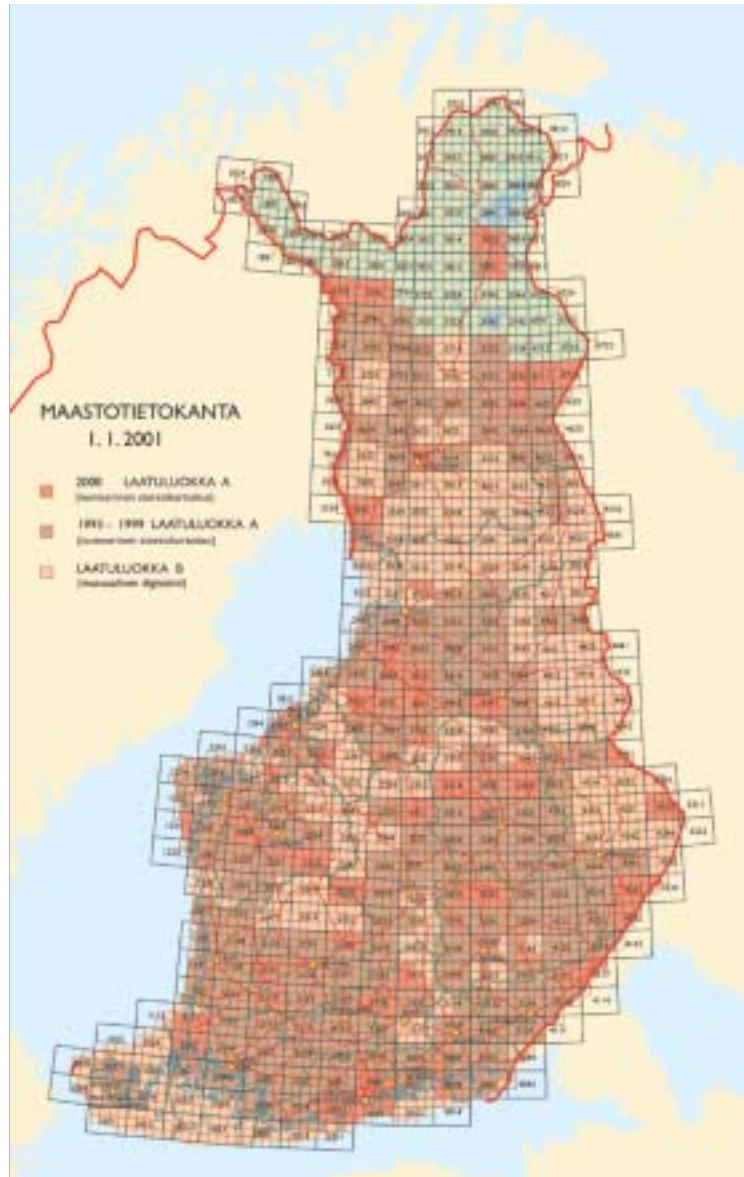
## Situation in 2001

### Points of departure

The basic assumption is that public spending on public mapping will remain at the present level.

The operational basis of public mapping explained in greater detail in Appendix 1 can be summed up as follows:

- The new national EUREF-FIN coordinate system based on the Finnish permanent GPS network is now in place (Figure 2) and is being prepared for introduction.
- The field work on the third precision levelling of Finland will be completed in 2003 (Figure 3).
- Digital basic topographic data cover the whole country, except for the northernmost parts of Lapland (Figure 5).
- The gathering of basic topographic data on the northernmost parts of Lapland, now a responsibility of the National Land Survey of Finland, has begun and is expected to be completed by 2006.
- All the basic topographic data have been transferred to a new centralized data system.
- Basic improvements intended to make the quality of the basic topographic data more uniform has begun and should be completed by 2006.
- Updating of the basic topographic data is now based on a new production system.
- Upgrading of the network information service system has begun.



**Figure 5.** Extent of the topographic database on January 1, 2001, by quality category

## Changes in the operating environment

The following aspects that characterize the operating environment of public mapping and changes in it also have an impact on how the targets should be defined:

- Gathering and use of geographic information is now on a permanent basis in many sectors.
- International shared use of and cooperation related to geographic information and map material are on the increase.
- Communication networks and wireless communications are increasingly important as means of using and disseminating geographic information and map material.
- Accurate positioning technology and geographic information material are increasingly used together in a number of applications.
- Extensive shared use of geographic information material based on communication networks will result in stricter requirements for basic topographic data as far as its quality, validity, compatibility and customer-friendliness are concerned.
- Increasingly accurate aerial photographs and remote sensing material are becoming more widely available and will eventually assume a role comparable to that of basic topographic data.
- There will be no substantial increase in public spending on the gathering and updating of basic topographic data, though at the same time the total capacity for updating and using geographic information is likely to grow as different sectors make more use of it.
- Steps are being taken to harmonize the pricing and distribution mechanisms of basic topographic data in Finland and other countries.
- International contacts and expanding markets also mean more competition in the production of basic topographic data.

## Advances in information management

The targets set for public mapping are also influenced by overall strategies for the information society, information management and geographic information.

For example, the Finnish Government Resolution on the development of information management in the State administration (March 2, 2000) declares the following aims:

- The authorities should see to it that their information systems are available to all authorized users and able to provide high-quality service. Special attention should be paid to information security and to ensuring reliable operations in special circumstances.
- In order to facilitate the shared use of data resources and make them more compatible, and to minimize overlaps, instructions and strategies concerning compatibility should be drawn up for different sectors of the State administration.

The geographic information strategy for the administrative sector of the Ministry of Agriculture and Forestry (MMM 3/2001) lists the following targets:

- Information gathering in different fields should be carried out efficiently, in a cooperative spirit, and keeping in mind the need for high quality. At the same time, overlaps should be minimized, and cooperation in information updating with external parties should yield useful results.
- Individual citizens, businesses and the rest of the public sector should be provided with information services suited to an electronic environment that are based on transparency and uniform principles.
- Businesses should be able to process material and services in a variety of ways. This will make it possible to set up the services at lower cost.
- Material and services should be in wide use so that maximum benefits can be reaped from the gathering of material and the setting up of services.

## Targets and strategies for 2010

The overall aim of public mapping is to promote the well-being of the population and business competitiveness, and to help to ensure good administrative practices by providing versatile, high-quality maps, topographic data and geographic information services.

Research and development done in conjunction with public mapping should have a sound theoretical basis and yield solutions that can readily be applied in practice (Figure 6).

The public mapping strategy can be divided into four sectors:

1. A complete multi-use concept incorporating topographic data, products and services.
2. Quality standards supporting extensive use, and clearly defined quality management.
3. Pricing and distribution principles encouraging wide use of products.
4. Strong research and development input.

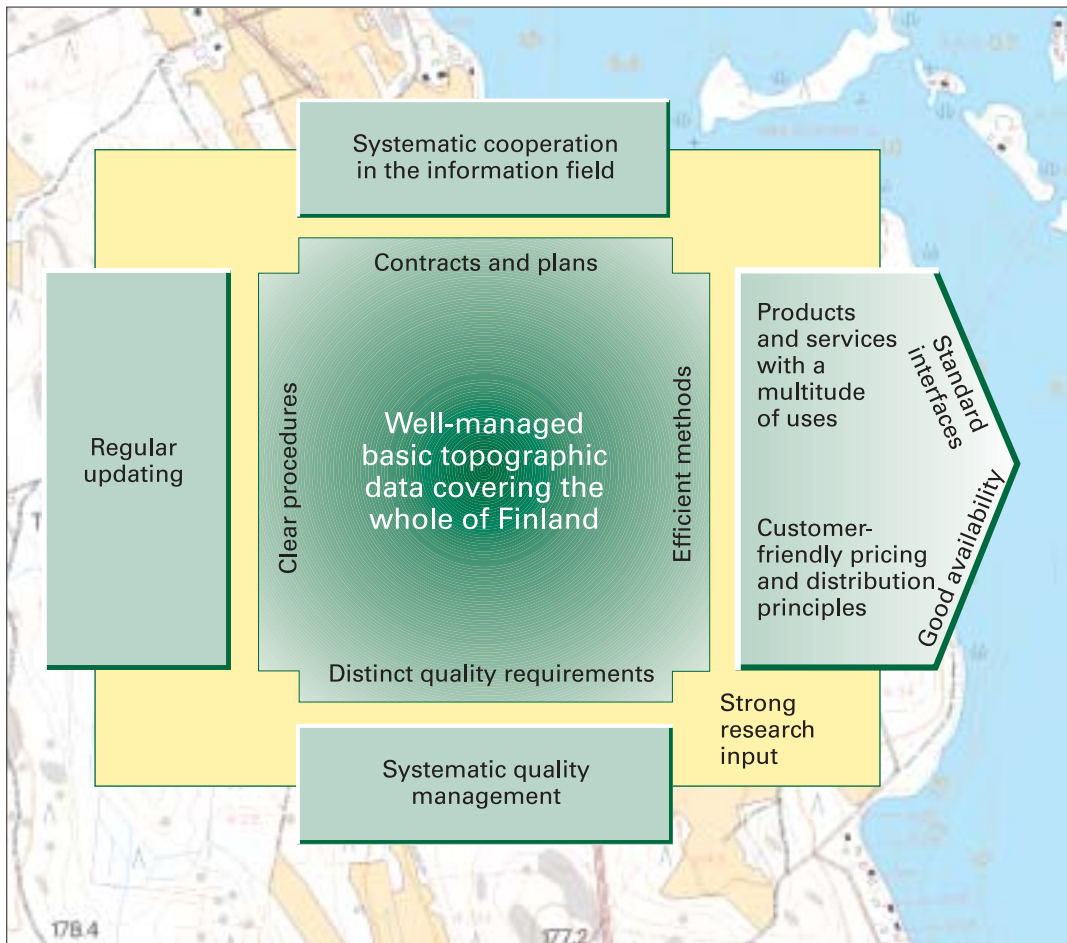


Figure 6. Targets for public mapping

# 1. A complete multi-use concept incorporating topographic data, products and services



- 1.1. Individuals, businesses and government should have access to basic topographic data covering the whole country which is technically homogenous and of high quality, is based on up-to-date data and quality models, and gives users access to a comprehensive range of information sources.
- 1.2. A register of Finnish place names should be maintained in conjunction with the basic topographic data.
- 1.3. General topographic maps on scale 1:20,000, 1:50,000, 1:250,000 and 1:1,000,000, based on basic topographic data and covering the whole of Finland, should be available in both digital and graphic form.
- 1.4. Digital aerial photos should form a systematically updated data resource that covers the whole country and supplements the basic topographic data and map products.
- 1.5. Basic topographic data, digital map products and aerial photos, and their validity, quality and other attribute data should be publicly available as data products in the most common formats and through data services based on standard interfaces. The separate supply of data created or changed after a certain date should also be possible.
- 1.6. The public should have easy access to map material based on regularly updated topographic data, and to related validity, quality and other attribute data, through an electronic information service.
- 1.7. Information and material produced as part of public mapping should be managed so as to ensure their long-term preservation and easy use in a multitude of ways.
- 1.8. The National Land Survey of Finland (NLS) and the Finnish Geodetic Institute (FGI) should carry out public mapping and manage data resources in their own areas of responsibility.
- 1.9. Systematic cooperation with parties involved in mapping and geographic information work in different fields should be actively pursued so that the quality of the material can be improved, its shared use encouraged, and maintenance costs reduced.
- 1.10. Cooperation with the private sector should be smooth, especially in further processing geographic information and map material, and the development of electronic services.
- 1.11. The NLS and FGI should be actively involved in international cooperation projects to develop methods for producing and using basic topographic data and general maps. Ways of using basic topographic data and map material in large international projects and collaborative undertakings should be decided on a case-by-case basis.

## 2. Quality standards supporting extensive use, and clearly defined quality management

- 2.1 National EUREF-FIN coordinates and transformation models for use between different coordinate systems should be available by the end of 2003.
- 2.2 Basic topographic data should be available in accordance with the EUREF-FIN coordinate system by the end of 2004.
- 2.3 By the end of 2005, new topographic maps should be available in both Gauss-Krüger and UTM projections.
- 2.4 The new elevation system with elevation benchmarks based on the third precision levelling and linked to the European system should be available for use by the end of 2006.
- 2.5 Generally approved standards supporting national and international shared use should be applied to the basic topographic data, map material and information services produced as part of public mapping.
- 2.6 The gathering and updating of topographic data, and map production, should be based on approved quality, data and product models. At the same time, electronic services should be based on a service model that describes the applicable interfaces, for example. All models and instructions should be properly documented, accessible by the public and in keeping with international compatibility requirements.
- 2.7 The most important parts of the basic topographic data should be updated at least every five (5) years. However, the features changing most frequently, such as roads and buildings, should be updated every year. Aerial photographs, should be updated at least every five (5) years.
- 2.8 In specific cases, when topographic changes are usually slow because of the nature of the area, the interval between updates of topographic data and aerial photographs can be more than five (5) years, but not more than 10.
- 2.9 The positional accuracy of basic topographic data should be sufficient to enable versatile shared use of the material at national level.
- 2.10 Topographic data should be updated and their quality monitored to ensure that any positional errors are within the approved limits and the attribute data are correct in at least 97 per cent of cases, and that not more than 5 per cent of the features in each category are missing or incorrect.
- 2.11 Systematic monitoring of the quality of topographic data and material should be carried out separately from their production, and the quality data should be integrated into the generally used attribute and description data.
- 2.12 A quality description should be included in all material deliveries.



### 3. Pricing and distribution principles encouraging wide use of products



- 3.1 The topographic data, maps and information services produced as part of public mapping should be available to everybody. The principles governing their pricing and distribution should be public and uniform, and promote their wide use. The general principles and provisions on the transfer of government-owned information material should also be adhered to.
- 3.2 The pricing and distribution principles should enable public mapping to be a continuous process and also help to improve the quality of data, products and services.
- 3.3 The pricing and distribution principles should help to create a sound basis for a broad range of value-added services, taking the needs of all user groups into account.

### 4. Strong research and development input

- 4.1 Those carrying out public mapping work should possess up-to-date information on the usefulness of the latest methods and source material in the field, be familiar with the national and international standards used in mapping work, and be aware of any need to change the standards.
- 4.2 Research and development should lend long-term support to efforts to achieve the mapping targets set and help to improve the methods, information management systems, products and services related to public mapping, both technologically and qualitatively. Research and development should also support versatile shared use of geographic information material.
- 4.3 Research and development plans should be documented and public.



*A station of the Finnish Geodetic Institute's permanent GPS network at Virolahti*

## Further measures

Further improvements will be made in the availability, usability and compatibility of topographic data and maps by 2010. However, extensive research and development work will be needed in 2002-2005 before any new methods devised meet the requirements and can be put to productive use.

The main aim of further measures is to ensure that when, in the middle of the decade, the national basic topographic data have been fully compiled and the necessary major improvements have been incorporated, administration and production units have a clear and well-documented vision of the guidance and development measures needed in 2006-2010.

### A complete concept incorporating topographic data, products and services

- In the management of basic topographic data, the validity of data models should be examined and the need to improve the methods of updating and supporting geographic information analyses further studied.
- In updating basic topographic data, the impact of permissible delays (1/5/10 years) on production, any regional divisions, and cooperation with other parties maintaining geographic information on the country as a whole or on large regions should be examined.
- In maps on scale 1:5,000-1:25,000, the need for general topographic map products and any alternative procedures should be examined.
- In small-scale map databases, the range of databases needed on scale 1:100,000-1:1,000,000 should be specified and the potential of an automatic generalization based on the topographic data system studied.
- The general technical requirements for digital aerial photos should be examined.
- In distribution, the focus should be on standardized forms of data transmission and interfaces through which basic topographic data, digital map products and aerial photos can be made available to the public.
- In graphic maps, a study should be made of whether graphic material can be produced and supplied to customers using new digital printing techniques.

### Quality and other standards to be applied, and quality management

- The validity of quality models applicable to basic topographic data and the need to improve them should be examined.
- In the case of basic topographic data, the positional accuracy requirements that support versatile shared use should be specified, and the impact of these requirements on production costs examined.
- In quality management, a study should be made of whether the quality of the data, products and services generated as part of public mapping can be monitored separately from the production process.
- In updating topographic data and producing topographic maps, matters related to the introduction of the EUREF-FIN coordinate system, the new national elevation system and the UTM map projection should be examined.
- How national and international standards and technically open solutions should be applied to data management related to public mapping should be examined.

### Pricing and distribution principles

- A study should be made of whether the royalty pricing principle can be applied to the transfer of user rights for

basic topographic data and map products.

- The impact of more extensive updating cooperation on pricing and distribution

principles and contractual procedures should also be examined.

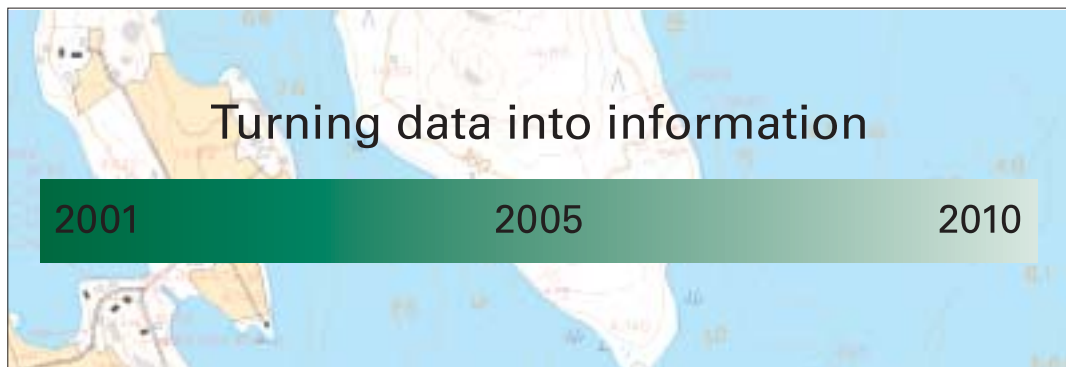
## Implementation

The public mapping strategy will be put into effect in tandem with the geographic information strategy for the administrative sector of the Ministry of Agriculture and Forestry. The goals can be achieved by providing the National Land Survey of Finland and the Finnish Geodetic Institute with annual result targets, and by allocating research funding to projects that support mapping policy targets.

The public mapping strategy is not a permanent long-term implementation programme, but part of a continuous process

aiming to continuously produce high-quality and versatile topographic data, maps and information services covering the whole of Finland.

The operating environment is changing rapidly. Thus, implementation of measures should be monitored on an annual basis, and preparations should already be made for a strategy review in the middle of the decade when the gathering and updating of basic topographic data will enter a new phase.



## Public mapping in 2001

The National Land Survey of Finland (NLS) is responsible for practical mapping work, data gathering, production of general maps, product distribution and general promotion of the shared use of mapping material and other geographic information.

The Finnish Geodetic Institute (FGI) is responsible for coordinate systems, the measuring and updating the highest-level permanent control point network, and sectoral research in the field of public mapping.

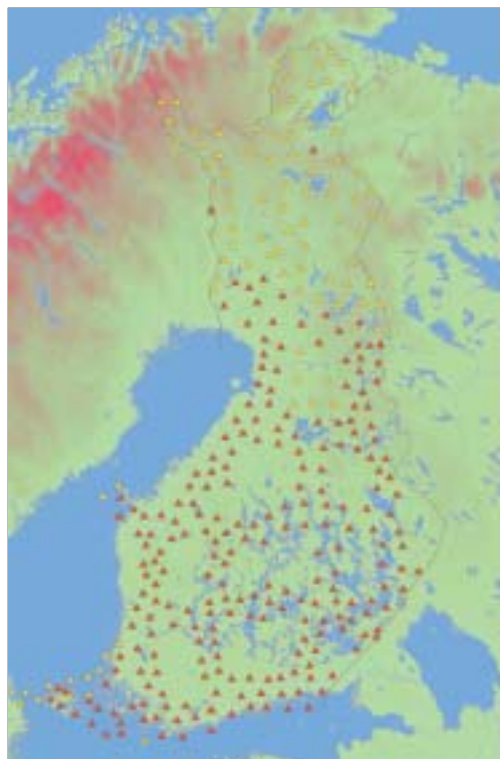
The Topographic Service, the mapping agency of the Finnish Defence Forces, has so far been responsible for producing and updating maps covering the northernmost parts of Lapland. However, with the completion of its topographic database, the NLS will assume responsibility for these activities by 2006.

The mapping material for the whole of Finland except for the northernmost parts of Lapland has been converted into digital basic topographic data. These basic topo-

graphic data have been entered in a unified topographic database which is regularly updated and which forms the basis for most of the wide range of general map products and information services available.

The attributes of the basic topographic data incorporated into the topographic data system differ from one region to another. This is because of improvements in mapping methods and the fact that the methods are not used in the same way in all parts of the country.

The topographic data has been incorporated into the Finnish National Grid Coordinate System (kkj), while the maps are published in accordance with the national general sheet line system. There is growing pressure to adopt a pan-European coordinate system that is more compatible with the present positioning systems, and studies have shown that the NLS is in a position to put this into practice during the next few years.



*Coverage of the topographic database on January 1, 2001, by quality category*

*The FGI's class I triangulation points. Those marked in red were checked in 1988-2001*

# Material, product and service concept in 2001

## Basic topographic data

### Benchmarks, benchmark archive and benchmark registers

The permanent control point network produced as a result of geodetic control surveys forms the basis for all mapping activities. It enables topographic data and geographic information, and consequently maps, to be tied to the national grid coordinate system. At the moment, the benchmark register contains information about some 25,000 horizontal benchmarks in class I-III and some 48,000 elevation benchmarks in class I-III, in all parts of Finland.

### Topographic database

The topographic database is a data system incorporating the basic topographic data. It covers the whole country, except for the

northernmost parts of Lapland, for which the database should be completed by 2006.

Topographic data are primarily based on aerial photographs taken using regional photogrammetric plotting (quality category A, 59%). Digitization using fair drawings of the existing basic map on scale 1:10,000 (quality class B, 30%) is the secondary method used. The northernmost parts of Lapland on which there is still very little digital topographic data comprise about 11% of Finland.

The basic topographic data comprises two important parts, which are independent databases from the users' point of view: roads and addresses, and nomenclature.

Most parts of the topographic database are updated every 5-10 years. However, the information on roads, addresses, buildings and the transmission network is updated annually.






## Map databases

The topographic database is used to produce map databases on different scales. Sometimes the map databases are more general than the topographic database, though it is often necessary to add some feature types. In them, the basic topographic data is presented as map features, the amount of information and number of

features usually decreasing as the scale gets smaller.

In addition to map databases corresponding to topographic maps on scale 1:20,000 and 1:50,000, small-scale map databases are also produced on scale 1:100,000, 1:250,000, 1:500,000, 1:1 million and 1:4.5 million.

## Maps produced for publication

Printed map series		
Map series	updating interval, years	
Printed topographic maps, 1:20 000	10	
Printed topographic maps, 1:50 000	10	
Printed general maps, 1:500 000	5	
		Digital raster maps
	Digital raster product	Updating interval, years
	1:20 000 Raster material for topographic maps	10
	1:50 000 (only as separate image files)	10
	1:250 000	5
	1:500 000	5
	1:1000 000	5



1:20 000

## Other map products

Other map products include the base map on scale 1:5,000 produced using aerial photographs as background, though this is not available for all parts of the country.

The private sector is responsible for publishing the printed map series on scale

1:250,000. Basic topographic data are used as the source material, so at the moment no corresponding map series is published in the public mapping process.

*Ortophoto and cadastral boundaries on scale 1:5,000*



## Elevation models

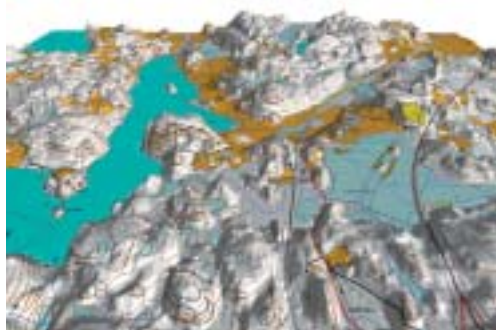
A digital elevation model describes the ground elevation using a systematic grid network as a basis. The existing national model has been produced by triangulating the contour lines of the 1:10,000 basic map originals (in Lapland, 1:20,000) and by calculating the elevation values on a regular grid network using triangulation as a basis.

The elevation positional accuracy of an elevation model depends primarily on the accuracy of the contour lines used. The model used at the moment is flatter than the actual terrain on hill tops and at the bottom of valleys because the elevation values of the minimum and maximum points of the topographic features are not included among the contours used as input data. According to a measurement covering the

*Digital elevation model*

whole of Finland, the average elevation error in a 25-metre square is 1.8 metres.

Work to convert the elevation model into a more accurate 10-metre model has begun as part of the process of updating the topographic data. In the new model, all features of the topographic database which have had their elevation defined will be used as source material.



## Distribution of map and information products and information services

### Distribution and sale of printed map products

Retail sale of the general maps produced by the NLS is the responsibility of its distributors (District Survey Offices and specialist businesses). There is also an OnLine-shop, which acts as a central web-based ordering service.

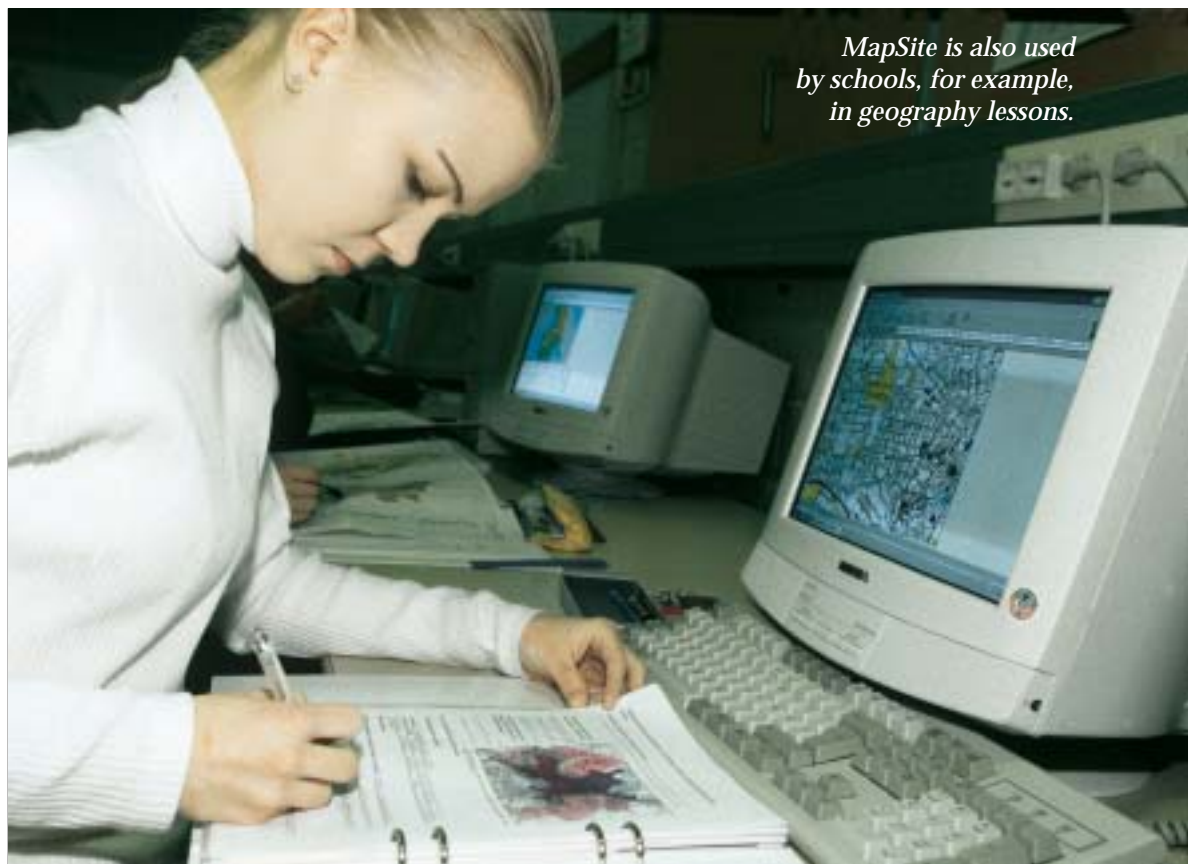
### Transferring the right to use digital map material and map products

Licencies to use the products are sold by District Survey Offices and the NLS Sales and Marketing Services. Distributors specializing in the processing of digital material and agents using geographic information in their applications also play a major role.

### Electronic services

The MapSite web service is the channel for the use and distribution of map material on the Internet. Users can browse through the NLS's digital raster maps on the desired scale using free-choice area-definition and download map images for their own use. By concluding a separate agreement with the ordering service, customers can also use the MapSite to examine information about properties and their selling prices, and benchmarks.

As yet, the systems used by the NLS do not allow direct use of digital topographic data via the Internet.



*MapSite is also used by schools, for example, in geography lessons.*

## Other products and services related to public mapping

### Benchmark data

The NLS can supply information from its benchmark archive and register as paper copies, on diskettes and in electronic form. Benchmark register data can also be ordered via the MapSite ordering service on the Internet.

### Aerial photograph products

The NLS has archived all the aerial photos it has taken for map production as film images. Photographs taken since the 1950s have been entered in the aerial photograph register.

In addition to the digital photo products made for mapping purposes, the NLS can



*Geographic information directory on the Internet.*

also supply orthophotos made on the basis of 1:60,000 high-altitude photography carried out by the Topographic Service (Orto-CD).

### Geographic information directory

The aim is to incorporate all Finnish geographic information available to users outside the bodies producing the material into the geographic information directory maintained by the National Land Survey. At the beginning of 2000, the directory had about 320 datasets on the country as a whole and on individual municipalities. Updating the directory forms part of efforts to promote shared use of geographic information.

*Orthophoto on scale 1:10,000*

## 2. Quality and other standards to be applied, and quality management in 2001

### Reference systems

In mapping, the national grid coordinate system (kkj) is used to determine horizontal positions, while the elevation positioning is on the basis of the N60 system (N60).

The general sheet line system and the map sheet coding system approved by the NLS on December 10, 1940 are used as the sheet division. The general sheet line system is based on the right-angle basic coordinates of the Gauss-Krüger map projection. Finland comprises five projection zones, with 21°, 24°, 27°, 30°, and 33° as the central meridians.

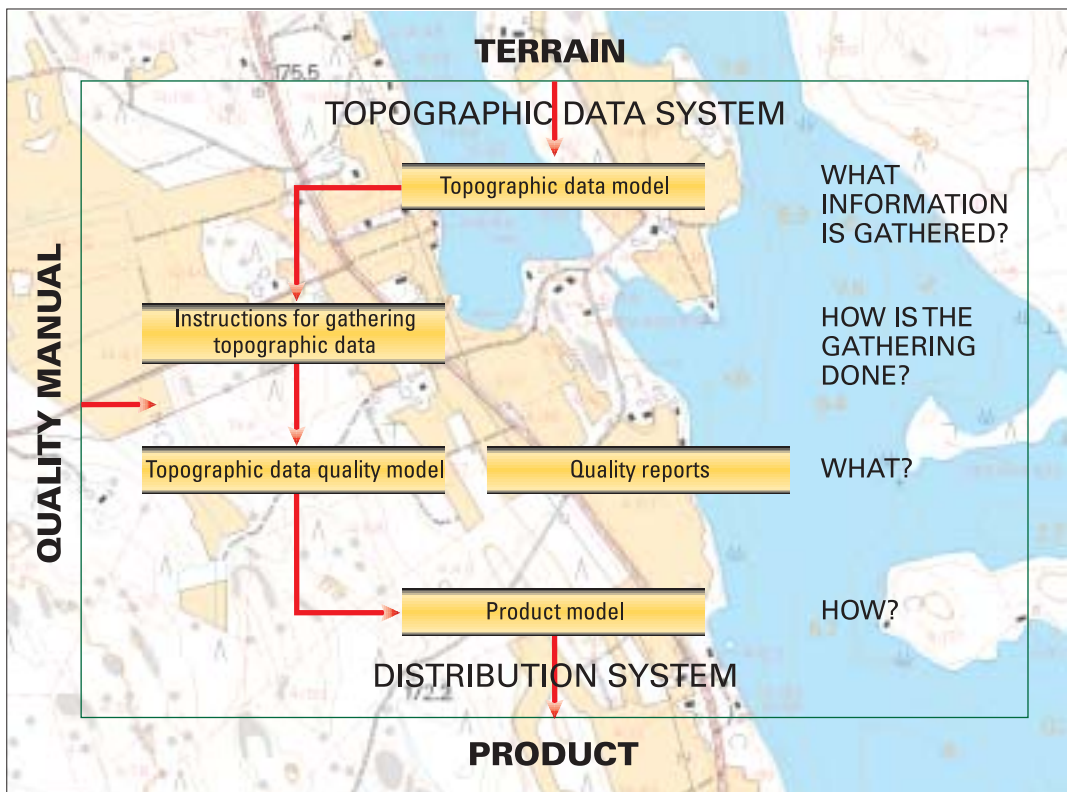
### Quality management

Production and updating work related to the gathering of geographic information

and map production rely on the topographic data quality manual (MML 76/1995), instructions for the gathering of topographic data, the topographic data quality model (75/1995), instructions for small-scale map databases (MML 82/1997) and product-specific presentation models.

The NLS units carry out sample-based tests to monitor the quality of basic topographic data. At the NLS level, quality is monitored by testing samples taken from what each production unit supplies. Quality has usually proved to comply with the models used though long production runs and technological changes result in some variation.

*Turning topographic features into a product*



### 3. Principles governing pricing and distribution in 2001

The pricing of services is based on the Act on Bases for Charges Payable to the State (150/1992).

- **Printed maps**

Pricing is based on the market prices users are prepared to pay for printed maps.

- **Copied maps and printouts**

The price consists of the production costs and a material charge. A large proportion of all copies are printed out from databases. Printouts are priced in accordance with the prices normally charged for copies.

- **Transferring rights to use digital material**

Licences to use digital material are granted for limited periods and for specific parts of documents. The scope and duration of the licence is stipulated in the licence conditions; unless otherwise agreed, the licence is normally valid for 10 years. Any updating of the material entitles the user to an extension (usually for another 10 years). The scope of the licence depends on the number of

users and printouts produced under it. The user must either destroy the material or return it to the NLS when it is no longer needed.

- **Updating digital material**

For updates, the NLS charges a fee amounting to 10-30% of the sales price, and appropriate consideration is given to any discounts or price rises. Customers normally receive updates once a year, when the delivery costs are charged separately.

- **Direct use of digital material and browsing**

In direct use, each search subject to a fee is priced in accordance with a price list. Some of the basic material intended for general use is free of charge.

- **Publishing rights for graphic and digital material**

Customers intending to use NLS-supplied graphic or digital products to generate new map products or publications must also obtain a publication permit and pay a fee that depends on the type of publication and the number of copies.



*The NLS's MapSite  
Internet service  
<http://kartta.nls.fi>*

## 4. Research and development projects in 2001

### Updating the coordinate and sheet division systems

The committee examining the updating of the Finnish national coordinate systems has recommended that Finland adopt the pan-European EUREF coordinate system. The international compatibility of the Finnish systems would be further enhanced by adoption of the UTM projection, which shows the whole country in one zone with a central meridian of 27°. Any changeover to the new system would take several years and all material used for map production is unlikely ever to be transferred to the EUREF system.

### A new data management and updating system for the topographic database

In autumn 1997, the NLS made a strategic decision to start using the same basic system for both cadastral tasks and mapping. As a result, the most important IT elements of the topographic database are now based on the same architecture as the cadastre system.

### Electronic data services related to databases and products, development of MapSite

In separate projects, information network services are being developed into a self-service channel between producers and users to ensure that the needs of the NLS are also taken into account.

The aim is to make the NLS products and services available through a single administratively and technologically coordinated self-service interface. Organization of the services will ensure the uniformity of

the external customer interfaces most important to the NLS, both administratively and technologically.

The aim is to achieve a clear separation between infrastructure maintenance and development of services, on the one hand, and the customer interface covering production, on the other.

### More compatibility between the national cadastral system and the topographic database

If positional data and background maps are to be incorporated into the new cadastral system and into any future planning data system, account must also be taken of a number of new requirements in developing the topographic data system.

### Developing the data management and updating system for small-scale databases

The systems used to update small-scale map databases derived from basic topographic data are being improved to ensure that updating runs smoothly and the information service is easy-to-use.



*Updating the topographic database at an ESPA workstation.*

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