



*European Umbrella Organisation
for
Geographic Information*

Cadastral Geographic Information Systems in Europe:

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CONTENTS

PREFACE	89
1. INTRODUCTION	11
2. DEFINITIONS.....	12
AUSTRIA.....	12
BULGARIA	12
CROATIA	12
DENMARK.....	13
THE NETHERLANDS	13
NORWAY.....	13
PORTUGAL.....	14
SWEDEN	14
SWITZERLAND.....	15
3. FACTS ON CADASTRAL GIS IN SOME EUROPEAN COUNTRIES.....	16
AUSTRIA.....	16
BULGARIA	16
CROATIA	17
CZECH REPUBLIC.....	17
DENMARK.....	18
FINLAND	19
FRANCE	19
GERMANY.....	20
GREECE	20
HUNGARY	20
ICELAND	22
ITALY.....	22
KOSOVO	22
THE NETHERLANDS	23
NORWAY	23
POLAND.....	24
PORTUGAL.....	25
SLOVENIA	26
SPAIN	27
SWEDEN	27
SWITZERLAND.....	28
UNITED KINGDOM.....	28
TECHNIQUES APPLIED	30
AUSTRIA.....	30
BULGARIA	30
CZECH REPUBLIC.....	30
DENMARK.....	30
FINLAND	31
FRANCE	31
GERMANY.....	32
GREECE	32
HUNGARY	32
ICELAND	32
ITALY.....	3233
KOSOVO	33
THE NETHERLANDS	3334
NORWAY	34
POLAND.....	3435
PORTUGAL.....	36
SLOVENIA	3637
SPAIN	38

SWEDEN	38
SWITZERLAND.....	39
UNITED KINGDOM	39
SPECIAL FEATURES AND PRACTICES	40
AUSTRIA	40
BULGARIA	40
CZECH REPUBLIC	40
DENMARK	40
FINLAND	40
FRANCE	41
GREECE	41
HUNGARY	41
ITALY	41
KOSOVO	43
THE NETHERLANDS	43
NORWAY	43
POLAND.....	43
PORTUGAL.....	45
THE REGISTERS OF RURAL AND URBAN PROPERTIES WILL BE DRAWN UP ON THE BASIS OF THE CADASTRAL DATA EXTRACTED FROM THE NATIONAL CADASTRE INFORMATION SYSTEM, PREPARED BY THE IGP.	45
SPAIN	46
SWEDEN	46
SWITZERLAND.....	46
UNITED KINGDOM	46
SUPPORTIVE LEGISLATION ENVIRONMENT	48
AUSTRIA	48
BULGARIA	48
CROATIA	48
CZECH REPUBLIC	48
DENMARK	48
FINLAND	49
FRANCE	49
GREECE	49
HUNGARY	49
ICELAND	50
KOSOVO	50
THE NETHERLANDS	51
NORWAY	51
POLAND.....	52
PORTUGAL.....	52
THE PORTUGUESE SUPPORTIVE LEGISLATION ENVIRONMENT IS BASED ON THE DECREE-LAW NO. 172/95 FROM JULY 18, 1995, WHICH DEFINES THE FRAMEWORK OF THE REGULATIONS OF THE CADASTRE OF REAL PROPERTY.....	52
SLOVENIA	52
SPAIN	52
SWEDEN	53
UNITED KINGDOM	53
CAPACITY BUILDING.....	54
AUSTRIA	54
BULGARIA	54
CROATIA	54
CZECH REPUBLIC	55
DENMARK	55
FINLAND	56

FRANCE	56
GREECE	56
HUNGARY	57
ICELAND	57
KOSOVO	57
THE NETHERLANDS	58
NORWAY	58
POLAND	58
PORTUGAL	58
SLOVENIA	58
SPAIN	58
SWEDEN	59
SWITZERLAND	59
UNITED KINGDOM	59
INSTITUTIONAL NETWORKING, LINKS WITH NATIONAL GI ASSOCIATION	60
AUSTRIA	60
BULGARIA	60
CROATIA	60
CZECH REPUBLIC	61
DENMARK	61
FINLAND	61
FRANCE	61
GERMANY	62
GREECE	62
HUNGARY	62
ICELAND	63
KOSOVO	63
THE NETHERLANDS	64
NORWAY	64
POLAND	64
PORTUGAL	65
SLOVENIA	66
SPAIN	66
SWEDEN	66
SWITZERLAND	66
UNITED KINGDOM	67
ILLUSTRATIVE EXAMPLES OF URBAN APPLICATIONS	68
AUSTRIA	68
BULGARIA	68
CROATIA	68
CZECH REPUBLIC	68
DENMARK	70
FINLAND	70
FRANCE	70
GERMANY	70
HUNGARY	71
ICELAND	71
KOSOVO	71
THE NETHERLANDS	71
NORWAY	71
POLAND	72
PORTUGAL	72
EXAMPLES OF APPLICATION AREAS OF CADASTRE GIS APPLICATIONS:.....	72
SLOVENIA	72
SPAIN	72
SWEDEN	73
SWITZERLAND	73

UNITED KINGDOM.....	73
ILLUSTRATIVE EXAMPLES OF RURAL APPLICATIONS.....	74
AUSTRIA.....	74
BULGARIA.....	74
CROATIA.....	74
CZECH REPUBLIC.....	74
DENMARK.....	75
FINLAND.....	75
GERMANY.....	75
HUNGARY.....	75
ICELAND.....	76
KOSOVO.....	76
THE NETHERLANDS.....	76
POLAND.....	76
PORTUGAL.....	76
EXAMPLES OF APPLICATION AREAS OF CADASTRE GIS APPLICATIONS:.....	76
SLOVENIA.....	76
SPAIN.....	76
SWEDEN.....	77
SWITZERLAND.....	77
UNITED KINGDOM.....	77
4. TRENDS AND FEATURES OF ONGOING DEVELOPMENTS.....	78
AUSTRIA.....	78
BULGARIA.....	78
CROATIA.....	78
CZECH REPUBLIC.....	78
DENMARK.....	79
FINLAND.....	80
FRANCE.....	80
GERMANY.....	80
GREECE.....	80
HUNGARY.....	80
ICELAND.....	81
KOSOVO.....	82
THE NETHERLANDS.....	82
NORWAY.....	82
POLAND.....	84
PORTUGAL.....	84
SLOVENIA.....	84
SPAIN.....	84
SWEDEN.....	84
SWITZERLAND.....	85
UNITED KINGDOM.....	85
THE ROLE OF CADASTRAL GIS IN THE NSDI.....	87
AUSTRIA.....	87
BULGARIA.....	87
CROATIA.....	87
CZECH REPUBLIC.....	87
DENMARK.....	88
FINLAND.....	89
FRANCE.....	89
GERMANY.....	89
GREECE.....	89
HUNGARY.....	90
ICELAND.....	90
KOSOVO.....	90

THE NETHERLANDS	90
NORWAY	91
POLAND.....	91
PORTUGAL.....	91
SLOVENIA	91
SPAIN	91
SWEDEN	92
SWITZERLAND.....	92
UNITED KINGDOM	92
CONCLUSIONS.....	93
6.1 VERIFICATION OF EUROGI'S ADVANTAGES, INTER-DISCIPLINARITY AND COMPETENCE IN THIS FIELD.....	93
AUSTRIA.....	93
BULGARIA	93
CROATIA	93
CZECH REPUBLIC.....	93
FINLAND	93
FRANCE	94
GREECE	94
HUNGARY	94
ICELAND	94
NORWAY	94
POLAND.....	94
PORTUGAL.....	94
UNITED KINGDOM	94
6.2 THE VALUE OF THE NATIONAL GI ASSOCIATIONS FOR THE SOCIETY IN THE CADASTRAL GIS FIELD	94
AUSTRIA.....	94
BULGARIA	95
CROATIA	95
CZECH REPUBLIC.....	95
FINLAND	95
FRANCE	95
GREECE	95
HUNGARY	95
ICELAND	96
KOSOVO	96
NORWAY	96
POLAND.....	96
PORTUGAL.....	96
SLOVENIA	96
SWEDEN	96
UNITED KINGDOM	96
6.3 EUROGI'S ROLE IN THE FIELD THROUGH ITS RELEVANT PROJECT – FROM THE NGIA PERSPECTIVE	96
AUSTRIA.....	96
BULGARIA	96
CROATIA	96
CZECH REPUBLIC.....	97
FINLAND	97
FRANCE	97
GREECE	97
HUNGARY	97
ICELAND	97
NORWAY	97
POLAND.....	97
PORTUGAL.....	97
SLOVENIA	97
SWEDEN	97

UNITED KINGDOM	97
6.4 LINKS BETWEEN THE NGIA AND THE CADASTRAL GIS OPERATORS/AGENCIES	98
AUSTRIA	98
BULGARIA	98
CROATIA	98
CZECH REPUBLIC	98
DENMARK	98
FINLAND	98
FRANCE	98
GREECE	98
HUNGARY	98
ICELAND	99
KOSOVO	99
NORWAY	99
POLAND	99
PORTUGAL	99
SLOVENIA	99
SWEDEN	99
UNITED KINGDOM	99
HANDLING STREETS, ROADS, SQUARES AND SIMILAR PUBLIC LANDS	100
AUSTRIA	100
CROATIA	100
FRANCE	100
GREECE	100
ICELAND	100
PORTUGAL	100
ESTIMATED MARKET VALUE OF THE OVERALL REGISTERED REAL PROPERTY AND LAND ASSETS PER COUNTRY SUPPORTED BY CADASTRAL MAPS	101
CONTRIBUTORS/ACKNOWLEDGEMENTS	102
AUSTRIA	102
BULGARIA	102
+ 359 2 965 34 53 + 359 2 68 32 15 RSP@TU-SOFIA.BG	102
HTTP://WWW.TU-SOFIA.BG	102
CROATIA	102
CZECH REPUBLIC	103
DENMARK	103
FINLAND	103
FRANCE	104
GERMANY	104
GREECE	104
HUNGARY	105
ICELAND	105
ITALY	105
KOSOVO	105
THE NETHERLANDS	106
NORWAY	106
POLAND	106
PORTUGAL	107
SLOVENIA	107
SPAIN	107
SWEDEN	107
SWITZERLAND	108
UNITED KINGDOM	108
<i>SUGGESTED REFERENCES</i>	<i>109</i>
<i>PREFACE</i>	<i>109</i>

There is no single coherent solution in the field of cadastre within Europe at the current time. The institutional evolution, applied services as well as the definition of cadastre differ from country to country due to the influence of culture, history and other societal reasons. On the continent, cadastral GIS are acknowledged as an inevitable and supportive complement to land registry and together they serve not only the security of property rights, but directly foster the economic-societal prosperity and facilitate sustainable development.

The growing single market of the European Union (EU) has an impact on user requirements. It emphasises a need for interoperable services in the field of cadastre and related public registers for the benefit of the e-society towards citizens, market players and public agencies at the local, regional, national and even European level.

Cadastre has been a priority for the EUROGI community since 1999. In that year, as motivated by the realisation that the use of digital technologies are a key factor to growth and employment, the “e-Europe – an Information Society for All” concept was adopted by the European Commission (EC). EUROGI signed a Memorandum of Understanding with the EC Joint Research Centre (JRC) and identified three priority areas to address: Data Policy in Europe, EU Enlargement and Cadastres.

In 2001, EUROGI organised, the first EC Cadastral workshop in conjunction with the JRC and HUNAGI in order to consider in depth and highlight the importance of cadastre in the planning, implementing and monitoring EU policies with special emphasis on the Agro-Environment Measures and Common Agricultural Policy. This took place at the same time as the EC announced its new initiative to develop the European Spatial Data Infrastructure (ESDI, later to be renamed as INSPIRE, Infrastructure for Spatial Information in Europe). In 2002 EUROGI contributed to the success of the First Congress on Cadastre in the EU held in Granada by introducing early results of the Cadastral GIS Survey. In 2003 EUROGI proposed to set up an Application Working Group in order to handle the many issues of European cadastre. This proposal was made by EUROGI’s Executive Committee and will be presented to the EUROGI Board for approval during the Annual General Meeting in March 2004.

During the past decade, cadastre has been recognised as one of the cornerstones for the spatial data infrastructure not only in each country (amongst others in Hungary, Netherlands and Poland) but also at the European level (INSPIRE, GINIE, EuroCadastre, EuroGeographics, FGDC, PCGIAP) and more recently at the global level too (4th GMES Forum, GSDI7 Conference).

EUROGI is a GI community which represents more than 6500 governmental, academic institutions, non-governmental organisations, private sector entities and individuals from more than 20 European countries representing the GI users, developers, data brokers and decision makers. The competence in and diversity of disciplines represented by EUROGI is of great value to European institutions as well as decision makers at all levels. EUROGI provides improved access to GI supported by an appropriate legislative framework, which should become part of the *acquis communautaire* serving and enhancing the exploitation of programmes. e.g. GMES and Galileo as soon as possible.

As far as the important role of cadastre is concerned, I am convinced that the views of the EUROGI community and their partners expressed in this survey will contribute to introducing the diversity and common features of cadastral GIS in Europe in a comparative way. Taking into account the advanced stage that cadastre and related public property registers are at in the majority of EU Accession Countries, it is anticipated that the “enlarged Europe” will be more connected and more competitive. Cadastre is a core element to e-government. In the e-Europe context, the launch and implementation of the e-content project, EULIS clearly verifies this trend, whilst the institutional developments are remarkable especially in the Netherlands, Norway and Sweden.

Jean Poulit
President
EUROGI

Paris, February 2004

1. INTRODUCTION

When asking for a definition of Cadastral GIS, one receives various answers depending on who the question was put to. This report will help to make clear that Europe does not have a strict definition of Cadastral GIS, rather guidelines that are based on nationally accepted standards. This document will compile the various definitions in order to help enhance visibility of Cadastral issues throughout Europe.

This report was originally prepared for the 1st Cadastre conference held in Granada under the Spanish EU Presidency in May 2002 by the Hungarian member of the EUROGI Executive Committee. It was based on input from 14 national geographic-information associations (NGIA) throughout Europe that are EUROGI members (Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, The Netherlands, Poland, Slovenia, Spain, Sweden, United Kingdom). One year later the EUROGI Executive Committee approved the initiative to revisit the report in order to update the content and inviting additional countries to be included in the survey from the European Economic Area (Norway, Switzerland), as well as EU Member (Austria, Italy), Accession and Candidate countries with emphasis also on the CIS and West Balkan countries (Croatia, Macedonia).

The Survey covers the following areas:

1. Facts on cadastral GIS in some European countries
2. Techniques applied
3. Special features and practices
4. Supportive legislation and environment
5. Education and Training
6. Institutional networking (links with NGIA's)
7. Illustrative examples
8. Trends and ongoing developments
9. Role of cadastral GIS in the NSDI
10. Conclusions

In order to maintain and/or enhance the report for EUROGI on continuous basis, any new entries, remarks, corrections and addendums including information on suggested further readings should be kindly sent to the following address in electronic form:

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It is anticipated the maintained report will be downloadable both from the sites of EUROGI (www.eurogi.org) and HUNAGI (www.hunagi.hu), member of EUROGI.

2. DEFINITIONS

AUSTRIA

Although there is no defined Cadastral GIS in Austria, the infrastructure for GI related to cadastre and property registration has been developed to a very high level for a long time. The national database for real property information as well as the digital cadastral map run by the Federal Office for Metrology and Surveying (BEV) are basically used for many property related applications by all levels of public administration and by many private institutions.

The current activities are mainly focussed on organising and implementing a national GI infrastructure for Austria with all partners from public and private sector to be involved.

BULGARIA

Bulgarian local and state authorities process cadastre data using are many GIS applications. There is however no common definition of the term **Cadastral GIS** in Bulgaria. Therefore, this section provides the official Bulgarian definition of cadastre.

In Bulgaria, the term Cadastre could be used with different meanings. Its precise definition is given in the Law on Cadastre and Property Registry (2000, updated in 2004) as follows: The cadastre is the aggregate of

- (1) basic data about the location, boundaries and extent of **real property** within the territory of the Republic of Bulgaria;
- (2) data about the right of ownership and other real rights on real properties;
- (3) data about the state borders, boundaries of administrative-territorial units, boundaries of territories belonging to settlements, and boundaries of territories of identical durable land use.

Data about real property and the right of ownership and other real rights on real properties shall be mapped out on a **cadastral map** and shall be recorded in **cadastral registers**. A map, on which additional data are reflected as well, shall be a **specialized map**.

According to this definition, cadastral data could be considered as combining two parts: spatial data (cadastral maps) and textual data (cadastral registers).

There are different kinds of cadastres in Bulgaria: Urban cadastral maps in scale 1: 500 and 1:1000; rural cadastral maps in 1:2000 and 1:5000. Further, there are also forest cadastral maps in a scale 1: 10000 and 1:25000, and other specialized cadastre definitions.

CROATIA

Recently Cadastral GIS comprises data and information systems run and maintained by the State Geodetic Administration (SGA). There are still two main data-sets in distributed databases maintained:

Alphanumerical part of Cadastre: alphanumerical information about properties and owners or possessors (fully digitalized)

Graphical part of Cadastre: cadastral maps in large scale (digitalized up to 20%)

Joint Cadastral GIS is under development as well as activities running towards development of Joint Land Database System between cadastre and land registry.

DENMARK

Denmark does not yet have a national approved definition of cadastral GIS, and it is not believed one will use the term cadastral GIS. However, the National Survey and Cadastre of Denmark in co-operation with Association of Local Authorities, Professional Land Surveyor Association, Copenhagen and Frederiksberg municipalities working from the concept of creating a “**national cadastral infrastructure**”. It is the intention to involve other organisations in defining the definition of the national cadastral infrastructure. The definition based on the Swedish model, will most likely could cover the Danish definition of a national cadastral infrastructure. Denmark has one national cadastre.. Denmark does not distinguish between urban and rural cadastre and there is no definition either for urban, nor for rural cadastral GIS

THE NETHERLANDS

Cadastral GIS: (The answers in this questionnaire are restricted to the GIS systems of the Dutch national Cadastre) There are two main databases maintained:

AKR: alphanumeric information about properties and rights

LKI: graphic information about cadastral parcels and large-scale topography

In the Netherlands there is no legal difference between urban and rural GIS.

A law has passed parliament that states that all public restrictions must be shown in the cadastral information system. Partly this will be realised by inscription of public restrictions in the land registry, partly by connection to information systems held by municipalities.

NORWAY

Cadastral GIS: There are no authorised definition in the sense that the term Cadastral GIS is defined in the national legislation etc. However, the Cadastre is widely understood as technical information on the parcels, including the parcel map and related register-based information. In Norway, the cadastre and the Land register are separate databases, under separate jurisdictions.

The databases include information on parcels, buildings and apartments, addresses with co-ordinates, and there are links to thematic layers like roads, water, placenames, Digital Terrain Model, municipality borders, etc.

Cadastral GIS thus should be defined as Geographical Information Systems using cadastral data – in combination with other data. The role of the cadastre give the official identification number for the cadastral units, buildings and addresses facilitating tasks in local administration

collection of fees

land use planning

protection

construction

facilitating tasks in central administration

statistics

facilitating tasks in private sector

information to the property market, property owners and developers

Urban Cadastral GIS : in Norway, the municipalities play an important role in urban management in respect of being responsible for technical infrastructure, issuing building permits, land sub-division, awarding addresses, urban and rural planning, housing, schools, kindergartens, public health etc. Thus, applications supporting these

tasks are not really designed especially for urban purposes, but are generally designed for supporting the tasks mentioned. Since the municipalities play such an important role in urban management – a definition could be: GIS applicable for municipal purposes.

Rural Cadastral GIS: which is especially applicable for rural purposes. Examples could be agriculture planning, cultural heritage, environment protection, timber transport, etc.

PORTUGAL

Information about rural and urban real properties existing in Portugal is scattered throughout various registers, organized in accordance with entirely separate objectives by different public departments, ranging from the IGP to the Directorate-General of Taxes and the various land registry offices, municipalities, among others.

The cadastre isn't part of the same organization as the legal registry.

Portugal does not yet have an explicit Cadastral GIS definition by law, although the Geographical Portuguese Institute (IGP) is working on the concept of creating a "National Cadastral Information System". The cadastre of real property, referred as simply cadastre, is understood to mean the set of data that characterize and identify the real properties existing on national territory. It is defined by decree-law N°172/95 of July 18, 1995.

The original understanding of the cadastre of real property as a process undertaken solely for tax purposes, has given way to the awareness of its multifunctionality, since there are several thematic applications which can be developed when there is but one single register for all real properties, in which through the use of standard criteria, each property is individually identified and characterized. With this register, which represents a basic cadastre, thematic or sectoral registers can be rapidly linked together without losing their dependence on the department that supervises them. The joining together of these registers results in a national system for the cadastre of real property.

Real property denotes a legally autonomous and delimited area of land, including the waters, plantations, buildings, and constructions of whatever kind existing therein or placed thereon, and of a permanent nature, as well as each autonomous fraction under the system of the horizontal ownership of property. There is no distinction between urban and rural real property.

The real property is characterized through its administrative and geographical location, geometrical configuration and area.

Each surveyed real property is identified by means of an unambiguous numerical code, known as the property identification number (NIP – Número de Identificação Predial). The use of the NIP is mandatory in all public documents as the means of identifying surveyed real properties.

SWEDEN

Cadastral GIS: at the National Land Survey (NLS), the term "the integrated cadastral system of Sweden" is used. This means that the whole infrastructure, the registered and presented property information (land, owners, users, houses etc.), is integrated with its geographic location. This data covers the whole nation, but is not stored in a single database. Several authorities (i.e. municipalities, taxation authorities, and NLS) maintain the database infrastructure. The cadastral data is linked with unique identities in order to work in a uniform system for presentation and analyses.

The word *Cadastral* refers to land ownership information. It refers to not only the location of the parcel but also connects to ownership and rights, taxation, building and real estate information, mortgages, plans, regulations etc.

SWITZERLAND

The Civil Law from 1912 constitutes the basis of the "Federal Land Registry System". It was detailed with the "Instruction for the Monumentation and Cadastral Surveying" in 1919 and with the "Ordinance for Land Registry" from 1910. When the cadastral system has been established in the early 1900s, several principles have been defined that are still valid today:

the land register has five main parts and is based on a cadastral map;

the cadastral map has to be based on cadastral surveying;

according to the political and administrative structure of the country, the operational control of cadastral surveying and land registration is with the Cantons;

the Confederation is supervising and subsidizing the Cantons;

cadastral surveying can be contracted to private sector land surveyors;

surveyors carrying out cadastral surveying need to hold a Federal licence.

In 1993, two new ordinances - VAV and TVAV - replaced the old instruction from 1919. The aim was to renovate the cadastral surveying system and to introduce the digital data format. Due to the versatility of data in digital form, the purpose of the cadastral surveying data has been extended from purely serving the land registry to serving land information systems of any kind. The establishment of the system-independent data description language INTERLIS was a crucial element in this concept.

The data of cadastral surveying has been structured in 8 information layers, which has the advantage that they can be acquired independently from each other.

There is no distinction between urban and rural cadastre.

3. FACTS ON CADASTRAL GIS in some EUROPEAN countries

AUSTRIA

The legal responsibility for the cadastre is up to the Federal Office for Metrology and Surveying BEV in co-operation with the Licensed Surveyors (Ingenieurkonsulenten für Vermessungswesen), who are authorised to carry out subdivision documents. BEV is a public agency within the Austrian Federal Ministry of Economics and Labour. There is a very strong private-public partnership with clear competences between the two partners, regulated by law. The permanent maintenance of the centrally stored cadastral data, which mainly consists of a database and the digital cadastral map, is done by 41 decentralised regional cadastral offices all over Austria. The Land Register which contains information about the legal situation of real estate like ownership, easements, mortgages, rights and obligations is linked to the real property database and is run by the 145 local courts belonging to the Austrian Federal Ministry of Justice.

The Austrian cadastre is parcel based, which has occurred as an advantage in using the cadastre for a big variety of applications as spatial planning, any property related planning or administration system.

NUMBER OF CADASTRAL PARCELS 10.4 MIO., 7.846 CADASTRAL UNITS, 3 MIO. PROPERTY UNITS. 282.000 CADASTRAL MAPS

NUMBER OF AGRICULTURAL PARCELS: 4.6 MIO.

BULGARIA

The cadastre and the property register are under the responsibility of two different state organizations. The cadastre is created, maintained and stored by the Cadastre Agency (CA) at the Ministry of Regional Development and Public Works. The property register is maintained and kept by the “Recordation Agency” (RA) at the Ministry of Justice.

The property register comprises the lots of the real properties as acts of ownership and other legal actions, circumstances and legal facts for which recordation is envisaged by law.

The cadastre and the property register are linked by bilaterally, based on the identifier of real properties. The basic data about the real properties in the property register shall be received from the cadastre. Data about the right of ownership and other real rights over real properties in the cadastre shall be received from the property register.

The national responsibility for the cadastre is up to the Cadastre Agency legally established by the Law on Cadastre and Property Register in 2000. The Cadastre Agency is an executive agency under the Minister of the Ministry of Regional Development and Public works, with the main office in Sofia. The main office works together with the regional cadastre offices, which are located in the administrative centers of the Bulgarian regions. The 28 cadastre offices are territorial units of the Cadastre Agency.

The Cadastre Agency is responsible for performing the cadastral activities in compliance with the law; maintaining geodetic/survey, cartographic and cadastral

archive ("Geokartfond"), development of the format of the digital maps and the corresponding registers. The cadastre offices, within the assigned districts of the territory of the country, are responsible for performing the cadastral activities; storing the original materials and data from geodetic surveys; fulfilling other functions, established by the setup regulations.

The cadastre agency will collect all data which have been in the Ministry of Agriculture and Forests, in technical offices and local authorities. Further, the agency will manage data about water management and supply in the settlements, electrical supply management and gasification. The agency is developing a cadastral map that will cover the whole territory of Bulgaria. Until now, only 7 % of the Bulgarian territory is covered by cadastral maps. It is expected that by the end of 2004, 30% of the Bulgarian territory will be captured by cadastral maps.

In Bulgaria the Cadastral Agency is responsible for urban cadastral GIS. The number of cadastral parcels is not available.

The Ministry of Agriculture and Forests (MAF) is responsible only for rural and forestry lands (rural cadastre). In its structure, there are 28 Regional Land Commissions working in the offices of the regional local authorities in Bulgaria.

The number of agricultural parcels is about 10,150,000.

CROATIA

The national responsibility for state surveying, topographic mapping and cadastre is by law responsibility of State Geodetic Administration (SGA). A National Program on State Survey and Real-estate Cadastre for period 2001.-2005. has been launched by Croatian Parliament in 2001. as a key instrument of realization of SGA's major tasks: modernisation of cadastre and its improvement to be able together with the land registry to guarantee legal security on real-estates and to produce necessary spatial data sets requested by other governmental institutions, economy and citizens. Cadastral system in built form institutional part (SGA; 1.400 employes) and private sector – private and legal persons licensed for state survey and real-estate works by SGA (475 licences; 3.000 employes).

NUMBER OF CADASTRAL PARCELS 21 MIL., SYSTEMATIZED IN 3.315 CADASTRAL MUNICIPALITIES AND SHOWN ON 57.000 CADASTRAL MAPS

CZECH REPUBLIC

During 2001 the *“Enhanced Information System of the Cadastre of Real Estates”* was implemented. The new Enhanced Cadastral Information System (Enhanced Cadastre) means not only quite new complex cadastral software, but first of all a higher level of cooperation among parts of state administration and full use of existing communication possibilities to improve access for clients. The Enhanced Cadastre is a *key part of wider Information System of State Administration*, which is being developed.

Client/server architecture has been chosen. Local databases at cadastral offices are linked with a central database by WAN. Updating the central database is based on real-time replications from the local databases. The central database serves as the only point for access to cadastral information via Internet and the point of the data exchange with the other ministries. Written and graphical data of the Cadastre are

fully integrated and stored in relational database environment. Both central and local levels use uniform application software environment, based on Oracle and Bentley SW products. The security of system is at very high level. The Enhanced Cadastre data fully comply with the National Data Standards.

Since the new system cooperates with the Central Register of Citizens and the Central Register of Economic Subjects (to identify owners and any change in postal addresses), government order No 111/2001 on this cooperation has come into effect. Remote access to cadastral data (both descriptive and graphic) was a part of the solution of the new cadastral software and was started in 2001. It enables to “competent users” right of access to Central Database, which replicates data of local databases within minutes. The security of the Central Database is ensured by a firewall. The data are provided for reading only. Clients must be registered on base of a contract with the Central Database and deposit an initial payment before using this service. Main clients are Courts, public administration offices, municipalities, banks, lawyers, surveyors, evaluators, and real-estate agents. Standardised services like searching for owners or parcels and standardised extracts from the database are available. At the end of 2001 more than one thousand clients were registered.

NUMBER OF CADASTRAL PARCELS 21,5 MIL., 5 MIL. OWNERS

NUMBER OF AGRICULTURAL PARCELS 12 MIL

DENMARK

The National Survey and Cadastre under the Ministry of Environment is responsible for geodetic and small-scale topographic mapping, nautical charting, and for maintaining and updating the cadastral register and the cadastral maps. Legal rights to land such as ownership, mortgage, easements and leases are recorded in the Land Book at the local districts courts under the authority of the Ministry of Justice. The land book is based on the cadastral identification of the land parcels.

Cadastral surveying or surveying for legal purposes is the responsibility of licensed surveyors in private practice. There are about 100 private surveying firms employing about 300 surveyors in total. The cadastral work is controlled through very detailed regulations in the Cadastral Act.

The cadastre covers the total of about 2.5 million land parcels representing about 1.5 million properties. It consists of a parcel register (parcel/cadastral number, area, identification of the properties consisting of more than one parcel, and obligations concerning farming and forestry); country wide digital cadastral maps; a register of control points (about 360,000 points); and an archive of the legal survey measurements (about one million sheets) and the old analogue cadastral maps (about 15,000 sheets). The cadastre is updated daily. Both the cadastral register and the cadastral maps are computerised, and the cadastral information is available on the web.

The Land Book records legal rights in land such as ownership, mortgage and easements. The Land Registry at the local district courts also includes the paper archives of the legal documents. The Land Book is based on the cadastral identification (unique cadastral number) of the land parcels and properties. However, the cadastral maps and the legal

survey measurements are held at the National Survey and Cadastre and are not available at the Land Registry offices. The Land Book is computerised and the information is available on-line. In Denmark, all registers of property data have been computerised. The registers are formed into a network of subsystems to accommodate the use of digital mapping and to facilitate land use management. The National Survey and Cadastre is responsible for the coordination.

SOURCE: [HTTP://WWW.SWISSTOPO.CH/CADASTRALTEMPLATE2003/COUNTRYREPORT/DENMARK.PDF](http://www.swisstopo.ch/cadastraltemplate2003/countryreport/denmark.pdf)

FINLAND

In Finland the national cadastre is maintained by the National Land Survey for rural areas and by 87 municipalities/cities for urban areas. These organisations have own cadastral databases for operational use and a common database for data service. Most of the operational cadastral databases include the cadastral units as geographical objects. At the moment more than 95 % of the cadastral unit's area available in GI form. According to new legislation all cadastral units must be available as GI by 2005.

Until 1998 the National Land Survey of Finland (NLS) had the cadastral index map and attribute data in two separate databases. 1998 was adopted new seamless database system (JAKO-system). The existing system is object oriented and all register units are described in the national geodetic reference system as geometric objects as well as their topology.

In urban areas (ca. 2 % of total area) municipalities are responsible for the Cadastre.

In Finland one cadastral unit may include several type of land use, e.g. field, forest, build-up and even water area.

NUMBER OF CADASTRAL PARCELS: In Finland one register unit can be comprised of several parcels. The number of register units is 2.6 million but the number of parcels is ca. 4.3 million. Of these units there are ca. 0,4 million urban lots.
NUMBER OF AGRICULTURAL PARCELS: The number of the agricultural parcels is about 1 million according to the Finnish IACS land parcel registry system.

FRANCE

Cadastre in France lies with the ministry of economy, finance and industry. A text assigns to that ministry the role of maintaining the cadastral map of the country, the main driver is tax collection on properties. It results that emphasis is placed on the maintenance of the alphanumeric part of the cadastral information, the graphical part being updated with several months delay. Cadastral GIS is the main concern of local governments. In more than 75% of the major cities (more than 30 000 inhabitants), vectorisation of the cadastral map has been done in partnership between the local authorities, the utilities and the service in charge of the cadastre in the finance ministry. The agreement between the partners allows the local government and the utilities to fund the vectorisation, the cadastre service ensuring its updating. **The elected government of several "départements" (NUST3 level administrative unit) are funding the vectorisation of the cadastre over their territory.** Up to now about **25%** of the cadastre maps are vectorized and "GISized" **or planned to be vectorised.** In many local governments an "unofficial" cadastre exists which is created by

continuous updating of the official cadastre between two deliveries of updated cadastral maps by the cadastral service.

NUMBER OF CADASTRAL PARCELS: 50,000,000 parcels and 500,000 cadastral maps

NUMBER OF AGRICULTURAL PARCELS: 25,000,000 (figure to be confirmed)

GERMANY

In Germany, the introduction of geo-information systems (GIS) started in the early seventies (last century). The cadastral information is stored in two independent systems, the Automated Real Estate Map (ALK), which handles the graphical information, and the Automated Real Estate Register (ALB), which contains the attribute data. The German states are responsible for the cadastre as it relates to the 1:1000 scale.

The cadastral administrations of all German states are currently developing the Official Cadastral Information System "ALKIS" which will integrate cadastral data of the ALB and ALK.

NUMBER OF CADASTRAL PARCELS: Germany: ca. 100,000,000, North-Rhine Westphalia 9,000,000

NUMBER OF AGRICULTURAL PARCELS: No differentiation between agricultural and urban area parcels. About 30 % of all parcels are located in rural areas (situation in North-Rhine Westphalia, Germany)

GREECE

So far cadastral GIS in Greece is under development. Approximately 7% of the country is being surveyed. Currently, GIS cadastral databases are under development in certain municipalities (341 out of a total 5775). Those databases are developed, operated and updated by private sector firms that carry out the data collection. Once the cadastral survey procedure is completed those databases will be handed over to the Hellenic cadastral and mapping organisation, which is the governmental agency, authorised of the operation and the maintenance of the cadastre.

Urban Cadastral GIS: so far, there are no such applications in Greece. In the future, there plans for developing such applications.

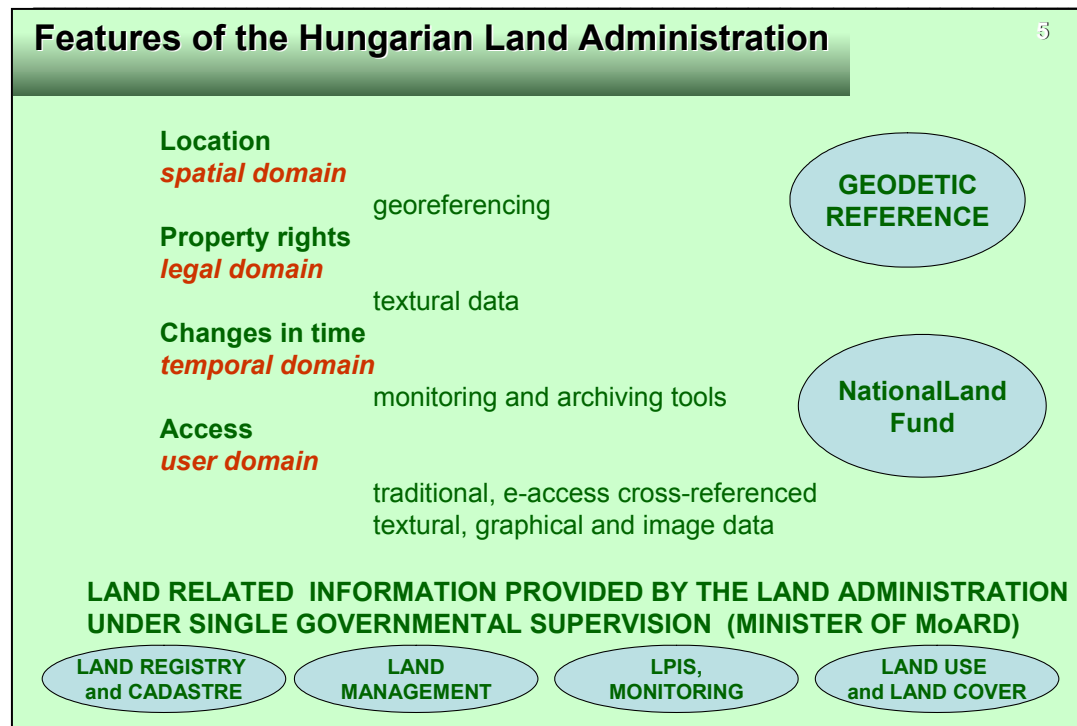
Rural Cadastral GIS: there are plans by the Hellenic Ministry of Agriculture for the development of a Land Parcel Identification System (LPIS), which aims at the facilitation of CAP. This system, however, will be developed in the future and will be based on "rural land parcels" (parcels that have uniform cultivation) as opposed to "cadastral land parcels" (parcels that are defined by ownership rights.)

NUMBER OF CADASTRAL PARCELS: Approximately 18 million (estimate for the entire country) Approximately 2 million parcels currently have been surveyed

NUMBER OF AGRICULTURAL PARCELS: Not known.

HUNGARY

In Hungary the functions and responsibilities related to land registration, cadastre, land use, land valuation, large-scale topographic mapping, satellite geodesy, geo-administrative boundary database, geographical names, remote sensing and LIS applications and developments all being supervised by the Department of Lands and Mapping at the Ministry of Agriculture and Rural Development (DLM/MARD).



There have been land book, land registration and cadastral maps operating in Hungary for over 150 years. This system was totally based on paper records consisting of cadastral maps (boundary information) and property sheet records, which record the property description, ownership information, and any financial or other burdens on the property (i.e. the legal and administrative records). These records have continuously been maintained and were unified in 1972 by the Act on Real Estate Registration and later on by the Act CXLI (1997) on Real Estate Registration.

Recently, for registration of land parcels and other real estates, a full cadastre system is in force in Hungary, identical with the concept introduced by FIG. It is a unified, multipurpose legal system, integration of the cadastral maps and the registration records including the traditional Land Records (Grundbuch).

Approximately 60,000 cadastral map sheets cover the area of Hungary at scales from 1:1000 to 1:4000. Recently, the digital cadastral survey in standardised form is carried out on 500 thousand hectares (6% of the area of Hungary), as well as about 60% of the rural areas cadastral maps are available in vector form (the rest in raster form).

The ongoing National Cadastre Programme has the aim to provide full country coverage as soon as possible in order to provide multipurpose cadastral service for the user community with special emphasis on the requirements of integrated rural development (land consolidation, landscape planning, support AEM, CAP etc).

11 of the 23 districts of the capital are turned to digital cadastral system using advanced solution based on a 3 -year development between 1995-97. The daily updated database and related service is suitable for use by the local government in planning, urban management, transportation, gardening pollution control etc.

The Land registry is fully computerised. The one-stop-shop principle is adopted and the clients can access to some parts of the Land Registry using internet via the Governmental Portal (www.meh.hu, www.ikb.hu).

The Land Administration also operates and maintains a homepage which gives detailed information on the current organisation of the Hungarian Land Management Sector, the strategy of the sector, the role and features of the Land Registry as well as the IT strategy and its step-by-step implementation in the Land Administration.

An other network of Land Administration is the TAKARNET, an intranet-type network, which connects the institutions of the Hungarian land administration and it provides data supply for external users on Internet.

The following services of TAKARNET are provided for external users such as notaries, local authorities, banks, lawyers, real estate agencies, public administration::

- Information about the property sheets,
- Map copies (this service will start in 2004 for the settlements, where vectorized cadastral maps will be available)

The physical network was set up in 1998. The latest improved software was installed in the middle of 2002. The network provides operational data service in the land offices since 1st August 2002. External users can use the network since 1st. April 2003. The ministerial decree 41/2002 FVM regulates the financial and other conditions (data supply and fees) of accession to the network.

NUMBER OF CADASTRAL PARCELS: About 7.5 million , shown on about 60000 cadastral map sheets at scale 1:1000 to 14000. Still there are map sheets in different projections, mapping systems and datum: stereographical, cylindrical etc at scale 1:1440, 1:2880.

NUMBER OF AGRICULTURAL PARCELS: About 2.5 million

ICELAND

The Land Registry of Iceland is the custodian of the Land Registry Database, which is the central framework for all real estate data in Iceland. The Land Registry has begun the initial stages in the development of a Cadastral GIS. A number of local municipalities have also developed GIS systems, which maintain land records based on unique parcel identifiers maintained in the Land Registry Database. The Ministry of Agriculture maintains a cadastral Register of farms and agricultural lands in cooperation with the Land Registry of Iceland

NUMBER OF CADASTRAL PARCELS 86,000

NUMBER OF AGRICULTURAL PARCELS 8,000

ITALY

In Italy the management of the Cadastre, considered as an archive of the real estate assets in the national territory, is entrusted to the *Agenzia del Territorio*, a non-profit public body established with the financial administration reform implemented with the Decree Law n. 300 of 1999.

The *Agenzia del Territorio*, also responsible for the real estate rights registration system, acts with wide administrative and financial autonomy under the high supervision of the Ministry of Economy and Finance.

The internal organization of the Agency comprises 7 Central Structures and a Supervisory Service, 20 Regional Directorates and 102 Provincial Offices. The personnel comprehensively amounts to about 12.000 (of which about 2.000 in the rights registration Offices and about 4.500 in the cadastral sections).

KOSOVO

Cadastre in Kosovo is organized by Kosovo Cadastral Agency (KCA), under Ministry of Public Services. Land Cadastre evidence cover complete territory of Kosovo. Graphical part of evidence is Land Cadastre. Maps will be completing available in

digital form until the end of year 2003. Textual data are in digital form already available.

Data in Land Cadastre are managed and maintained from Municipality Cadastral Offices (MCO) in Kosovo controlled by Kosovo Cadastral Agency. Every MCO has at the moment its own database for their territory. In KCA are collected all database of Land Cadastre where after vectorization and check control will be delivered in all MCO together with guideline for maintenance.

Process of production digital land cadastre maps is done with scanning analogue maps and then vectorised by hand all parcel borders. Basic unit in land cadastre is parcel; which could be divided into parts of parcel with different land use. Every part of parcel is closed polygon with centroid and parcel number. Topology of data is built and data are without topological errors.

In attribute table are collected data about area, type of land use and production capacity of land and owner for each parcel.

Common identifier for graphical and attribute part of land cadastre data is parcel number.

NUMBER OF CADASTRAL PARCELS

Number of land parcels in Kosovo: 1917000

Number of cadastral community: 1301

NUMBER OF AGRICULTURAL PARCELS

Number of agricultural land parcels: 1420000

THE NETHERLANDS

The answers in this questionnaire are restricted to the GIS systems of the Dutch national Cadastre. Two main databases are maintained:

AKR: alphanumerical information about properties and rights

LKI: graphic information about cadastral parcels and large-scale topography

NUMBER OF CADASTRAL PARCELS: 8.000.000

NUMBER OF AGRICULTURAL PARCELS: NA

NORWAY

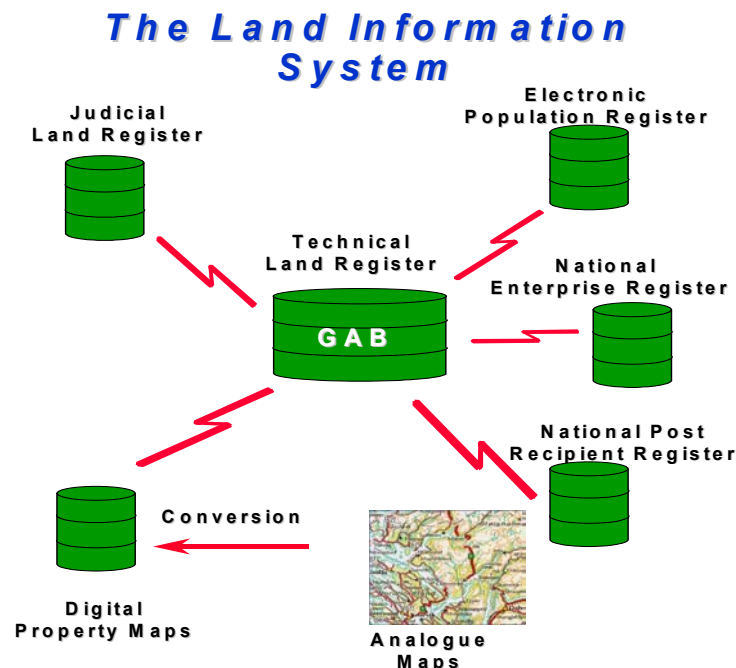
The present situation is a traditional dual registration system, whereas Cadastre and Land Register are separate: Cadastre is under the Ministry of Environment with the central register operated by the Mapping Authority and the registration done mainly by the municipalities. The Land Register is under the Ministry of Justice. The central register operated by an agency under MoJ and the registration done by 87 local courts. Both registers are in digital form. The registers are combined into a joint on-line service to the users. The cadastral law of 1980 introduced a uniform system for property identification for the whole of Norway

1	2	3	4	5
<i>Municipality unit number</i>	<i>Auxiliary cadastral unit number</i>	<i>Property unit number</i>	<i>Leasehold unit number</i>	<i>Section unit number</i>

The cadastral unit identification in Norway

The Norwegian Cadastre can be described as the Cadastre map database together with the cadastre register named GAB-register (G= Ground parcels - 2.8 million units, A=Addresses - 2.0 million units, B=Buildings: 3.6 million units). The GAB register substituted the old cadastre, contains information about properties, buildings and addresses, serves as a tool for facilitating local and central public administration. It is administered by Norwegian Mapping Authority but updated by the municipalities and land registry.

After the approvals of the new law on land registration, the cadastre will be a responsibility for the Norwegian Mapping Authority. The municipalities will be responsible cadastral surveys and mapping including updating the system as a monopoly task.



The databases will be centralised, but the municipalities will have local clients available for internal use.

NUMBER OF CADASTRAL PARCELS: 2.800.000 parcels

NUMBER OF AGRICULTURAL PARCELS: 299.000 parcels (Agriculture and fishery together)

POLAND

The real estate cadastre has been established consistent with the statutory regulation for the whole country. It contains a descriptive part and cartographic part in the forms of registration maps. The real estate cadastre is managed in 380 poviats by chief poviats administrators and by presidents of towns having poviats rights.

On the end of 2002 the degree to which Information technology is used for the real estate cadastre has been fully employed in the descriptive part; covering by digital reference map in vector or raster amounts to 70% of the areas of towns, and 40% of the areas of rural regions.

It is estimated that data concerning around 13.7 million buildings should be registered in geometric and descriptive forms in the real estate cadastre.

The work being conducted by the geodetic and cartographic services are closely connected with the real estate cadastre system. These include:

State Register of the Course of Borders and Areas of the Units of Territorial Division

of the Country,
 Register of real estate prices and values,
 Geodetic Register of Systems of Land Technical Facilities,
 Basic map,
 GIS implementations as for example STRATEG system.
 The **STRATEG** system is designed to aid managing of a territory inhabited by a local, self-governing community: municipality, county/district, and province.
 The basis of the system is **LIS**, established upon:
 digital map
 register of land and buildings (cadastre)
 register of utilities/territorial development
 maintained by centres for geodetic and cartographic documentation.

That **LIS** has been implemented by PPU GEOBID seated in Katowice in numerous places in Poland, while the **STRATEG** system is being implemented i.e. in the town of Olsztyn, Piotrków Trybunalski and others.

The **STRATEG** system functions on PC class computers, not requiring additional software or tools besides the WINDOWS 95/98/NT operation system. The number of licensed users of that system increases constantly (over 1500) and, as research done by GUGiK (Head Office of Land Surveying and Cartography) showed, it is the most popular programme serving the purpose of graphic part of cadastre and of GIS in Poland.

The modules of **STRATEG** system function in four groups, connected with:

- 1/ registering individuals in a local self-governing community
- 2/ managing of a municipality, county/district
- 3/ updating basic information
- 4/ collection of charges and taxes

The heart of the system is the graphic programme **EWMAPA** for WINDOWS 95/98/NT, developed in Poland, the first version of which, for DOS, appeared in 1991. **EWMAPA** is a computer graphic programme having a unique structure of data storage: base, vector, and object. Objects may be composed of elements located on different layers and sub-layers, they are of functional character. Descriptive attributes are most often associated with objects.

EWMAPA is a versatile programme, which may serve the purpose of constructing digital maps, and servicing the geodetic and cartographic resources. It can also create and analysis objects in space, on the basis of data contained in other modules of the **STRATEG** system. The system is based on a cadastral system of spatial references, that is border points, parcels, and classification contours. The layers and sub-layers in the system are of technical character as they serve the purpose of physical division of the content of spatial elements and creation of dispersed databases. **EWMAPA** provides various possibilities of data presentation.

The newest rage is the use of colour raster and the possibility of transforming aerial photographs into **orthophoto-grams**, on the basis of land model constructed from height measurements (station poles) held in the geodetic and cartographic resources.

NUMBER OF CADASTRAL PARCELS 30 millions

NUMBER OF AGRICULTURAL PARCELS 20 millions (They are in one system)

PORTUGAL

The mandate of IGP (100 employees in this area) in cadastre is to:

- Produce, renew and maintain the cadastre of real property in each and every area of the national territory;
- Construct and maintain networks for supporting the operations referred to in the last paragraph and establish and manage the corresponding data bases;
- Issue identification cards for real properties and copies or extracts of cadastral files and sheets;
- Certify the geographical location, geometrical configuration and identification of surveyed real properties;
- Establish technical standards and specifications for the cadastre of real property;
- Grant authorization and the respective license for carrying out activities within the field of the cadastre of real property;
- Accredite technicians for the production of technical document;
- Ratify work of a cadastral nature carried out by other bodies.

IGP may request the collaboration of the public and private sector (approximately 4000 qualified surveyors and 18 licensed companies) in order to perform the operations of producing, renewing and maintenance the cadastre; construction and maintenance of networks for supporting the operations referred to in the previous paragraph and establishing and managing the corresponding databases; finally to establish technical standards and specifications for the cadastre of real property. There have been until the mid 90's cadastral maps and real property sheets for the rural areas of roughly 40% of the country's area, covering 134 municipalities and maintained by IGP. The cadastral maps are 100% in raster form and they are currently being transformed to vector in order to be submitted into a Cadastre SIG. This so called geometric cadastre relating to rural properties located in an area considered to have been included under the cadastral system before the new cadastre comes into force will remain in force until the first operation for the renewal of the cadastre is undertaken in this area. Those cases which are considered urgent by the owners to update, and which will be resolved without waiting for an operation to be undertaken for the renewal of the cadastre, the aforesaid owners guarantee to provide coverage of the corresponding costs. Thus, the cadastral information was not updated continuously.

The real property is the cadastre unit.

Since 1995 both IGP and private sector have been surveying real properties.

Although some IT solutions have been used and tested, the cadastre GIS is still under development.

NUMBER OF CADASTRAL REAL PROPERTIES:

Approximately 18 million, with approximately 150 thousand surveyed, covering 4 municipalities and 45000 hectares (at scales 1:1000 and 1:2000); from the old geometric cadastre of rural real property there are still in force 2 million real properties covering 4 890 000 hectares (at scales 1:500 to 1:5000).

SLOVENIA

Land Cadastre evidence covers complete territory of Slovenia. Graphical part of evidence is Land Cadastre Maps will be completing available in digital form until end of year 2002. Attribute data are in digital form already available.

Data in Land Cadastre are managed and maintained from branch office of Surveying and Mapping Authority of the Republic of Slovenia. Every branch office of Surveying and Mapping Authority has at the moment its own database for their territory. All data are periodically collected into central database of Land Cadastre. Attribute data

are in central database refreshed daily, graphical part of data are refresh once a week, because production of digital land cadastre maps are not finished yet for whole territory of Slovenia.

Process of production digital land cadastre maps is done with scanning analogue maps and then vectorised by hand all parcel borders. Basic unit in land cadastre is parcel; witch could be divided into parts of parcel with different land use. Every part of parcel is closed polygon with centroid and parcel number. Topology of data is built and data are without topological errors.

In attribute table are collected data about area, type of land use and production capacity of land and owner for each parcel.

Common identifier for graphical and attribute part of land cadastre data is parcel number.

NUMBER OF CADASTRAL PARCELS Number of land parcels in Slovenia: 5 140 000. Number of cadastral community: 2698

NUMBER OF AGRICULTURAL PARCELS: Number of agricultural land parcels: 4 419 000

SPAIN

There is no legal Cadastre GIS definition in Spain. It is called *SigCA (Sistema de Información Geográfica Catastral)*. SIGCA is used to manage the cadastral digital cartography in conjunction with SIGeca, used for the processing of alpha-numeric information. S.iG.C.A. is used for 95% of the national surface (500.000 km²) with exception to Basque country provinces (7.261 km²) and Navarra (10.421 km²). The Spanish cadastral GIS is an information system composed by three different sub-systems:

1. -SIGCA: used to manage digital cartography
2. sigeca: used to manage alpha-numerical information
3. BDN: national integrated database

These tools allow the Spanish cadastre to manage the following information:

NUMBER OF CADASTRAL PARCELS

7576 local municipalities

11.000.000 urban parcels

32.000.000 building elements

28.000.000 urban units for taxation purposes

1.200.000 hectares of urban cartography 1/1.000 or 1:500 (60% of it is digital)

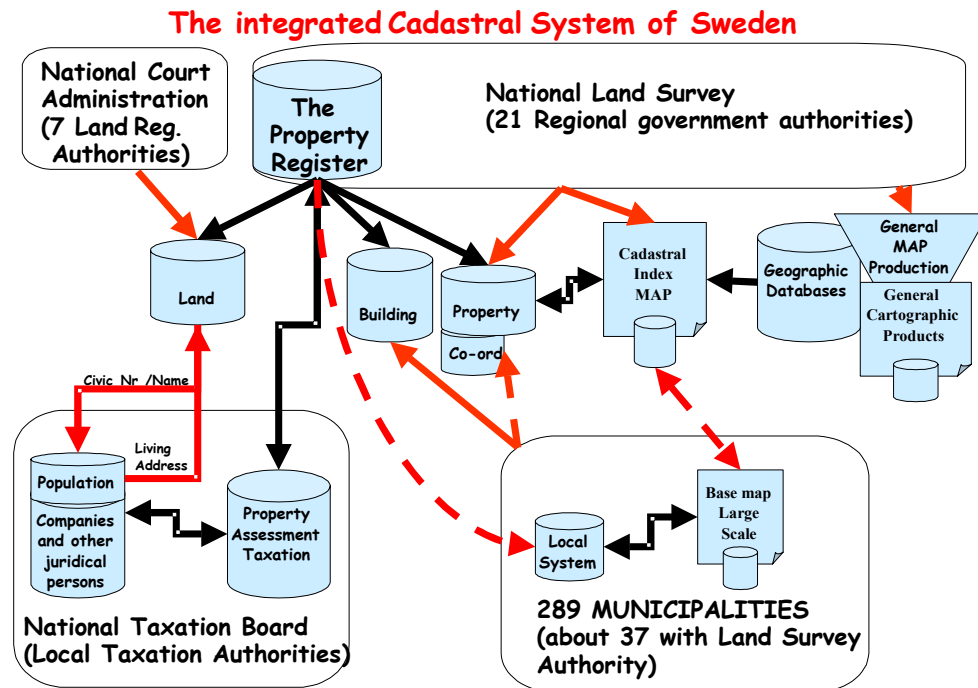
43.200.000 rural parcels

57.000.000 rural sub-parcels (different potential crops)

47.000.000 hectares of rural cartography (70% of it is digital)

NUMBER OF AGRICULTURAL PARCELS ?

SWEDEN



NUMBER OF CADASTRAL PARCELS About 4.7 million real properties (cancelled as well as existing). Number of parcels =?

Real properties in Sweden is not divided into urban and rural land, but rather buildings and addresses.

About 3 Million registered buildings.

About 2.5 million registered addresses.

NUMBER OF AGRICULTURAL PARCELS There are about 300,000 agricultural enterprises. Each of them normally consists of several real properties, some owned land and some leased land.

SWITZERLAND

NUMBER OF PARCELS

Estimation for total number of parcels: 4 million (due to the federalist structure, there is no national statistic for the number of parcels)

NUMBER OF AGRICULTURAL PARCELS

No statistics is available. The number of agricultural parcels might be estimated at 10-20% of the total number

UNITED KINGDOM

There is no legal or fiscal cadastre in the European sense in the UK. There is a large scale digital map for the whole of the UK which is structured differently by the two surveys that provide the data (for Great Britain (GB), which covers England, Scotland and Wales. Northern Ireland (NI) which covers Northern Ireland.) which is used as the graphical for a land registry of which there are three in the UK. The surveys do not include 'land use' and they only record physical features – invisible boundary lines are now being inferred in GB for residential areas and to closed polygons in rural areas.

Since the UK has no cadastre, there is no cadastral GIS in the UK.

The functions, which in many European countries are ascribed to the national cadastre, are distributed among a number of central and local government organisations in the UK. These organisations may in creating their own GIS, make use of digital mapping services supplied by the UK's national topographic mapping authority's, the Ordnance Survey-GB (OS-GB) and Ordnance Survey-NI (OS-NI).

For example, HM Land Registry in England and Wales (HMLR), Registers of Scotland (ROS), and Land Registers of Northern Ireland (LRNI) use OS-GB and OS-NI digital maps to produce the plans showing the extents of registered title parcels.

NUMBER OF CADASTRAL PARCELS The exact figure is not publicly available but is substantial. HM Land Registry for England and Wales currently have 18 million titles on the register, which by the end of 2002 will all be available online.

NUMBER OF AGRICULTURAL PARCELS The exact figure is not available but is substantial. In England alone the number of fields are estimated as 1.7 million and the number of farm holdings in the region of 76,000.

TECHNIQUES APPLIED

SW, DATA MODEL, DATA COLLECTION, CREATION AND MAINTENANCE
CADASTRAL GIS, VISUALISATION, ACCESS AND USER INTERACTION,
GEOGR QUERY AND ANALYSIS (FROM DATA TO INFORMATION),
ADVANCED SPATIAL ANALYSIS, DATA & INFORMATION PROTECTION

AUSTRIA

At the moment the IT structure of the Austrian real property database as well as for the digital map are redefined to get into an integrated system with will be included into federal e-government procedures. Especially new web-technologies demand more web-based services for all kinds of clients. The implementation of a new IT-solution will be a step further towards a national infrastructure in Austria.

BULGARIA

The most used software is ArcGIS together with Oracle database. Local authorities use mainly MapInfo. A lot of national software and standards were developed in order to serve the requirements of the land reform in Bulgaria. They are still in use on local level management.

CZECH REPUBLIC

SW – APP Group designed on demand, Oracle Database, Data collected in 90th. IS runs in local offices and central database as well. Local database enables some queries (relation between parcels and owners). Visualisation by Bentley SW. In principle, this system is not considered a geographical system. It consists of property borders, parcel numbers, kind of parcels and very limited content. The Cadastral system is public, where everyone is authorised to get information.

DENMARK

The Danish cadastral register and cadastral map are being redesigned. The present short presentation concerns the present cadastral register and map system. The cadastral registry data is stored in an Ingres relational database. The supporting SW is in-house developed. The cadastral map is managed in the Intergraph Microstation SW built on MGE and MGDM. Design files are stored in Oracle DB. A data model exists. An English translation can be provided if requested. When land is to be subdivided or property boundaries changed, both private or public landowner must apply by law to a private licensed surveyor (except for Copenhagen and Frederiksberg municipalities) for the necessary legal surveys and for the preparation of documents needed for submission of an application to the National Survey and Cadastre for updating the cadastre. The application must contain a copy of the cadastral map showing the alteration of the boundaries, measurement sheets showing the new boundaries, documentation for legal rights, as well as documentation showing the approval of the future land use according to planning regulations and land use laws. The approval from the National Survey and Cadastre, showing the updated cadastral register and the updated cadastral map, is returned to the licensed surveyor. Simultaneously, the approval is forwarded to the municipality for updating of the property tax register, and to the local Land Registry Office for updating the Land Book. Deeds or mortgage may then be entered in to the land book based using the updated cadastral identification. The process of the cadastral work is controlled by the Act of Subdivision and Land Registration providing very detailed regulations. To

determine the existing boundaries the surveyor must compare the legal survey information (the cadastral map and the measurement sheets) to the actual state of conditions, placement of fences etc. If discrepancies are found the surveyor has to clear up the reason. Maybe the land owners have agreed for another boundary without taken care for updating the cadastre, or maybe the boundary in the field has been accepted by the landowner for more than 20 years which may lead to the establishment of a prescriptive right. In these cases, the licensed surveyor must involve the landowners, and if they cannot agree on the reason for the discrepancy the problem must be solved through a special legal procedure for boundary determination carried through by the licensed surveyor. Boundaries are surveyed to a high accuracy in a local sense and corners are typically marked with iron pipes. Today most surveys are connected to control points and linked into the national geodetic network (since 1934). Within a few years the demands for a fully digitised cadastral process tends to be mandatory. /source: http://www.ddl.org/thedanishway/LandAdm_01.pdf/

It is always a real challenge to make the advanced cadastral information accessible to a wide range of users. Obviously KMS sees the Internet as the main vehicle for distributing such information. It requires that the Internet services are accessible in an open standardised way allowing utilisation by Internet providers. Based on the Open GIS Consortium standards, KMS offers access to cadastral and topographical products through “KMS Map Supply”.

In addition KMS developed in 1998 “WEB-Matriklen”. Data from the cadastral register and digital cadastral map is made available as an Internet service. It is envisaged that the KMS Map Supply within a few years will replace the WEB-Matrikel.

FINLAND

This is a description of the systems used by the municipalities for cadastral applications. Municipal land register has been established in municipalities using one of three commercial applications available in the market. Related databases are used. Cadastral data is managed using commercial GIS software such as xcity, Mapinfo, Arcinfo and Autocad. Operational applications have been developed according to the needs of municipal authorities and users based on general database management and GIS applications.

FRANCE

Basically there are two main techniques used:

Vector: a data model exists which is DKM-like, Vectorisation is often subcontracted to private companies, labelisation compensates for the free updating by asking a service charge from the cadastre. Access is limited to the partners of the above mentioned partnership although access to the cadastral map through the Internet is considered to be provided by few local governments.

Raster: the programme is to turn digital the non-vectorised cadastral maps by a scanning technique with a seed point for each parcel by the beginning of 2004. This will be done internally by the cadastre service. Then IGN-France will geo-processed each map and assembled them into a seamless database, which will be part of the RGE. Updating of the rasterised cadastral map will be done digitally by the cadastre service on the same basis as the updating of paper cadastral maps using digital techniques.

Usage of the cadastral information ranges from information to public on their properties, instruction of building permits and urban planning including the public utility enquiry. Some municipalities would like to use the vector cadastral map in conjunction with real estate operations to identify the areas that are turning to disadvantaged or enriching area.

GERMANY

As a result of Germany's federal structure, data collection is largely decentralised and carried out mostly on the regional and local level, which means that the processing and maintenance of data is mostly tailored to local and regional requirements. Due to this decentralised (cadastral) approach the local requirements are best matched. Local data collection and updating, local applications are satisfied by modern decentralised information technology (decentralised databases). For the state of North-Rhine Westphalia, Germany, about 75% of the cadastral information is available in digital form (GIS). Within the next 5 year the data collection will be done. The updating of the data is done continuously.

Pricing: defined by fee regulations or laws (on the national level)
Copyright: defined by copyright regulations or laws (on the national level)
Restriction of use defined by regulations or laws (on the national level)
Licensing terms: dependent on the national situation

GREECE

The data model that has been developed accommodates the management of the spatial data using GIS functions. Legal data, as well as, historical record data are managed through Relational DBMS functions. Both geographic and legal data are stored into a central database and are accessed using Internet based technologies. To date, cadastral spatial data is being collected using primarily photogrammetric methods: orthophotomaps 1:5.000 for rural areas, and 1:1.000 photogrammetric diagrams for urban areas. Legal and thematic data for parcels are collected through a procedure in which owners or other beneficiaries declare their properties and rights. Visualization of cross-section data is made using GIS software. Access to data is available to those who have a lawful right to access information. Currently, this cadastral GIS system operates in 15 municipalities, while in 2004, the system will serve another 320 municipalities (approximately). Those municipalities are in the final stage of the data collection and validation procedure. In addition to the above, a prototype computer-based cadastral GIS operates in the Cadastral Centre of Athens covering two municipalities and an analogue system operates in three islands in *Dodecanese* since the late 1920's.

HUNGARY

Details in English on the web: www.takarnet.hu or www.fomi.hu

ICELAND

The Land Registry of Iceland is in the initial stages of developing a multi-purpose cadastre, and is currently in the process of developing a data model, data collection techniques and system architecture, to be used in the Cadastre.

ITALY

The updating of the cadastral information, both graphics and alphanumeric, is assigned to the real estate owners through the involvement of external professionals and, particularly: surveyors, engineers, architects, etc. for updating concerning the technical characteristics of cadastral information, notaries for the updating of the data

related to the real estate ownership. *Agenzia del Territorio* is charged with checking and registering in its archives the updating submitted by the professionals.

Several software procedures allow the updating of cadastral records in real time.

At present *Agenzia del Territorio* provides the following free of charge software procedures to the Professional Organizations:

- “*Pregeo*”: for the updating of the cadastral cartography and Land Cadastre records;
- “*Docte*”: for the updating of the tilling quality of the rural parcels;
- “*Docfa*”: for the updating of the urban real estate unit plans and Building Cadastre records;
- “*Voltura*”: for the updating of the ownership data.

It is also possible, through a package called “*Unidoc*”, the on-line submission of the real estate deeds by the notaries, enabling the contextual registration, transcription, filing of changes in real estate records as well as the related taxes payment.

KOSOVO

It has been decided reconstruct Network, Land Cadastre, Land Cadastre Database. Kosovo Cadastral Agency is under the ministry of Public Services, Government of Kosovo.

Graphical data of land cadastre (digital land cadastral map) are in production so from year 2000 and will be finished in this year (2003).

Production of digital cadastre maps are divided into several phases:

- Scanning of analogue cadastral maps about 10300 sheets.
- Vectorisation of parcel borders and editing of parcel numbers
- Merging map sheets of cadastral maps at the basis of measurements process
- Compare of graphical and textual data and any correction of differences
- Transformation cadastral maps produced at graphical methods into national coordinate system
- Harmonisation borders between different cadastral zones

All digital land cadastral maps are in national coordinate system and there are possibilities for analysing and overlaying with other geographical datasets. There must be put an attention on data quality. Positional accuracy depends on sources from where digital cadastral map was produced.

Textual data are available in digital form already 2 years..

Maintaining process

- Municipalities Cadastral Offices are responsible for maintenance process and field measurements for land cadastre.

Data access and data dissemination

All other data users could order cadastral data in accordance with data dissemination policy and price list.

Restriction at the data dissemination is only for personal data (data about land owners)

It is obligatory to respect law about personal data protection.

THE NETHERLANDS

Analog information is registered since 1834. AKR and LKI are created by digitizing the analog information in the years 1984 until 1999. These main databases are updated daily. LKI and AKR Information about selected individual properties is delivered on line (internet techniques) from information databases with an actuality of 1 day. Information about total areas (example: a municipality) is delivered off line

with a lower actuality of some weeks. The accuracy of the graphic data is 20 cm in urban areas and 40 cm. in rural areas.

LKI is stored in an internal Ingres relational database on a Unix mainframe; AKR is external stored in a IDMS database on IBM hardware. The data in the information databases are stored in the same way (copies).

Besides that an internal integrated Ingres Query database is used for special GIS applications and special products. In this database LKI and AKR information is combined. The actuality of this query database is 2 months on this moment.

Investigations have started to create a combined Oracle database with an actuality of 1 week or better to replace the now used information and query databases.

For the access and user interaction of the LKI database the (Finis) FINGIS system is used. MapInfo is the most used tool for query and analysis but besides that also special software is used.

On line information on this moment is delivered only to known clients (5000 up to 10.000 mails a day), so information protection and payments can be arranged more or less easily (fire walls, contracts, restricted products). Investigations have started for public access via internet.

NORWAY

The present register (GAB) is run on a mainframe computer, operated by IBM. Database system: DB2, software: CSP.

The cadastral map system used by the Norwegian Mapping Authority (NMA) is developed by NMA itself for internal use. The municipalities uses commercial software. The market leader is systems developed by the Norwegian company Norkart.

An integrated cadastre is being developed, using based on an object-oriented relational database. Oracle is used, and Java on the server side. The client is developed in C++.

GAB is a multi-purpose property register providing data for statistical purposes, for municipal use, property formation, planning purposes, addressing, buildings, for taxation (Governmental and municipal tax), banking activities and insurance.

Compulsory updating routines of GAB by the municipalities are as follow:

Land subdivisions, building activity, new and changed addresses, from Local courts, in case change of ownership, by agreement or on commercial conditions, from The Norwegian Population register, resident address of the owner, from The Norwegian Enterprise Register location address of the enterprise, the Central Post Register, changes in postal code.

The data content of the GAB systems includes: ground parcel, owner, owners' address; date of purchase, market value - referring to the last transfer, co-ordinates of one point of representation, area, land use, references to buildings and addresses, addresses, references to school district, constituency, postal zone, basic statistical unit, co-ordinates, references to corresponding building and addresses.

POLAND

The specificity of Polish GII lies in providing parallel solutions for three aspects of GII: technical, legal, and organisational one, that may be characterised in the following way:

In the technical aspect:

- A uniform spatial reference system, the parameters of which underwent modifications, yet which always has maintained its uniformity.

- 12. A uniform system of high quality geodetic , gravimetric, and magnetic networks, being the basis for other spatial studies.
- A uniform system of horizontal and vertical networks, intensely covering the entire country, became the foundation stone of the homogeneity of GI system in Poland, providing studies based on measurement with high accuracy and unmistakable location. The accuracy that GPS provides today has been possible in Poland for over 50 years. While due to the extremely precise gravimetric measurements, the geoid identified for the territory of Poland allows a precise definition of height using GPS, to a degree securing accurate registration of deformations in earth's surface.
- A uniform set and layout of maps, with substantial coverage, often covering the entire country, as well as that of aerial photographs and ortophoto-maps.
- The entire area of the country has been consequently, over the period of a few dozen years, covered with topographic maps (1:100 000, 1:50 000, 1:10 000) and the basic map (1:5000, 1:2000, 1:1000) in standardised style, at present supplemented with ortho-photomap in the same style, constituting an incomparably rich source of information. It was possible to obtain such a result thanks to efficient organisation of geodetic-cartographic services, consequent compliance with technical standards, and conducive policy of the state administration.
- A working register of geographic names, and a plethora of thematic maps, which found particular expression in the magnificent cartographic achievement of the Atlas of the Republic of Poland.
- A special government commission supervises the register of several thousand geographical names in the country and outside it, providing a uniform onomatology both on topographic and thematic maps, which in the Atlas of the Republic of Poland (Atlas Rzeczypospolitej), published 5 years ago, amounted to 1093 maps.
- A uniform, improved with time, system of technical standards that have the form of instructions and technical guidelines, the enforcement of which has been and is better than that of Polish or international norms.
- The system of geodetic and cartographic technical guidelines, used in Poland, is worth a special mention. The system of instructions, started in the interwar period, has not changed in the general outline for over 50 years, and has only been improved in details, due to technological progress. Efficient geodetic and cartographic supervision, together with precise instructions/guidelines, provided a high level of uniformity for spatial information throughout the country.
- A gradually improved inventory system of administrative boundaries.

The system of administrative borders has two faces: the legal one, from which results the obligation to publish in Official Journals of Law of the Republic of Poland (Dziennik Ustaw RP) the changes in administrative borders, and the technical one, where until 1999 the registration of borders was made according to cadastral principles, and since July 1, 1999, a special national register of borders has been functioning, where their course and changes are documented technically.

The system of soil classification and register of land, covering the entire country.

- The system of land and buildings registration is a legal and technical continuation of the cadastre of land and buildings that, depending on the region of the country, has been functioning for 170 to 140 years. It covers the entire state, both in the descriptive and map part (buildings only on maps), having the scale of 1:1000 in

urban areas, and 1:2000 or 1:5000 in rural areas. The entire territory of Poland, for 50 years now, has been covered with a uniform, exact soil classification (pedology). The Polish cadastre, besides borders and soil classification, comprises also land use.

- Uniform principles for creation and updating of basic maps, as well as topographic maps, together with the standardised system of symbols used on maps.

The content of cadastral maps is a part of content of the basic map, which exists for urban areas and the majority of rural areas. Where the basic map does not exist, its functions until the time of its establishment are performed by the cadastral map. The basic map (cadastral map), updated by force of law, is used for making or supplementing topographic maps, which both (basic and topographic maps) are by law the basis for drawing other kinds of maps.

- A unique common system of making inventory of utilities.

A constituent of the basic map is the unique system of stock-taking of utilities, that by law all operators of technical infrastructure networks must submit to. Each piece of equipment and network of utilities have to be agreed for before routing and surveyed after installation, and before covering up. The system of stock-taking has been in force for 28 years now, which means that only few utilities, installed before, are not precisely catalogued geodetically. The obligation to catalogue and co-ordinate the utility systems make Poland stand out among the countries of Europe.

PORTUGAL

At this time, the Portuguese Cadastre Information System is in a process of a complete redefinition. The goal is to take the system a couple of steps further, in order to make the cadastral information accessible to the widest range of users and integrate the e-government procedures. The use of the web technology, more reliable database software and progressively abolish the use of paper are some of the main goals of the future IT structure.

The follow description concerns the actual system that is being used.

The entities used are the real properties borders, numbers, social areas and constructions inside the property (graphical data) and the NIP. Complementary it is usually gathered data related to the owners, area and numeric codes linking the property with the property register and others (alphanumeric data).

The alphanumeric data is stored and managed in a RDBMS functions. The cadastral maps are managed in Bentley Microstation. All this is built and linked with the help of MGE and other SW specifically developed to this matter. The geographic query and analysis, advanced spatial analysis is also made with specific SW developed to this operation. The access can only be made by a workstation at IGP.

All persons are guaranteed the right to obtain copies of cadastral files and sheets, with data only related to the real property (the personal data is confidential and protected by law). The cadastral spatial data is being collected using ortophotos and digital vector cartography at scales from 1:500 to 1:5000, complementary surveyed is made.

SLOVENIA

At Surveying and Mapping Authority at the moment used in-house SW solutions prepared by outside contractors (computer company).

It has just been decided to copy the central Land Cadastre to Governmental centre for informatics (GCI), the copying will be based on the Oracle replication technique which means that the copy at GCI will be a read-only

one. GCI will also take over the responsibility for other customers within the government network to the Land Cadastre Database:

- Ministries of Justice, Agriculture, Internal Affairs, Finance (for Property taxation), Education, Environment.
- Local Government
- Statistical Office.

For the new real Property Register there is a wish to develop one common database including:

- Land Cadastre, the centralised version.
- Building Register.
- House Register part from the Spatial Unit register.

Database models have been presented for the physical structure of the databases, but no synchronisation has been made against the SC. More work has to be done in this area during the next visit and go into even more detailed discussions.

Production process of digital land cadastral maps

Attribute data are available in digital form already 20 years. In last ten years this attribute data are uniformed and maintaining in central database.

Graphical data of land cadastre (digital land cadastral map) are in production so from year 1991 and will be finished in this year (2002).

Production of digital cadastre maps are divided into several phases:

- Scanning of analogue cadastral maps
- Vectorisation of parcel borders and editing of parcel numbers
- Merging map sheets of cadastral maps at the basis of measurements process
- Compare of graphical and attribute data and correction of differences
- Transformation cadastral maps produced at graphical methods into national coordinate system
- Harmonisation borders between different measurement areas and between different cadastral community

Analyse and QUERIES

Data are in vector form and topology is build. Because of these facts queries and analysis are possible on every attribute and graphical data in land cadastre.

All digital land cadastral maps are in national coordinate system and there are possibilities for analysing and overlaying with other geographical datasets. There must be put an attention on data quality. Positional accuracy depends on sources from where digital cadastral map was produced.

Maintaining process

- Land parcel owners order measurement at the geodetic companies
- Geodetic company acquire from Surveying and Mapping Authority all data form archive which are necessary for field measurement
- Geodetic company is responsible for technical part of field measurement and preparation of experts report
- Surveying and Mapping Authority carry out all administrative part of maintaining process and build new topology in central database

Data access and data dissemination

On line access is allowed at the moment for public administration and land book office

All other data users could order cadastral data in accordance with data dissemination policy and price list.

Restriction at the data dissemination is only for personal data (data about land owners) It is obligatory to respect law about personal data protection.

SPAIN

-Rural cadastral cartography is available on scales 1:2000 and 1:50000 and is developed from a photogrammetric flight at a scale of 1/8,000, from which orthophotographs are made on a scale of 1/5,000.

-Urban cadastral cartography is available on scales 1:500, 1:1000 and is developed by means of numeric restitution from a photogrammetric flight, by digitalizing graphic document existing at the Cadastre or are based on the digital cartography held by other public administrations over which the cadastral lots are super-imposed.

- Both urban and rural cartography are available in vectorial formats: ASCII formats (FICC), shapefiles, DXF, SVG.

- Orthophotograph are available on scale 1:5000 in digital formats (GIFF)

- All the graphic data are store in ORACLE –UNIX databases with SDE (ESRI) as spatial data engine, and are in the same data base as the alphanumeric information.
 - All the users in the cadastral offices can access, query and maintain the graphic database, all the applications are implemented in PC using window interface and are development in visual-basic using Map-object (ESRI).
 - Citizens can access to the digital cadastral information in the cadastral offices and get a copy.
 - The system can provide in real time descriptive and graphic certifications refer to an urban unit or a rural lot and contain the basic physical, legal and economic data of the property along with its graphic representation as appears in the cadastral data base.
 - The main graphic features are plots, cadastral lots and buildings in urban areas, and cadastral polygons, lots (owner) and sublots (use-crop) in rural areas linked with real assets alphanumeric data, cadastral values and owners included
- Graphic information would be available in a year in Internet.

SWEDEN

The system covers information on all real properties in Sweden. Everything is collected and stored in databases.

The "attributes" are stored in centralized mainframes (IBM, based on AROS/ROSAM database management system).

The "geography" is stored in different local/municipal-based systems in connection with a centralised geographic database system (UNIX, based on an in-house developed database management system BANKIR/APC).

Access to the information is possible in the following ways, (depending on needs, costs and type of user):

- ❑ **On-line** (programme to programme, client-server, Internet, modules to reach updated data for own applications)
- ❑ **Data extracts** (Exports part of information from the system, adjusts the information for the customers special needs, converts or transforms the information to fit special applications and delivering through Internet or CD).
- ❑ **Standalone or intranet application together with data extract.**
- ❑ **Paper documents** (delivers legal documents about survey diagrams, titles, mortgages etc, Cadastral Index maps on paper or other maps).

SWITZERLAND

Software: there are several softwares that are used. The only requirement that they have to satisfy is to be able to read and write the cadastral data model in INTERLIS. Data model: is defined by law through the system-independent data description language INTERLIS.

Maintenance / Visualisation / User Interaction / Query / Analysis: depending on the used SW.

UNITED KINGDOM

As noted in the answer to question 1 the UK has no cadastre as such but in performing the function of creating and maintaining the Land Registers within England, Wales (HMLR) Scotland (ROS) and Northern Ireland (LRNI) the beginnings of a cadastre is effectively being built. This could well in time be adapted and integrated with other government functions to develop a cadastre for each of the regions. By logical extension the Land Register being created and maintained within each UK region by other authorities in the UK could be similarly integrated if the desire was present.

Within Scotland only 35% of the land parcels are held in the Land Register at the current time.

SPECIAL FEATURES AND PRACTICES**AUSTRIA**

The cadastre will be one of the main parts within e-government procedures, which will be implemented in the next two years. As result of a legally regulated system for property registration and mapping in Austria running for a long term, the content of the system is of high quality and of public reliability. Inventing e-government procedures are therefore mainly challenges for the co-ordination of the involved partners and changing responsibilities by the necessary IT procedures. The example of the recently passed law for establishing an Austrian address register, which is built on cadastral data, has proved the feasibility of procedures for related application fields.

BULGARIA

The provisions and routine for establishment, maintenance and use of the information systems as well as for direct access to the data shall be prescribed by an ordinance, adopted by the Council of Ministers by motion of the Minister of Regional Development and Public Works and the Minister of Justice.

For the cadastre and the property register, computerized information systems are created, which shall be linked with each other in the future. Both computerized information systems will be used as fundamental information systems in the integrated e-services system to be created under e-government policy.

A specialized cadastre of artificially constructed water objects (hydrology utilities , reservoirs) is created under the management by the Ministry of Environment and Waters in Bulgaria, which is also funding it. This cadastre is harmonized with the Water Directive of the EU.

CZECH REPUBLIC

As introduced in item 1.1

DENMARK

A system of digital lodgement of cadastral data is currently being implemented in order to improve the interaction between the private surveying firms and National Survey and Cadastre and thereby improve the efficiency and effectiveness of the cadastral processes. The digitalisation of the cadastral register and the cadastral maps has paved the way for changing the whole cadastral process into a digital one. The software, entitled MIA, has been developed by the initiative of the National Survey and Cadastre in cooperation with the private surveyors association. By implementing this new concept of digital lodgement still more responsibilities will be placed in the private sector. The initiative is also regarded as one of the pilot projects within the efforts of introducing e-government in Denmark. /source: <http://www.swisstopo.ch/cadastraltemplate2003/countryreport/Denmark.pdf>

FINLAND

The JAKO system used at the NLS provides services for surveying. The surveyor can conduct the whole survey process with all phases of the data processing using the JAKO system only. The system is also register system that take care of the official Cadastre for which the NLS is responsible. The third task is information service

where the system provides for the users a map user interface and a wide selection of GIS tools for manipulating the data.

FRANCE

The scanning of more than 400 000 paper cadastral maps implied to develop a customised scanner able to scan a paper map in less than 1 minute including installing the map on the scanner. The principle is similar to SPOT5 technique where the earth is replaced by a flat stabilized against vibration desk and the HRV instrument being a CCD detector (similar to the barettes acquired for SPOT5) moving on a rail „flying” over the paper map.

A specific software has been developed to handle the 400 000 files and another to allow the seed points to be digitized. The seed point has the unique parcel identifier as attribute in order to link any parcel based information to the seed point

GREECE

For the areas in which the cadastral data collection procedure has been completed, there is a standard system operating by Ktimatologio S.A. (Hellenic Cadastre). For the areas that are surveyed by private sector firms under the supervision of Ktimatologio S.A (through contracts that have been signed with Ktimatologio S.A.), there is no standard software to manage the data that are collected. Contractors have developed their own database management applications to handle their operations during the collection and validation period. At the end, those individual databases will be merged into the unified National Cadastral Database

HUNGARY

The cadastre is the base of the National GIS. The Hungarian Cadastre System (often called as unified real estate registration) is a unified, multipurpose legal system, an integration of the Cadastre and the traditional Land Records (Grundbuch). The cadastre system consists of:

- Real estate registration map, which is identical to the cadastral map and serves also for land surveying purposes.
- The parcels each having a unique parcel number and certain details are recorded on the ‘Property Sheets’. Property sheet consists of three parts:
 - Part 1. descriptive data (parcel number, address, site area, features of cultivation, soil quality, etc.),
 - Part 2. titles i.e. data relating to the ownership (name, birth, address, etc.),
 - Part 3. all the other titles and deeds (mortgages, restrictions, easements, etc.).

The land book containing the descriptive data of every real estate inside the community is arranged according to parcel number order, showing the extent of the total area as well.

ITALY

The Italian Cadastre, principally born with fiscal purposes, was realized through the constitution of two distinct archives:

- the Land Cadastre, including all the rural or non-built up land;
- the Building Cadastre, including all the civil, industrial and commercial buildings.

The core elements of the cadastral archives are respectively:

- for the Land Cadastre: the rural **parcel**, a continuous ground part, located in the same municipality, with the same tilling and the same owner;

- for the Building Cadastre: the **urban real estate unit**, that can be a part of a building, a whole building or groups of buildings or an area open to a functional and income autonomy, as a rule identified through the Land Cadastre cartography. The Cadastre, both Land and Building, is a geometric-parcel based archive as it includes both geometrical information (cartography and plans) and technical-economic information (characteristics and incomes).

The main alphanumeric information included in the cadastral data bank concern the parcels and urban real estate units identification codes, the size, the tilling quality (for the rural parcels) and the building quality (for the buildings), the economic data relevant to the income and the owner personal particulars.

The identification both of the rural parcels and the urban real estate units, realized through alphanumeric characters, is univocal. The obligation to use the cadastral references in the deeds concerning the transfer of real estate rights allows the link between the cadastral data bank and the real estate registries.

The economic component of the cadastral information, at present represented by the income, is the base of the real estate taxation system both at the national and local level. The study and the experimentation of multi-parametric mass evaluation procedures are currently in progress in order to review cadastral appraisals with the aim to adjust them to the real values reflected by the real estate market, from which it is also possible to derive the buildings income.

The cadastral data bank, which we can consider completely computerized, counts about 77.000.000 of rural parcels, of which about the 80% income endowed, and about 51.000.000 of urban real estate units.

The cadastral cartography, realized with the aim to represent the real estate assets focusing their ownership, covers the whole national territory. It also represents a support for land planning and management.

The maps are generally built in the scale 1:2000. Other scales are used, for example, for the urban areas (1:1000) and for the mountainous or little parcelled out areas (1:4000).

The cadastral cartography consists of about 300.000 map sheets (whose size is generally cm. 70 x 100), about 225.000 of which in the scale 1:2000, about 50.000 in the scale 1:1000 and about 25.000 in the scale 1:4000.

Cartographic information are preserved on different supports and formats:

- on paper for all the Provincial Offices;
- raster, through geo-referenced images of the paper maps with some vectorial layers, for 67% of the Provincial Offices;
- vector, through numerical structured files, for 33% of the Provincial Offices.

The digital cartography is currently managed through a computer system called WEGIS (Web Enable GIS) that allows the consultation and the updating of the cadastral maps both raster and vector according to the surveys submitted by the technical professionals.

KOSOVO

In Kosovo rebuilding of Cadastre started after the war between Kosovo and Serbia. During conflict time Cadastral data in Kosovo were defective and some of them are stealing by Serbian government.

Base for rebuilding of Cadastre in Kosovo have been analogue Cadastral maps and textual database in digital form from year 1985 and some data from book of changes. In future planed establishment unified register with data from Land Cadastre, Textual database, graphical data, buildings and apartments and Property Rights.

THE NETHERLANDS

The dutch Cadastre maintains the main databases LKI and AKR and distributes the data and special products, like statistical information about selling prices of properties. Measurements for updating large scale topography is mainly done by private firms, managed by the Cadastre provided also the specifications.

The turn around is more than 200.000.000 euro a year. Notary is the main client (65% of earnings). The products mostly are standardised (more then 95%). ICT spendings are 60.000.000 euro a year. In total there are some 2000 employees of wich some 50 are busy in making and selling special GIS products.

NORWAY

An infrastructure has been established for distribution of GAB together with data from the Land register. A government owned, shareholding company carries out this task. The company, Norsk Eiendomsinformasjon, operate as a wholesaler, and have agreements with commercial distributors that actually front the end-users. The distributors have opportunities to combine data from the GAB and the Land register with data from other information sources to especially customer-oriented applications. A project for establishing an infrastructure for an automated (or register-based) census have been finalised. All future censuses will be based upon updated GAB-register in combination with the updated national population register. Important features are: The address identifier as a common key for data exchange, every dwelling also in multi-apartment houses have a unique address, a complete register for all dwellings, and secure maintenance routines that secure high data quality.

Basic principles behind the establishment of the GAB system are as follow:

- Governmental fundings necessary
- Centralised database
- Co-operation between various public agencies, and between public and private sector in general
- Have the multi-purpose aspect in mind
- One register - many users
- Include few, but important data
- Build the databases step by step.
- Establish secure and high quality updating routines.
- Updating routines supported by law
- Focusing on completeness
- Focusing on data quality and standardisation
- Cost recovery - user fees

POLAND

Referring to the Polish Law cadastre is the basis for National GIS

An effect of the Polish infrastructure of GI is that the entire area of the country has been covered with a unified, accurate system of spatial information, presented in maps

and databases; information that is based upon a uniform system of geodetic networks, collected in a uniform way and continuously updated.

The legal aspects of the Polish National GIS

- A properly arranged system of land and buildings registration which, in contrast to other cadaster systems, also stores information on land use.

The obligation to keep the register of land and buildings is a modified continuation of regulations binding in the former annexed territories of Poland belonging then to Prussia, Austro-Hungary, and Russia.

In spite of opinions encountered in the EU countries, in the last 50 years in Poland there was private ownership of land and systems of cadastre and land and mortgage registers serving to protect it.

- Legally regulated system of setting lines of demarcation between real properties and of geodetic registration of results of such procedures.

The system of delimiting real estates has been functioning incessantly, where in proceedings cadastral services replace court of justice. Only in litigious proceedings do delimiting cases find their way to courts.

- Law-induced obligation to report, by owners (and users) any changes in the property, both to the register of land and buildings and to the register of utilities.

The most symptomatic feature of the geographical information system is the legal obligation forcing the owner (of real estate) or operator (of utilities) to report changes that took place in the cadastre (of land and buildings) or catalogue of utilities. The owner is not only obliged to report changes, but also to provide, at his own expense, the surveying documentation referring to those changes. It is this obligation that makes the Polish cadastre and the GIS based on it continuously updated.

- Obligation to report changes imposed upon courts of justice, notaries public, and other organs authorised to make changes.

The obligation to report changes in the cadastre rests, then, also upon courts, notaries public, and organs of the administration authorised to make changes.

- Legally imposed requirement to disclose in land and mortgage register the data on real properties, based only on evidence data.

The law stipulates that in section I. of land and mortgage register (KW), changes may be made solely on the basis of cadastral data. Section I of KW is excluded from the KW credibility principle, which in such case applies to cadastre.

- Law-induced obligation to keep the documentation registering spatial changes in a specific and defined location.

The obligation to gather information documenting spatial changes in one place is a consequence of the, discussed above, profound legal influence upon the system of spatial information. The documentation is kept in the so-called centres of geodetic and cartographic documentation (odgik).

- Legally imposed obligation to report the intention to make supplementary measurements, as well as reporting the results of such measurements to a specific location of data gathering and updating, where such results undergo technical supervision.

The law imposes also the duty of announcing the intention to survey a spatial change, collecting source information about the existing documentation of a location, and delivering the results of measurements to the documentation centre, in order to update the existing geodetic and cartographic data. Before accepting to documentation centre, the work is subject to technical supervision.

- Obligation, induced by technical regulations, to relate supplementary measurements to the geodetic matrix.

A very specific requirement in Poland is the obligation to add survey results to geodetic matrixes. That means that each piece of information about space is uniquely located in relation to a definite reference system, regardless the value of existing maps, which entails that even maps that are not too correct cartometrically, may be spatially corrected on the basis of supplementary surveys added to the geodetic network.

- The obligation to have necessary authorisations for performing work that serves as basis for spatial registration.

The obligation to have professional qualifications has a profound tradition in geodesy (see the materials for the norm ISO 211/TC 19122), particularly in Poland, being an example for several other professions.

- The obligation to carry out spatial co-ordination of utilities.

This obligation (cf. item 19) is a guarantee of spatial order and security in ever more confined space, especially in urbanised areas. Despite certain limitations that it imposes upon the sovereignty of operators of utilities, it is accepted because of undisputed advantages it has in preventing collisions.

At 1996 SMA adopted the centralised concept and all systems developed after that are centralised:

- Spatial Unit Register including House register
- Register of Geographical Names
- Central Land Cadastre
- Geodetic Points
- Building Register

The new Real Property Register will be centralised.

PORTUGAL

The aim is thus to evolve towards the National Cadastre Information System, which by fulfilling the need for the modernization of the Public Administration and providing a reliable description of the administrative and legal reality of real estate, represents the acquisition of an infrastructure that is essential for the development of the country.

The registers of rural and urban properties will be drawn up on the basis of the cadastral data extracted from the National Cadastre Information System, prepared by the IGP.

The real property is characterized through its administrative and geographical location, geometrical configuration and area.

The administrative location of a real property is determined by:

- The district, municipality and parish in which all or most of its area is located or, in urban areas, where its main entrance is located;
- The locality and street in which its main entrance is located, the police number allocated to the property and the specifications which make it possible to distinguish it from other properties, whenever these data are available.

The location may also refer to the place at which the real property is situated or the name by which it is known.

The geographical location of a real property is determined by the positioning of its boundaries within the system of co-ordinates that has been adopted.

The geometrical configuration of a real property is established by the cartographic representation of its boundaries, joined together by means of a closed polygonal line, and of the limits of its social areas, when these exist, joined together in the same way. It may be completed with other topographical and cadastral representations and areas,

including those relating to existing constructions. The area of a real property is determined by calculating the difference between the areas of the geometrical figures resulting from its boundaries and the limits of its social areas. As said before each surveyed real property is identified by means of an unambiguous numerical code, known as the property identification number (NIP), which is mandatory to use in all public documents as the means of identifying surveyed real properties. An identification card is issued for each surveyed real property, on which the respective NIP is stated. This card must be presented in all legal acts and other acts undertaken with government departments in relation to real properties located in surveyed areas. Each surveyed real property has a corresponding cadastral file, which contains the cadastral data relating to that property.

SPAIN

Maintenance of the information with two different procedures:

- General works, with the assistance of private firms, under technical specifications.
- Compulsory declarations from titleholders (more than 1.646.000 last year 2001)

Distribution of cadastral information to more than 8.000 institutional customers (town halls, regional administration, and national government), 8.000.000 rural titleholders and 18.000.000 urban titleholders. (More than 900.000 cadastral certificates were sent during the last year, 2001)

This activity is developed through 65 territorial branches (Gerencias Territoriales). 2.800 persons work for the Directorate General for the Cadastre, 300 of them at the Head office.

All the properties are appraised through a specific land mass valuation system. Market prices are used as a reference to assign the cadastral value to urban real estate properties. Rural properties will be appraised with the same procedures in next years.

All the properties have a unique cadastral code, used as a reference that can not be repeated. This cadastral code is the main link between the cadastral information database and other databases, as the Land Registry one.

SWEDEN

Legislation makes Cadastral handling unique for each country.

In Sweden, organisations and authorities collaborate and co-operate well. Thereby, data can be used between and in different organisations. Thus, this demands standards, which are used and developed in joint projects.

In Sweden, economical agreements and contracts are handled in a concord and uniform way.

SWITZERLAND

Increasing use of digital orthophoto maps as basis for cadastral surveying and topographic mapping.

UNITED KINGDOM

Description of the ROS system for Scotland:

A digital mapping system containing definitive extents of legal titles depicted on the topographic map (from OS-GB) along with an index map and basic textual

information is linked to a separate Land Register System containing details for each title in the register. A complementary Registers Direct System provides access to the Land Register and Index Map via a secure extranet over the web to subscribing property professionals.

Description of LRNI system for Northern Ireland:

A similar system to that of Scotland is in place and is being developed. The register details are available via landweb direct an online web service via a secure extranet to subscribing property professionals and the legal profession. The LRNI registers will in due course be integrated into the Northern Ireland Geographical Information System (NIGIS).

Description of HMLR system for England and Wales:

A similar system to that of Northern Ireland and Scotland exists and is at an advanced stage of development. The property professional can access the records via Land Registry Direct over the World Wide Web via a secure extranet. There is a close working relationship between HMLR and OS-GB with regard to the inter relationship of the Land Register and the topographic data to optimise resources and to improve the maintenance and currency of the two data sets.

SUPPORTIVE LEGISLATION ENVIRONMENT

AUSTRIA

The basic legal regulation for the Austrian Cadastre is the Surveying Act (Vermessungsgesetz), which has first been enacted in 1969 and which has been amended several times on demand of administrative or technical changes. There are a number of regulations on federal and provincial level related to the subject of cadastre and referring to the Surveying Act or to components of the cadastre. GIS in general is not yet regulated by any law, neither regarding educational issues nor for technical purposes. Therefore there is no defined responsibility for GIS.

BULGARIA

The laws of the Republic of Bulgaria that concern directly and indirectly the creation and use and of cadastral data are:

- Law on Restoration of Ownership of Forests and Land Entirety (1997)
- Law on Forest (1997)
- Law on the Ownership and Usage of the Agriculture Lands (1991)
- Law on the Civil Registration
- Law on Municipal Property
- Law on the Ownership
- Law on the Regional Development
- Law on the State Property
- Law on Cadastre and Property Register (2000, changed 2004)

CROATIA

The major law regulating Cadastre is Law on State Survey and Real-Estate Cadastre (1999.). Based on this law in last three years 8 bylaws have been put in power by SGA (5 are still missing). In 2004. SGA will release new bylaw on Real-Estate Cadastre. For Cadastre big relevance has also Law on Land Registry (1996.). In 2004. Ministry of Justice and SGA will release bylaw on Joint Land Database System. Recently SGA is working on numerous technical instructions (8 released in 2003.).

CZECH REPUBLIC

The Land Registration Act and the Cadastral Law, set down details of content and administration of the cadastre and specify the basic technical aspects. Extensive appendices cover nearly all the technicalities of the cadastre (e.g. methods of survey and their processing, accuracy parameters, working out of sub-division plan, system of codes used, extracts from technical standards, examples and specimens of outputs, etc.).

DENMARK

There is many statutes and statutory instruments which regulates the Danish cadastre. It will not make sense to list them all (only in Danish), but the most important is the Act of Subdivision and Land Registration with supporting detailed regulations.

FINLAND

The data content of the Cadastre is defined by the law on Cadastre (Law on Real Estate Register). According to the effective law all cadastral units must be available as GI objects by 2005. Same legislation covers both the municipal cadastral authorities and the National Land Survey.

New legislation of cadastral data service system is in Parliament at the moment (15.4.2002). According to the proposal the status of the common cadastral data service database will be strengthened and the GI based data service will be made mandatory in the whole country by 2005.

FRANCE

Legislation relating to GIS cadastre doesnot exist. Only the role of the cadastre service for producing paper map (and its „dematerialized” version) as well as the role of the chartered surveyors in delineating properties limits where requested by the neighbouring parties are in force. N.B.: more details may be added by the „cadastre service”

GREECE

There are two main laws that specify the framework within which the Hellenic Cadastre is developed and operates:

Law 2308/1995 that specifies the procedure according to which cadastral data are collected and validated.

Law 2664/1998 that specifies the framework within which the Hellenic Cadastre operates once the initial data have been collected through the procedure of Law 2308/1995.

Law 2664/1998 makes provisions for computer-based management of cadastral data. In addition to the above laws, there are contingent laws that influence the data collection and operation procedures (e.g. Law about the forest lands and coastal zones).

Finally, the above Laws have been modified to accommodate new facts (e.g. Law 3127/2003).

HUNGARY

There have been a number of changes in the legislation relating to land issues in Hungary which have provided a framework for the land privatisation, supported the computerisation of land records and the adoption of digital technology. It was a good opportunity for examining the existing legal framework in terms of potential restrictive practices; simplifying the regulatory framework and reviewing the legal code; reviewing the credit arrangements and resolving the issues concerning copyright and ownership. In the framework of this task, the following regulations are in effect or in preparation:

Acts:

Act LXXVI of 1996 on Surveying and Mapping Activities. In the Act the Hungarian Government defines the tasks and projects related to land surveying and mapping activities as well as provides the conditions to meet the national demands for map supply in a cost-effective way and in accordance with uniform professional standards.

Act CXLI (1997) on Real Estate Registration.

Act XLVIII. (1999) amending Act LV.(1994) on Agricultural Lands. This act stipulates for the registration of users of land of over 1 ha holdings in the land offices.

Act CXVI (2001) on the National Land Fund. The aims of the law include the rational management of state-owned lands, improved land tenure and land use conditions, as well as support for the development of viable family farms and for those whose living is based on farming.

Decrees and Directives:

The Joint decree No. 21/1997 (12 March) of the ministers of Ministry of Agriculture and Rural Development (MARD) and Ministry of Defence (MoD) allocates the tasks according on implementation of the Act on Surveying and Mapping.

The Joint decree No. 63/1999 (21 July) of the ministers of Ministries of “Agriculture and Rural Development”, “Defence” and “Finances” regulates the way of handling and supplying the surveying and mapping state data, as well as the fees of data supply.

Joint Decree No.58/1999.(VI.18.) FVM-HM amending Joint Decree No.21/1997.(III.12.) FM-HM. Subject: On execution of certain parts of the Act LXXVI on surveying and mapping. (Ministries of “Agriculture and Regional Development” and “Defence”.)

Decree No.50/1999.(V.26) FVM amending Decree No.16/1997.(III.5.) FM. Subject: On execution of the Act LXXVI on surveying and mapping. (Ministry of Agriculture and Regional Development.)

Decree No. 109/1999. (XII.29.) Enacting clause of Act CXLI. (1997) on Real Estate Registration, MARD.

Government Decree No. 184/1999. (XII.13.) Korm. On the detailed rules of registration of users of land of over 1 ha holdings in the land offices.

Government Decree 17/2002.(II.18.) Korm.: Detailed rules of property registration, property handling and utilization of National Land Funds.

Decree No.41/2002. (V.14.) FVM. (MARD) on the administration service fee for supplying certain land registration data available through query from computerised database and on data supply through data transfer network.

Decree No.98/2002. (X.17.) FVM (MARD): Modification of Decree 21/1995.(VI.29.) FM on creation and handling of digital base geodata.

Decree 33/2002.(XII.17.) GKM. Modification of Decree 6/2001. (III.19.) GM on measuring the instruments and their metrological supervision.

Directive No. 1/1998. (Ministry of Agriculture and Regional Development.). Subject: On cooperation of institutions participating in the National Cadastral Program.

ICELAND

At present there is no cadastral map legislation in place in Iceland. However Article 29 of *The planning and Building Act of 1997 (73/1997)* stated that local municipalities were required to establish a register of all farms, land parcels and land lots within the municipality. Further to this Article 1 of *The Registration and valuation of real property act of 2001 (6/2001)* under which the Land Registry of Iceland operates provided that the Land registry database should form the basis of a Geographical Information System. In order to fulfill this obligation the agency has begun the initial stages in the development of a Cadastral GIS for Iceland. A number of local municipalities have also developed GIS dealing with land records.

KOSOVO

Kosovo Cadastral Agency has drafted all relevant laws related for cadastral activities in Kosovo. Until now are approved by Kosovo Assemble law on establishment of an

Immovable Property Right Register Regulation no. 2002/22 and Law on amendments and additions to Law 202/5 on the establishment of on Immovable Property Right Register. Both laws give good background for modernisation IPRR.

THE NETHERLANDS

The activities for the registration and distribution of cadastral information are based on a Law for the Dutch Cadastre. Besides that the Cadastre is one of the shareholders of the GBKN (the large scale topographic map in the Netherlands that is integrated in LKI).

The Dutch Cadastre is a non governmental organisation but is not permitted to make profits. Tariffs must be legislated by a Ministry. They are not permitted to make (GIS) products in combination with information of other organisations. So their possibilities on the GIS market are restricted. Their costs are fully compensated by earnings in the field of registration and distribution of data.

NORWAY

Legal framework for land registration in Norway can be characterised by the followings

- Contracts are binding between the parties at the time of signature
- Registration is not mandatory, but is almost “always” done
- Registration gives protection against third party
- “Anybody” can write deeds
- No notaries involved
- Most documents are written by real estate agents and banks
- Control of the validity of signatures and content of the documents done at the registration office
- Checking are done by clerks - judges involved in difficult cases only
- The land register is a title registration system
- Users can rely on the extracted information in the register – they do not have to consult the documents
- The register gives positive and negative confidence
- The parties can rely on the registered information being correct
- The parties can rely on the registered information only
- The state compensates any economic loss due to defaults in the register provided that the affected party is in good belief
- Also losses due to fraud (false signatures etc.) is compensated

The cadastre is defined in the present “Law on Land sub-division”, together with the by-laws. This law is about to be replaced by a new law, the “Law on land registration”. The new law gives rules for a new generation of the cadastre, where the cadastral map and register are integrated in the new application. The need for better quality is underlined and there will be more comprehensive updating routines. The rules for the 3D cadastre is defined in this law, which is expected to pass the parliament in 2004. According to the new Cadastral Law and new Cadastral system, the Land Registration will be transferred to Norwegian Mapping Authority featuring

- Registration of titles, mortgages etc. will be centralised
- New technology will be introduced (electronic conveyancing)

The new law introduces 3 main elements:

- abolishment of the municipal survey monopoly, private surveyors will be permitted to conduct cadastral surveys

- ❑ legal basis for 2 new types of cadastral units - property in strata and joint property
- ❑ a new property register - the new cadastre. The new cadastre will comply with the requirements for integration of cadastral map and register

POLAND

The Polish environment law is based directly and indirectly on the cadastral system:
 For the general overview and planning
 Indirectly on the topographical maps and data which are supported and up-dated by the cadastral system,
 For the monitoring and fee system:
 - directly on the maps and data from the cadastral system

PORTUGAL

The Portuguese supportive legislation environment is based on the Decree-Law No. 172/95 from July 18, 1995, which defines the framework of the Regulations of the Cadastre of Real Property.

There are other legislations and codes that are related to cadastre, such as:

- Civil Law;
- Code of Land Register;
- Code of Real Estate Municipal Taxes;
- Legislation related to the environment;
- Legislation related to the data and information protection.

Besides that, there are some complementary legislation that has some references to cadastre.

SLOVENIA

The National Assembly of the Republic of Slovenia has adopted a new systemic organizational regulation for the field of geodetic activities. The Law on Geodetic Activities (Official Gazette of the Republic of Slovenia, 2000, No.8) was prepared by the Surveying and Mapping Authority of the Republic of Slovenia. Second important law adopted in year 2000 is Real estate property, national border and spatial units registration law. Both laws give good background for modernisation of real estate registrations. Both laws are available at the home page as follows:

(<http://www.gov.si/gu/eng/gu.html>)

SPAIN

These are the main laws about Cadastre:

Texto parcial de la Ley 39/1988, de 28 de diciembre, Reguladora de las Haciendas Locales con las modificaciones posteriores.

Ley 53/1997, de 27 de noviembre, por la que se modifica parcialmente la Ley 39/1988, de 28 de diciembre, Reguladora de las Haciendas Locales, y se establece una reducción en la base imponible del Impuesto sobre Bienes Inmuebles.

Texto parcial de renovación del catastro rústico de la ley 24/2001, de 27 de diciembre, de medidas fiscales, administrativas y del orden social.

There are other Royal Decrees, Ministry Orders, Resolutions, etc.

All this legal regulations are available at: <http://www.catastro.minhac.es/>

SWEDEN

The regulation of laws generates obstacles and limits what Cadastral data can be used for. Data can not be used or the result can not be publicly presented, if it contradicts with security aspects, personal integrity etc.

Data are not accessible, if they are going to be analysed or used for non-proper activities, e.g. some market analysis. If Cadastral data are going to be used for business, there exist regulations that control how data can be sold or developed.

The government pays for the construction of Cadastral databases. Nevertheless, the customers of data have to pay for them. This is an important system because it guides the governmental production in a proper way. If customers are prepared to pay for data then the produced data are needed. The data quality can be held on a high level.

Logical interfaces are also important because the information should be interpreted in a correct way. A lot of work is carried out regarding standardisation by the Swedish standardisation organisation, STANLI.

UNITED KINGDOM

In the UK there are many statutes and statutory instruments which regulate the operations of the central and local government organisations which collectively carry out functions which in mainland Europe are characterised as ‘cadastral’. The laws are too numerous to list here, but two relevant examples are the Land Registration Act 2002 and Land Registers (Scotland) Act 1979, The Land Registration Act (Northern Ireland) 1970, which determine the scope of the land registries of England and Wales, Scotland and Northern Ireland respectively.

There is no legislation in the UK that sets out how the data sets provided by OS-GB and OS-NI should be built and constructed.

There is likewise no legislation that requires the Land Registries to use OS-GB or OS-NI topographic data sets.

CAPACITY BUILDING

AUSTRIA

The high level qualification for the public and private sector are nearly the same. Licensed surveyors in private practice as well as officers in public sector with responsibility for cadastral affairs are obliged to undertake a five year course at the Technical Universities of Vienna or Graz. The graduation is Dipl.-Ing. or since a short period Msc. Students get a very broad qualification in all fields of technical surveying, scientific methods and legal training as well. GIS has become a focus too.

After the graduation it is required to get 3 years practical training and to pass an examination for the professional qualification.

Professional associations try to keep this high BAC+5 + 3 level for property surveyors for the future.

Especially in GIS sector there are many professionals from other courses like informatics, geography, economics e.a. On the other hand many of the graduated surveyors leave the core profession and start their professional career in related fields like communication technology, e.a.

The number of students is very low and there are many efforts to increase it.

BULGARIA

Specialized education is given on several levels. The lower level is provided in the College of Civil Building in Sofia and other similar colleges that exist in all regional cities. Both Bachelor and Master degrees are provided in several higher education establishments such as the University of Architecture, Civil Engineering and Geodesy, and the University of Mining and Geology, both situated in Sofia as well as some other universities in the country.

Additionally, state universities and other professional bodies provide specialised in-service training mainly with the focus on the use of information systems and GIS in administrations. For example, the Ministry of Agriculture and Forests has organised training for their staff in two levels:

1. For administrators in 28 Regional Land Commissions and at the Ministry of Agriculture and Forestry – they are responsible for server administration, data backup, software installation etc.
2. For users of GIS – responsible for data import, data control, operating the system, making reports and other issues.

The above mentioned activities are still not enough for capacity building. There is a strong demand for GIS courses that should be delivered in the local authorities, private and public companies.

CROATIA

There are presently two profiles educated for cadastre purposes in Croatian educational system. Through the 4 year secondary education (15-18 years) geodetic technicians (also called geometers) are educated in educational centres in 7 towns. In total some 270 – 300 scholars per year are inscribed.

University education is organised at the Faculty of Geodesy of University in Zagreb. Yearly inscription rate is 120 students. Yearly graduation rate for last ten years is 45 students in average. There is classical 9 semester curriculum (reaching dipl. ing. title), next 4 semesters (Mag. Sc.) and final 4 semesters for (Dr. sc.). It is expected in next few years to adopt Bologna declaration and change the system. At present, because of lack of professional surveyors on the labour market in Croatia an extraordinary study at the Faculty of Geodesy has been organised for some 160 students. 40 of them are supported by scholarships from SGA.

Inside SGA a capacity building programme in a frame of “Real-property Registration and Cadastre project” has started in year 2003. lasting till 2008. which should enable transformation of SGA to an efficient cadastral organisation.

CZECH REPUBLIC

A. Secondary education:

Surveying Polytechnic in Prague (for students of 15-18 years)

4-years secondary school (surveying, mapping, cadastre, cartography, etc.)

B. University education:

Ing. is the title used for MSc. Level. Most of the universities offer also the doctoral programmes (PhD.)

Czech Technical University in Prague

Brno University of Technology

Military Academy of Brno

Technical University of Ostrava

University of West Bohemia

Some other universities offer the programmes connected with cadastre including:

University of South Bohemia

Mendel University Brno

DENMARK

Surveyors can only obtain their education at Aalborg University as a five-year course of study for a M.Sc. in Surveying, Planning and Land Management. The education is based on problem oriented project work, supported by lecture courses to instruct the students in necessary disciplines and theories. The project work is carried out by groups of four to six students having a teacher appointed a supervisor. The curriculum consists of one year of basic studies followed by two years of general studies and examinations in the main fields of surveying and mapping, GIS, cadastre and land-use management, and spatial planning. During the last two years of the course, the project work has a more scientific approach and the students are given the opportunity to specialise in certain fields of the surveying profession. The final half year term takes the form of a final project for the dissertation thesis.

About 30 students graduate each year. However, the intake is increased during the recent years due to combined efforts of the university and the Association of Land surveyors. The project organised educational model includes flexibility to adapt the content of the curriculum according to the needs of professional practice and consistent with current technological development. The focus on subjects presented in the lecture courses and dealt with during the project work is easily updated or changed to reflect technical and professional development in society.

A survey is carried out every ten years. It includes identification of the area of further education and training. It is assessed whether the educational profile matches the demands of practice. And it is measured to what extent the surveyors make use of opportunities for in service training activities such as training courses and professional seminars, symposia and workshops. The match between university education and professional practice is assessed by asking the surveyors to indicate areas of their education they have not utilised in their working life, and also to indicate work areas where they feel their education was lacking. The results are rather clear. The educational profile is assessed as adequate and there are no major areas lacking. However, there may be a need to improve the areas of general management and business economics in the university programme. This again may be developed in combination with CPD programmes in the same areas. Regarding the training activities the result is very encouraging. More than 80% of the surveyors were attending such activities in 1997. Ten years ago the percentage was 72, twenty years ago it was 41, and 30 years ago, in 1967, only 11% of the surveyors attended in-service training activities. In 1997, the surveyors employed in the public sector use eight days in average on training activities. Surveyors in the private sector (outside the surveying firms) used six days, and the surveyors in private surveying practice used five days. In average the surveyors spent six days on in-service training activities in 1997. This is in fact more than recommended in the concept for Continuing Professional Development (CPD) that was put into force in January 1995. The recommended standard in the CPD concept is 40 hours per year. This is a very positive trend. The standard is voluntary and it is up to the individual members to meet the requirement in a manner suited for their own needs. On the other hand, a significant number of surveyors are still not performing training activities to fulfil the standard.

Source: http://www.ddl.org/thedanishway/surveying_6.pdf

FINLAND

Surveyors with university degree are responsible for the design and management of the land register systems. University surveying education includes substantially gi technology.

Surveyors with intermediate educational degree are normally responsible for survey operations and they are able to establish and register parcels. Also their education includes significantly gi technology.

FRANCE

Two main schools teach the cadastre practitioners. The „Ecole nationale du cadastre” in Toulouse educate the fonctionnaires that will work in the administration in charge of the cadastre and the „Ecole supérieure des géomètre topographe” who trains the surveyors (private sector) who receives the public interest mission of delineating properties. A surveyor is chartered after a two year practical experience after the school in a cabinet of chartered surveyor and is then registered as a „géomètre expert” at the „ordre des géomètres experts” (OGE).

GREECE

Currently, the main training and education that takes place comes from certain courses offered by the two surveying engineering schools that operate in Greece. Also, there are efforts to introduce cadastral courses at the graduate programs of certain Law schools in the country. Finally, certain subjects are taught at the 3-year tertiary

education schools that specialize in surveying engineering. Other universities organise seminars and lectures on the subject. All these, however, are made on an *ad hoc basis* and there is no formal program that would educate people on cadastral topics.

HUNGARY

The specialists are educated on Universities or Colleges. The modernisation tasks listed above are dependent on further development of human resources. High priority should be given to this problem, as the Land Management sector has more than 4800 employees. The training for the employees parallel with the daily activity can only partly be organised within the Land Offices themselves, so other forms of education should be applied. Also a lot of different actions are in effect or planned:

- GIS training for 800 land surveyors of Land Offices(1996);
- Training for Land Office employees in using TAKAROS system organised in various steps (1996 and 1997);
- Continuous training for county EDP managers (1995-);
- Preparation and start of a distance learning programme (OLLO - Open Learning for Land Offices) giving an academic level certificate (within institutional framework) for land surveyors. The programme is supported by EU Tempus Aid Programme (1996-);
- Preparation and start of training that give academic level certificate („Land Registration Secretary”) for Land Registration employees within the NMA organisational framework. The programme is supported by the NCP (1996);
- Management training for District and County Land Office heads (1996-97);
- Training for Land Office employees on managing state acceptance and verification procedures for digital cadastral maps supported by the National Cadastre Programme (1997);
- Creation of Human Resources Development strategy for Land Offices (1998);
- Training for Land Offices 16 employees in using TAKAROS system (1998);
- Management training for 21 new system administrator employees of Land Offices in using TAKAROS system (1999);
- Launch of SDILA (Staff Development in Land Administration) Phare/TEMPUS project (2000);
- Launch of LIME (LIME – Land Information Management for Executives), 2001.
- Launch of Land Registration Managers’ Training Course at Székesfehérvár College offering college degree training for land registration management staff (2001).
- Training for Land Office employees in using META system (2002-)
- Training for external users (public notaries, lawyers etc.) in using TAKARNET (2002-)

ICELAND

A work is underway for regulation of education and certification of surveyors.

KOSOVO

Formal education in Kosovo is organised at secondary school for geodesy and at the University of Prishtina, Faculty of Civil Engineering and Architecture - Department of Geodesy.

For all practical exercise connected with land cadastre are organised several training courses at the Kosovo Cadastral Agency and Municipality Cadastral Officiates.

THE NETHERLANDS

A lot of effort is spent on actual handbooks for the different working processes and on quality management. Some 50% of the employees is older than 45 year. So this is a special problem in education and training. In fact there is a growing need in internal technical training of employees. New (young and well educated) employees are mainly applied in the ICT division and in marketing.

NORWAY

Within the cadastre and Land Administration fields, five years courses which reflects the master degree is offered at the Norwegian Agriculture University. There are at present no schools that offer courses that lead to the bachelor degree.

Within the GI field, master degrees (in computer science) are offered at several universities. High schools offer bachelor degree in Geographical information.

POLAND

The cadastre specialists are educated at the Technical Universities in Warsaw, Cracow, Wroclaw and Olsztyn. Each cadastral performers must have a special geodetic license.

PORTUGAL

There are different levels of education that can be achieved in order to work in this area. There are the land survey engineers (five year university degree), topography engineers (2-3 years bachelors), surveyors and other GIS / Land Survey technicians (different courses levels in different institutes). The most important school for mid-level technicians is the Portuguese School of Geographical Sciences that gives a 3-year formation at surveyors, cartographers and GIS Specialists. The licensed companies that work in cadastre must have a land survey engineer as technical-director. At present, other areas such as juridical formation is increasingly needed in cadastre. For this matter they are innumerable laws schools with 4-5 years duration courses.

SLOVENIA

Formal education in Slovenia is organised at secondary school for geodesy and at the University of Ljubljana on Faculty for civil engineers and Surveyors (Department for surveyors).

For all practical exercise connected with land cadastre are organised several training courses at the Surveying and Mapping Authority and at the section for surveyors inside Slovenian chamber of Engineers. At the Slovenian geodetic institute is also organised training centre for geomatics.

SPAIN

The Directorate General for the Cadastre is part of the Ministry of Finances. The "Public Finance School" (Escuela de Hacienda Pública) is the institution in charge of developing the education and training programmes for civil servants, working in the Ministry. Every year the School and the Directorate General work together to design specific programmes focusing on Cadastre. As an average, every civil servant participates in two different workshops every year.

There are different workshops for the different groups of employees. New employees have to go through different tests

SWEDEN

In Sweden, GIS-educations can be described as:

- Land surveyors (technical (geodesy, photogrammetry and GIS) or real estate surveyor (GIS and Cadastral)). These are educated in Stockholm and Lund (only GIS and Cadastral). 4.5 years masters of science.
- GIS engineers (not cadastral). In Gävle, Helsingborg, Karlstad, Trollhättan, Kiruna. 2-3 years bachelors.
- City planners (GIS and planning). In Stockholm, Göteborg, Lund, Luleå. 4.5 years masters of science.

SWITZERLAND

On the university level, there are education programs in surveying on both campuses of the Federal Institute of Technology (ETH), one in Zurich and the other in Lausanne. Both offer programs equivalent to Masters degrees, which focus more on rural and environmental engineering with mostly optional courses in geomatics. The tendency towards environmental engineering over the last few years is actually a big challenge for geomatics. Around 50-60 students graduate from both ETH's combined each year.

In Switzerland, there are also two technicums that offer bachelor degrees in surveying (in Muttenz and Yverdon). Both technicums combined have 20-30 graduates annually.

UNITED KINGDOM

Provided by the academic community, professional bodies, and on-the-job the job training. There is no registration of surveyors in the UK.

INSTITUTIONAL NETWORKING, LINKS WITH NATIONAL GI ASSOCIATION

AUSTRIA

There are two main associations related to GIS in Austria:

The Austrian Society of Surveying and Geoinformation (OVG) is an association of about 700 individual members representing the profession in its original definition.

OVG is very active in many international associations as FIG, ISPRS, e.a. www.ovg.at

The Austrian Umbrella Organisation for Geographic Information (AGEO) is an umbrella organisation of 44 institutions representing all major interest groups of GI from private and public sector in Austria. www.ageo.at. AGEO has initiated many activities on GI in Austria since the foundation in 1998. There are close links to Pan-European GI associations and to Austrian organisations dealing with related matters.

As a result of the current efforts to co-ordinate GI in Austria, there will be a national advisory board for GI, in which AGEO will be represented.

The Federal Office for Metrology and Surveying (BEV) acts as a co-ordination point for many activities on the GIS related cadastral issues.

The Federal Chamber of Architects and Engineers (BAIK) with a special branch for licensed surveyors is the main representative for cadastral issues of the private sector.

BULGARIA

There are two associations related to the topic (Cadastral GIS). They are the following:

- Union of Surveyors and Land Managers in Bulgaria - it gathers all surveyors in Bulgaria and companies working in the land management.
- Association for Geospatial Information in South East Europe (AGISEE). The members of this association are from Bulgaria, Romania, Turkey and the Western Balkan countries. It is a newly created association bringing together interested parties from all over South East Europe. Its main goal is promoting Geospatial Information and supporting the creation of GI infrastructures in the region. It is in a good relationship with EUROGI.

CROATIA

The Croatian Geodetic Society (CGS) is umbrella organisation which gathers all surveyors in Croatia. In Croatian Chamber of Engineers in Architecture and Civil Surveying some 450 professional surveyors are listed as members. At the same time 475 private or legal persons are licensed by the SGA to execute works in state surveying and real-estate cadastre. Executing National Program of State Survey and Real-Estate Cadastre for period 2001.-2005. SGA is gathering companies executing the Programme. Beside CGS, Croatian Informatical Association is covering brighter spectrum of GI in Croatia, and Croatian Cartographic Society a cartographical GI aspects. All mentioned organisations are networked among them but there is no official national body covering this issue. SGA is member of all of those organisations.

Executing above mentioned Program SGA has established stakeholder network including some 200 ministries, municipalities and public enterprises participating in its execution.

CZECH REPUBLIC

An interdisciplinary and cross-sectors network directly dealing with the issues of cadastre was established in the Czech Republic in the year 1999. The association of Nemoforum is not a legal entity nevertheless it means an important national platform supporting information exchange and co-ordination of activities and development related to information on real estate and land and in some extent to GI in general. The 17 corporate members consist of public institutions (ministries, central agencies and the Union of towns and municipalities) and professional corporations and several universities.

Czech Association for Geo-Information (CAGI) is an active member of the Nemoforum. The representative of CAGI carries the role of a vice-president representing the private and academic spheres of Nemoforum. The representative of Czech Office for Surveying, Mapping and Cadastre (COSMC) is the other vice-president leading the public sphere (governmental institutions and municipalities). The experts from both of these spheres co-operate in 4 working groups: 1-NGII, 2-spatial identification, 3-cadastre, 4- support of land market. A significant role of Nemoforum is organising seminars and workshops on related topics to support the exchanging experience, views and opinion. Cadastre related issues are of prior importance within this awareness rising activity.

The members of Nemoforum participate also in other networks as EuroGeographics (COSMC), EUROGI (CAGI), FIG (COSMC and Chamber of Valuers), AGILE (Masaryk University).

DENMARK

GeoFORUM Denmark, <http://www.geoforum.dk/>

Danish Association of Land Surveyors, www.ddl.org

National Metadata, www.geodata-info.dk

The Public Information Server, www.ois.dk

E-gov, www.e-gov.dk

Society of coordination of Spatial data infrastructure, www.xyz-geodata.dk

Inspire, www.inspire-denmark.dk

FINLAND

The National Land Survey and the association of the municipalities are members of the National Council for Geographic Information and advisory board of public data management. National Land Survey is also member of Register Pool, which is a co-operation body between the official national registry organisations.

FRANCE

Both OGE and the service in charge of the cadastre (from the ministry of economy) are full members or the National council for geographic information (CNIG) which is in France in charge of advising the government on national policy for GI and networking the players from the public sector. They both belongs to AFIGÉO which brings to the debate both the private and public operational actors. The current president of AFIGÉO is Dominique Caillaud, member of the French Parliament.

GERMANY

The Federal Republic of Germany has a population of some 81 million people over 357,000 km². It is organized in 16 states (Länder) and some 8500 municipalities. Each state is responsible inter-alia for its own topographic service, land and property registers, and environmental and statistical data collections.

The surveying and cadastral administrations of the 16 states and the Federal Ministry of Interior with its Federal Agency for Cartography and Geodesy, the Ministry of Defense by the Agency for Military Geographical Services and the Federal Ministry for Traffic, Building and Housing with its department for railways and water streets collaborate within the Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany (AdV). (<http://www.adv-online.de>). They work on technical matters of fundamental and supra-regional importance in order to find and to adopt uniform nation-wide regulations. AdV is coordinating all activities in the field of cadastre, surveying and mapping within Germany, which includes also provision of common documentation of data available and a uniform pricing policy for topographical geo data. AdV published a geo data modeling concept (<http://www.adv-online.de/neues/inhalt.htm>) in 1997.

National umbrella GI Association: DDGI

GREECE

A large portion of the surveying engineering industry that is involved in the cadastre participates actively in the activities of HellasGI.

Conversely, a large portion of the HellasGI membership is comprised by professionals active in cadastral operations. Also, significant percentage of the Boards members of HelasGI have had a significant role in the Hellenic Cadastre while another significant portion of the Boards has shown an interest and involvement. In the HellasGI conferences there have always been sessions dedicated to cadastral issues.

HUNGARY

Production of large scale base maps including cadastral maps fall under the responsibility of the Ministry of Agriculture and Rural Development (MARD).

The Hungarian governmental organisational framework is acting under the supervision of the Department of Lands and Mapping at the Ministry of Agriculture and Rural Development (MARD/DLM). It is responsible for establishing, maintenance and supplying of the geodetic control networks, the large scale base maps including the cadastral ones, the land registry, land protection and valuation, the topographic maps of selected scales and the remote sensing. Special emphasis is given to the tasks related to the implementation of the National Programme of the Adoption of the Acquis Communautaire.

The Department of Lands and Mapping is organised into four divisions:

- Division of Surveying: tasks relating to control point networks, national cadastral and topographic maps as well as regulations and rules on national mapping and surveying.
- Division of Land Registration: real property registration, land area data supply, legal measures pertaining the dept, and revises the appeals against land office decisions.
- Division of Land Protection and Land Valuation: tasks relating to licensing of non-agricultural use of croplands, control of utilisation obligation of croplands, support of land restoration and land use as well as supervision of measures on land consolidation.

- Division of Land Control and Development: control of land administration activities, technical upgrade of the land offices IT development, co-ordination of the NPAA framework, developments in GIS, spatial data infrastructure (SDI), remote sensing.

The above mentioned works are carried out by the following organisations:

- Institute of Geodesy, Cartography and Remote Sensing (FÖMI) as governmental organisation with nation-wide competence,
- National Cadastral Programme Non-profit Company,
- 19 County Land Offices (CLO) and the Budapest Land Office as governmental organisations with territorial competence,
- 116 District Land Offices (DLO) and the Capital Districts Land Office as governmental organisations with territorial competence,
- Office for National Cadastral Programme, as non-profit organisation.

The National Cadastral Programme Non-profit Company started its activities in August 1997, when the first credit was signed. This amount was 2.6 thousand million HUF. (EURO 10.4 million). The second credit possibility of 6.6 thousand million HUF (EURO 27,4 million) Out of this amount 4.3 thousand million (EURO 17.8 million) has already been spent. Thousand million HUF was spent on digital mapping projects (EURO 2.5 million), 1.2 Thousand million HUF (EURO 4.9 million) was spent on HW and SW for land register offices However, this amount is going to be refunded to the Non-profit Company. 44 million HUF was spent on training programmes and others expenses like operational costs of Non-profit Company and others. So far the Company carried out more than 90 public procurements for digital mapping. 67 settlements are completed. The total area involved in digital mapping is about 600 000 has including many cities and some districts of the capital. Today the company has a credit possibility of 9.8 thousand million HUF (EURO 40,7 million) for the acceleration of the National Cadastral Programme. The deadline of the produce of the whole country is 2007.

According to the best scenario, all of the cadastral maps of the rural areas could be digitally provided for multipurpose use by the year 2005. The approval of the proposal is subject of Governmental decision. For more information: www.fomi.hu, <http://fish.fomi.hu>, www.takarnet.hu

ICELAND

The Icelandic Land Registry (www.fmr.is) is responsible for managing and developing the Cadastral GIS. The Land Registry is also developing links with other government institutions and with local municipalities with regards to data collection and sharing. A majority of institutions, organisations and private companies involved in GI in Iceland are members of the National GI organisation, LISA

KOSOVO

In Kosovo only KCA with MCO is responsible institution for Land Cadastre. In future planned to be connected with different departments, associations, Ministries etc. like:

- Association of surveyors of Kosovo
- Ministry for Planning, Environment and Planning
- Ministry of Agriculture
- Statistical Office
- Private geodetic company etc.

Kosovo Cadastral Agency are work together with Governmental Centre for informatics at electronically land cadastre and other geodetic data access and dissemination

THE NETHERLANDS

All employees are internal connected trough intranet servers. Mails can also be send and received on Internet (Outlook express). In some cases this is also used for the attachment of GIS information (small files).

A public access is provided to general information and metadata trough web:
<http://www.kadaster.nl>

There are links with the site of the NCGI (National Clearinghouse Geo-information) and the site www.gbkn.nl

NORWAY

The automated Census project: Co-operation between, the Norwegian Mapping Authority, The Central Bureau of Statistics, The directorate for taxation, the population register and the municipalities.

There are extensive co-operations on establishment and maintenance of large-scale geographical information databases. The contributors are the Norwegian Mapping Authority, The municipalities, the national road administration, the public agriculture administration, the telecom industries etc. The cadastral map layer is included in these joint projects. In short: There are agreement on national level, there are joint production plans, there are agreements for how the costs should be divided, and at the bottom; an agreement on standardisation.

There are agreements on data exchange between the GAB-register and the national post register (on addresses and postal code), and with the national population register (on addresses and names etc).

On the topic standardisation, there are extensive co-operations among the most influential public sectors and these efforts are heavily supported by commercial GIS companies.

The Norwegian GI organisation is called Geoforum. (Organisation for Geographic information) They play an important role in arranging meeting-places and conferences both on national and regional level. The main event is the National conference on Geographic information where especially officials from the municipalities, various governmental bodies and software providers attend .

Internet-based applications have resulted in more focus on the legislation, the rules and the techniques for electronic signature.

POLAND

The National geodetic and cartographic service is constituted by the state and local governments on the district, region and country level.

National GI Association has social character and supports the governmental organisations with opinions, suggestions and information given in professionals journals and GISPOL Bulletin.

The organisational aspects of the Polish GII:

- Changing as regards reporting, yet uniform in content, manner of collecting the materials in the state geodetic and cartographic data resources.

In the course of various stages of centralisation and decentralisation of the state, there were changes of names but not of the essence concerning places of gathering and processing of geodetic and cartographic documentation, hence the spatial information gathered is uniform all over the country.

- A unique fund for managing the geodetic and cartographic data, built of charges for making the data available and meant to be used for gradual improvement of the data resources.

A substantial yet constantly threatened achievement is a separate fund made up of proceedings from making spatial information available, to serve the purpose of modernisation and processing such information, and modernisation of centres storing that information. Maintaining such a separate fund allowed for swift modernisation and equipping the centres of geodetic and cartographic information.

- A civil-code-induced system of protection of geodetic signs.

According to the Civil Code (Kodeks Cywilny), geodetic signs are subject of protection by owners of real estates where they are located. This increases the respect for the basis of spatial information.

- A uniform, in the entire country, system of registering documents being input to the geodetic-cartographic data resources (the OŚRODEK /centre/ software system) which allows to receive, process and make available the data stored in the geodetic and cartographic resources.

Having a wide variety of software systems functioning in Poland, and facing the substantial expansion of companies grouped in OGC, the existence of practically uniform software system for gathering and maintaining the documentation (the OSRODEK system) in centres of storing spatial information deserves recognition.

- The requirement for a uniform system of digital spatial data exchange (SWING SWDE) which, taking into consideration the substantial amounts of digital maps and a proper co-ordination policy shall allow to establish a uniform GIS in the country in a short time.

The SWDE shall, in particular, allow to unify the cadastral basis of GIS.

This coherent and legally protected system of defining, gathering, processing, and making geographic information available enables to maintain constant updating of basic information sets (cadaster, basic map, inventory of utilities) and, after the principles for generalisation and data exchange are formulated, shall allow to maintain constant updating of other types of maps as well as basic data in the topographic and geographic database.

PORTUGAL

The Geographical Portuguese Institute (IGP), under the Ministry of the Cities, Local Administration, Housing and Regional Development is the national authority of Cadastre, responsible for the execution of geographic national policy. With the ministerial regulation n° 10783/2003, it was deliberated that all the investments in this area need to be articulated with IGP, in order to avoid wastes and save the interests of the nation e to give sustainability to the national agenda of geographical information.

- Geographical Portuguese Institute: www.igeo.pt
- Army Geographical Institute: www.igeoe.pt
- Hydrographical Institute: www.hidrografico.pt
- Institute of Tropical Scientific Institute: www.iict.pt
- Institute of Rural and Hydraulic Development: www.idrha.min-agricultura.pt
- General Direction of Florests: www.dgf.min-agricultura.pt
- Environment Institute: www.iambiente.pt
- Mining and Geological Institute: www.igm.pt
- Water Institute: www.inag.pt
- Portuguese Association of Land Surveyors Engineers: www.ordeng.pt

- Geographical Information Users Association: www.usig.pt

SLOVENIA

In Slovenia are active several institutions connected with land cadastre:

- Association of surveyors of Slovenia
- Slovenian Chamber of Engineers – section of surveyors
- Association of private geodetically company

Surveying and Mapping Authority are work together with Governmental Centre for informatics at electronically land cadastre and other geodetic data access and dissemination

SPAIN

All the institutional networks are connected through Intranet servers that communicate around an 80% of the employees too.

The intranet contains a wide range of information concerning legal regulations, usual questions, education and training programmes, the Quality Plan, the annual Plan of Objectives, manuals, and others.

Also a public access is available through the website <http://www.catastro.minhac.es>
This Website contains information in English. Its visit is recommended. The website has no links.

SWEDEN

The Swedish Map Council, www.lantmateriet.se

The Swedish Credit Market Council, www.lantmateriet.se

The Swedish Land and Real Estate Council, www.lantmateriet.se

The Swedish Location Name Council, www.lantmateriet.se

The Swedish Development Council for Land Information, www.uli.se

The Swedish Cartographic Society, www.kartografiska.com

The Swedish Society for Photogrammetry and Remote Sensing,
www.geomatics.kth.se/~ssff

The Society for Land Surveyors, www.lantmatrare.a.se

The Swedish Standards Institute, www.sis.se

The Society for Map Techniques, www.kifdirekt.nu

The Society for Mapping and Surveying, www.skmf.org

A report called REGGIT was produced 5-6 years ago by the ministry. It regulates how geographic information should be produced and used in Sweden. In 1992, Statskontoret wrote a report about price regulations in Sweden.

SWITZERLAND

Most of the cadastral surveyors are member in the "Swiss Association for Surveying and Rural Engineering" (Geosuisse), which has some 830 members. 'Geosuisse' is member in FIG and is committed to the advancement of professional interests. The private sector cadastral surveyors are maintaining their own section within 'Geosuisse': the "Swiss Cadastral Surveying Association" (Ingenieur-Geometer Schweiz, IGS), which is representing the interests of the private sector.

The cantonal agencies for cadastral surveying are cooperating with each other and meet at least twice a year in the "Conference of the Cantonal Cadastral Surveying Agencies" (Konferenz der Kantonalen Vermessungsämter, KKVA), where structural

and strategic matters are being discussed in close cooperation with the Federal Directorate for Cadastral Surveying (V+D).

UNITED KINGDOM

Networking does exist among the central and local government organisations, which carry out functions of a 'cadastral' type, but not necessarily on a systematic or regular basis. Non Governmental Organisations such as the Association for Geographic Information (AGI) also provide opportunities for such organisations to network and share information, techniques, best practice, etc. There are a range of discipline oriented organisations, professional institutions and associations other than the AGI that provide strong net working and that support Land and Property. e.g. RICS.

AGI position on the proposal to establish a permanent commission on Cadastre within the European Union. The AGI does not support the EU Spanish Presidency proposal to establish a permanent commission on Cadastre within the European Union. Geographic Information (GI) and the associated technologies (GIS) are all pervasive and are used across a very wide range of disciplines, many of which are not related to the cadastre either now or in the future. GI and GIS are used extensively within the UK, which is well advanced in the use and exploitation of GI and the associated technologies. It has a buoyant market place, a strong GI Association in the AGI and all of this takes place without a national cadastre. There are a whole range of data sets within the UK that cover the whole country from an aggregated (small scale) through to a detailed level (large scale). There are a range of national initiatives that are building comprehensive reference data sets that cover street, land, property, land use, fields, topographic, aerial imagery, etc. which are supportive and becoming an integral part of the UK Government e-Government initiative. As a point of interest – the AGI would challenge any suggestion that the lack of a cadastre within the UK has held back the development, use and exploitation of GI and the associated technologies within the UK. The AGI view is that both at the UK level and the European level there is a need for an independent Information Commission that embraces all information including GI that will ensure Europe prospers from the information age. Fragmentation into permanent committees that deal with just one part of the total information set as is proposed for the Cadastre, etc. does not assist in delivering the Information Age and Knowledge Economy strategies and initiatives agreed by the European Council of Ministers.

ILLUSTRATIVE EXAMPLES OF URBAN APPLICATIONS

AUSTRIA

There is no difference between urban and rural applications. All legal regulations refer to parcels or projects without regarding any distinction. It depends on the subject which regulation is relevant, not on the surrounding.

There are incountable applications of cadastral GIS in Austria in urban areas, some examples are:

- Spatial planning
- documents for building permits
- environmental planning
- real estate management
- taxation of property

BULGARIA

A number of projects have been carried out in Bulgaria that use cadastral data or contribute to the realization of computerized use of the cadastre:

- “Collaboration in the area of measures for carrying out of Information policy of land and real property” , funded by Dutch Government (1995)
- “Assistance for implementation of new legal norm of cadastre and public information about real property” , funded by PHARE programme – partnership 96, EC, France and Bulgarian Government (1999)
- “Geodetic Network with Local Purpose”, funded by the World Bank and Bulgarian government (2002) , Cadastre Agency
- “Cadastre and Real Estate Registration” , funded by the World Bank (2001)
- Pilot project: “Land Consolidation Agreement in Bulgaria” (final step in 2004) –agriculture land consolidation plan was presented and accepted by the owners on the village of Golesh, municipality Kajnardzha.
- “Development of high level GPS network” , funded by the World Bank (2004)

CROATIA

Examples of urban applications of land cadastre datasets are:

- Preparation of urban plans
- Preparation of documents for building permits
- Underground infrastructure cadastre, utility companies
- GIS system of town of Zagreb

CZECH REPUBLIC

There is a high number of existing functional GIS applications implemented on different levels of public administration in the Czech Republic. The cadastral data plays an important role in these systems as it supports administrative agendas, planning processes or public information services in both the urban and rural spheres. The given www-addresses introduce mainly solutions in the Czech language, offering some short description in English and map illustrations.

- *Geo-application of the Year Contest*: <http://www.cagi.cz/html/geoap2000/3.png> - <http://www.cagi.cz/html/geoap2000/27.png> - <http://www.cagi.cz/html/geoap2000/28.png>
- *Economic Development*: IRIS - an Integrated Regional Information System http://irisps.crr.cz:8080/site_iris_czs/site_iris_cz.home
- GIS-MISYS Česká republika, www.gepro.cz/GEOAPLIKACE/GA_01/INDEX.ASP; www.opava-city.cz
- Transportation & Service Routing (GIS-MISYS Česká republika): http://www.gepro.cz/GEOAPLIKACE/GA_01/INDEX.ASP
- Ring road of the Chrudim town – GIS supported evaluation of road variants

Housing

- Comprehensive GIS supported statistical inventory in 2001 organised by Czech statistical office
- Municipal solutions as in Hradec Králové, www.mapy.hrdeckralove.org

Infrastructure

- Digital technical maps of cities as Pilsen, Kladno, and others, see www.gepro.cz/produkty/geoaplikace.asp
- utilities management – GeoArchive at the Municipality Office of Pardubice, www.geovap.cz/html/geoarch.htm

Health and Social Welfare

PAN – spatial analysis of unemployment – GI support for labour offices in the Czech republic, see <http://gis.vsb.cz/pan/>

Tax

GIS supported detection and localisation of not-payers, see www.gepro.cz/GEOAPLIKACE/GA_01/INDEX.ASP

Human Services – address points and GIS supported public services as in Nymburk, www.oku-nbk.cz/

District or city and region of Pilsen, <http://info.plzen-city.cz/gis/>; district of Kutna Hora, see <http://oku-kh.cz/gis>

Law Enforcement

PUKNI - Browser of cadastral data (real estate register) including digital maps in various format – GI support to agendas and control related to subsidies in forestry and agriculture

Civil Protection - ARGIS

Emergency Management & Services – GIS support for the Centre of Emergency Calls of the Integrated Rescue System in Ostrava; <http://ctvmo.cz>

navigating emergency cars in the Pilsen region, see http://www.kr-plzensky.cz/Plzensky_kraj/gis/navigace.asp

Elections – GIS application for the elections to the Parliament (by Czech statistical office) and to the local government of Kladno, see www.gepro.cz/produkty/geoaplikace.asp

Land Use Planning – many existing applications for physical and urban planning on the level of regions, districts, large or small towns, as see: <http://www.wmap.cz/region>; <http://dokumenty.prague-city.cz/uplan/start.htm>; <http://www.hrdeckralove.org/>; <http://info.plzen-city.cz/gis/>; <http://mu-novyjicin.tmapserver.cz/>

Parks and Recreations - environmental Atlas of Prague based on GIS analysis, modelling and presentation of environmental data: <http://www.premis.cz/atlaszp>
WEB of Hradec Kralove (publication system and map server): www.hrdeckralove.org/
Nature and landscape protection, including monitoring systems: www.schko.cz

Citizen Information (e-Government, Governmental portal, Internet access, Telehousing, 1 stop-shop) - ISKN – e-access to information on real-estate ownership; meta-data information system called MIDAS - Clearinghouse for Geo-information, see [http:// www.cagi.cz/midas](http://www.cagi.cz/midas)

DENMARK

Examples of rural applications of land cadastre datasets are:

Housing: Ministry of Economic and Business Affairs has developed a web portal: Public Information Server. The portal is not a GIS application. From the portal the user finds information from the House and Building Register, Cadastral Register (not the cadastral map) Property Tax Register and Planning register. Please see the Danish site on: <http://www.ois.dk/>

Health and Social Welfare: The Danish Cancer Institute has undertaken investigation of area dependent incidence of cancer. The cadastral map, addresses, building, etc were used for the investigation. No public sites are available.

Tax. Please see note number 1.

Land Use Planning. Cadastral data and planning data is used in several applications. The applications might not be true GIS applications, however, it is possible to view data from different sources. Example <http://kort.plandk.dk>. another example: <http://195.215.135.107/scripts/dyn3.pl?prog=show&pagename=kprammeplan&id=B.1.20&m1=3&m2=11&m3=1>

Citizen Information (E-Government, Governmental Portal, Internet Access). Please see note number 1

Infrastructure. Noise reduction. No public site available. See example <http://www.tetraplan.dk/programmer/mapnoise/sld014.htm>

During summer 2002 Denmark was hit by Newcastle disease. Ministry of Food, Agriculture and Fisheries launched a Internet site where farmes could follow the extend of the dicease. The site was based on information from topographical maps, cadastral data, addresses, etc. The site is closed.

FINLAND

Cadastral internet service exists to support municipal landregistration

<http://kuntaliitto.fi/kik2000> user: kik2000 psw:kml2000

FRANCE

Booklet is available illustrating the use of GI in urban governance. Please contact AFIGÉO www.afigeo.asso.fr

GERMANY

Imagine an architect who wants to realise a small trade building in a residential area. Therefore he must analyse cadastral, planning and other data of the responsible municipality. Currently these data are available in different municipal offices where they are only partially in digital form, and often in different data formats. A general approach is the cadastre in its multi purpose function within Germany.

Imagine a consultant who has a contract to build the "Magnetic Levitation Train Transrapid" (http://www.transrapid.de/pdf/tri_engl.pdf) between Dortmund, Düsseldorf and the airport of Cologne, Germany. Since the study area crosses several municipalities, the project manager contacts these municipalities for the relevant cadastral reference data. In addition - for the most recent aerial photographs, the specialist has to individually contact the surveying and mapping agency of NRW and / or private companies that obtain aerial photography for the area in order to determine

who has the most recent data. Cadastral and national mapping data has to be combined.

HUNGARY

Digital product service for utilities and facility management, including water, electricity, road and transport, railway, canals, telecom, gas. AM/FM is the largest stakeholder as application field in the GIS market. Major players are the SMEs. Building cadastre, real estate valuation, land use, construction works, impact analysis, investments related applications.

Services are regulated by Law and Directives. The character of the service is multipurpose use of land registry and cadastre information.

One of the most useable framework data infrastructure is MATÉRIA of the Central Statistical Office. The Institute of Territorial Planning provides information service called TEIR. Metadata services are FISH, METATÉR and KIKERES maintained by FÖMI, Geological Institute and the Office of the Prime Minister respectively.

ICELAND

The online version of the Reykjavik GIS can be accessed also using

<http://eldey2.bv.rvk.is/website/bvs/bvs.html>

KOSOVO

Examples of urban applications of land cadastre datasets are:

- Preparation of urban plans
- Preparation of documents for building permits
- Establishing cadastre of buildings
- Real estate tax

THE NETHERLANDS

- Trends in selling prices of properties (different kind of houses in the different regions), every 3 months statistical overviews. Highly awarded by national journalistics and taxation applications.

- Selling prices of houses in connection with living-addresses (for potential sellers and buyers).

- Parts of the cadastral map in connection with addresses or owners.

- Selection of cadastral parcels in connection with certain rights or dates of selling.

- Stock farming – stench policy

- The probability of agricultural land-changing to non-agricultural use

- The silence map of the Netherlands

Details can be found at:

http://gis.vsb.cz/webcastle/scripts/result.php?KB_Code=win1250&PF=DS&ID_System=guest&Vmod=All&Pressed=hlavni_abc

NORWAY

Urban Applications

Byggsrk. Find some examples on www.statkart.no/cerco

Transportation

There are various applications for transportation and service routing. Necessary data are standardised addresses with co-ordinates (completed nation-wide), road database and raster-based map database. Applications designed for ambulances, fire brigade, police etc.

Housing

Cadastral data include a complete database of dwellings, this is used for formulating a housing policy applied on national, regional and local level

Support Land Registry, Providing Cadastral Mapping And Service, Guidelines Rural21, Agrostatistics, Land Use/Land Cover, Land Protection, Valuation Land Privatization, Land Consolidation

For all items are being developed applications supporting the tasks. In general, private software companies provide the applications, and a necessary basis is updated high quality cadastral data

POLAND

A special STRATEG system (See Section 1) has been introduced in many towns, for example: Olsztyn, Piotków Trybunalski, Pabianice.

PORTUGAL

Examples of application areas of cadastre GIS applications:

- Environmental protection and management;
- Urban Planning;
- Forest evaluation and management;
- Agriculture evaluation and management;
- Identification and definition of real estate patrimony and taxes.

SLOVENIA

Examples of urban applications of land cadastre datasets are:

- Preparation of urban plans
- Preparation of documents for building permits
- Underground infrastructure cadastre, utility companies
- Establishing cadastre of buildings
- Real estate tax

SPAIN

- Taxation applications:

There are seven different taxes (three national, two regional and two local) set upon cadastral information. The importance of the Real Estate Property is highlighted here. Local tax collecting every year more than 4.216.000.000 € income. The gross base is determined applying to real estate values, assigned by the Directorate General for the Cadastre, the tax rate that the Town Hall approves.

- Land Registry applications:

The Cadastre provides to the Land Registry before the title inscription, information about the real estate properties. The Cadastre also supplies cartography and other needed information. The Land Registry and the Cadastre are linked on daily basis through the cadastral code. The notaries and Land Property Registrars are obliged to submit to the Cadastre all the information concerning the documents that they have authorised or registered.

- Urban Planning applications:

Cadastral information is also used to create and to manage Urban Plans (e.g., the cadastral digital cartography.)

- Public Assistance applications:

Whenever a citizen requires certain kind of economic public help (home aids, scholar grants, and others)

SWEDEN

In Sweden, there exist no specific differences between urban and rural applications. To name some of the application areas of Cadastral-GIS (rural):

- Forest taxation
- Forest evaluation and management
- Transport planning (road database)
- Fertilising of agriculture areas (GPS and GIS)
- EU-support (investigations and distribution of agriculture support from EU)
- Environmental protection

SWITZERLAND

Some applications include:

Economic Development, Housing

Infrastructure

Taxation

Law Enforcement

Civil Protection

Emergency Management & Services

Land Use Planning

Parks and Recreation

Citizen Information (E-Government, Governmental Portal, Internet Access,

Telehousing, One Stop Shop)

UNITED KINGDOM

Land Registration activities in Scotland make no distinction between Urban and rural areas and both benefit from the same underpinning legislation. Remember though there is only approximately 35% coverage of Scotland in the Land Register as noted in the answer to question 1.1. It is unknown what the relative % coverage is across different urban/rural areas but it is known that it varies dependent on the Land Register operational date of particular geographic areas of Scotland.

There are property-related database(s) available within the UK that do not use the topographic data available from OS-GB due to the cost of the data and the licence restrictions. e.g. GOAD data.

ILLUSTRATIVE EXAMPLES OF RURAL APPLICATIONS

AUSTRIA

As mentioned before there is no difference between urban and rural applications. All legal regulations refer to parcels or projects without regarding any distinction. It depends on the subject which regulation is relevant, not on the surrounding.

There are innumerable applications of cadastral GIS in Austria, some examples are:

Examples of rural applications of land cadastral GIS are:

- natural hazards prevention
- emergency services in natural risk zones
- agricultural subsidies
- forest management
- cadastre of vineyards
- land consolidation
- land taxation
- protection of nature
- water management

BULGARIA

The previous section listed several projects in Bulgaria. Part of them have direct impact on the use of the rural cadastre. With respect to the rural cadastre, the most important project is the pilot project: “Land Consolidation Agreement in Bulgaria” (final step in 2004) –agriculture land consolidation plan was presented and accepted by the owners on the village of Golesh, municipality Kajnardzha.

CROATIA

Examples of rural applications of land cadastre datasets are:

- Subventions in agricultural
- National register of vineyards – GIS based system developed by Croatian Institute for Vineyards and Vines and supported by SGA
- Kornati National park GIS pilot project based on the renewal of cadastral and land registry data
- Sorting out unsorted (unregistered or improperly registered) state owned agricultural land in Croatia – 65 ongoing and 90 pending projects with municipalities.

CZECH REPUBLIC

SUPPORT LAND REGISTRY –

POZEM – GIS support for land registration and consolidation used in 60% of districts in the Czech Rep.

ZRUIN – pilot project and law preparation concerning the authentic/basic register on spatial identification and real estate

PROVIDING CADASTRAL MAPPING AND SERVICE IMPLEMENTING POLICIES CAP (LPIS, CwRS), AEMS, GUIDELINES RURAL21 ETC., AGROSTATISTICS, LAND USE/LAND COVER –

IACS implementation, BPEJ (digital maps on soil and ecological rating and the country wide spatial units related to the cadastre)

LAND PROTECTION, VALUATION –

Digitalisation of the vineyard sections in the district of Znojmo and dissemination to the end users (CD-ROM);

information on land valuation, and or land value maps accessible via Internet –

<http://muris.mepnet.cz/public/menu/cpm2002/htm> or

http://www.cscom.cz/start_flash.htm

LAND PRIVATIZATION, LAND CONSOLIDATION –

a land consolidation pilot project in Kardasova Recice (COSMC and district authority of Jindrichuv Hradec together with the Dutch cadastre)

DENMARK

National Survey and Cadastre Denmark has created several illustrative GIS applications, which has been further developed by private companies. Example:

[http://www.kms.dk/C1256AED004E87BA/\(AllDocsByDocId\)/E3860C1592DC9A2CC1256B92003B3BE2?open&page=prvselv&omr=ERHVGIB](http://www.kms.dk/C1256AED004E87BA/(AllDocsByDocId)/E3860C1592DC9A2CC1256B92003B3BE2?open&page=prvselv&omr=ERHVGIB)

The most important tool is the “KMS Map Supply”, which is a national geodata warehouse. The Danish site is to be found on:

[http://www.kms.dk/C1256AED004E87BA/\(AllDocsByDocId\)/EA08FB744ABCAB9FC1256D1A0030DB87](http://www.kms.dk/C1256AED004E87BA/(AllDocsByDocId)/EA08FB744ABCAB9FC1256D1A0030DB87)

FINLAND

Internet map service is publicly available with links to the cadastral system and real estate purchase register. See http://www.nls.fi/jako/norm/index_eng.html.

GERMANY

The EU wants to control the area based arable and forage subsidies using remote sensing and other reference data (done in the project INVEKOS). In North-Rhine Westphalia, the digital cadastral information will be used to build up an rural land use cadastre.

HUNGARY

A methodology for the computer i.e. GIS-aided land consolidation has been elaborated in the 90s in Hungarian-German technical co-operation framework. The project delivered methodology for the organisational and institutional procedures in a multiagency environment, helped to set up the basics for the legislation needed and also achieved results providing know-how in education and training as well as awareness raising. The project conducted two workshops (in December 1999 and December 2000) with international participation in order to verify the results and sharing the experiences. In Hungary land consolidation is an emerging issue. The departments of the Ministry of Agriculture and Rural Development and their institutions are the main stakeholders to ensure sound legislation, appropriate methodology and supportive institutional framework with capacity building and pilot projects. The Ministry has strengthened its bilateral co-operation with the Dutch DLG/Kadaster implementing pilots related to Integrated Development and to elaborate land consolidation strategy applicable in the implementation of the mega-engineering Tisza flood prevention works. A FAO Technical Co-operation Project Proposal has been prepared in order to assist the optimal land use change using land consolidation in areas endangered by erosion, logwater and flood.

In the LPIS and CwRS components of the CAP IACS Hungarian institutional development the parcel numbers of the Land registry are playing the role of the connection key between the Land Registry/Cadastre and the application-oriented

databases. N.B. In Hungary FÖMI RSC provides operational monitoring and reporting on yearly basis in two field:

- area-based subsidy control using remote sensing since 1999,
- crop monitoring/yield estimation since 1997.

ICELAND

The Agricultural Research Institute is building a GIS with boundaries of every farm in Iceland for the Ministry of Agriculture in cooperation with the Land Registry of Iceland and the National Land Survey of Iceland.

KOSOVO

Examples of rural applications of land cadastre datasets are:

- Subventions in agricultural
- Agricultural land taxation
- Nature protection activities
- Protection of water sources

THE NETHERLANDS

- All kind of ongoing activities in projects of land consolidation.
- Same applications as mentioned under item 2.

POLAND

The STRATEG system was also adapted for rural needs and has been introduced in districts: Mielec, Pabianice, Brzesko

PORTUGAL

Examples of application areas of cadastre GIS applications:

- Environmental protection and management;
- Urban Planning;
- Forest evaluation and management;
- Agriculture evaluation and management;
- Identification and definition of real estate patrimony and taxes.

SLOVENIA

Examples of rural applications of land cadastre datasets are:

- Subventions in agricultural
- Agricultural land taxation
- Nature protection activities
- Protection of water sources

SPAIN

The rural applications are same than the urban ones, but also:

- C.A.P. control application:
Every year more than 4.820.000.000 € are distributed among Spanish farmers. The CAP subsidies control is managed through the information provided by the Cadastre
- Information applied to public infrastructures:
cadastral information is used to expropriate lands bound to become infrastructures as well as future planning

SWEDEN

The reason to make differences between urban and rural land is more based on historical than practical motives. In Sweden, the integration between urban and rural cadastral data is completed.

The infrastructure is built on national level, in combination with local updating on municipality level.

The nordic countries have cadastral systems, based on different legal and technical solutions. That means that nordic exchange of property information is not so common (or not even possible without complications). According to Swedish laws about personal integrity, it is also stated that most real property information can not be exported.

In the EU-based project "EULIS", some efforts are made to compare and give entrances to property information for some of the member countries. However, these efforts are only concentrated to some business activities in the "Cadastral field" like real estate market, brokers, and real property financing.

To name some of the application areas of Cadastral-GIS (urban):

- Physical planning
- Real estate brokers
- Insurance
- Bank and financial markets
- Real estate taxation
- Water supply, electricity, services, etc.
- Addresses
- Election to parliament
- Large infrastructure projects

SWITZERLAND

Some applications include:

Support Land Registry

Providing Cadastral Mapping And Service

Agrostatistics, Land Use/Land Cover

Land Protection, Valuation

Land Privatization, Land Consolidation

Other GIS applications include the use of information systems for local and municipal governments and administrations (operational in many cantons and municipalities)

UNITED KINGDOM

Please refer to the answer given to question 2.0

Approximately 65% (mainly agricultural and moorland) is not registered and ownership information is difficult or impossible to obtain. This situation however does not stop owners or farmers obtaining agricultural subsidies. The systems managing agricultural subsidies use the OS-GB and OS-NI topographic data as well as aerial photography from UK private sector data providers.

4. TRENDS AND FEATURES OF ONGOING DEVELOPMENTS

AUSTRIA

There is a mainstream to get cadastral procedures partly implemented into e-government structures as many of the content are essential for e-government issues. Beneath the activities focus on the development of a national co-ordination board for all levels of administration. The BEV has recently been appointed as the co-ordination point for all public institutions on federal level. The 9 Austrian federal provinces have already started with activities to co-ordinate their interests towards the federal level as well how to involve the more than 2300 municipalities in Austria which hold a lot of GI.

BULGARIA

A vision of creating a National Strategy for cadastre and property register has been defined and discussed. The main point is the gradual creation of a United Information System for Cadastre and Property Register as a guarantee for privacy and a base for electronic management. The necessary steps for its creation would be the development of a national geo database - as a State guarantee and control on the property. This geo database would bring together the geospatial data of all departments. Local authorities, having access to the centralized geo database would have a common platform and source for legal information available.

The most important aspect for the future development of the cadastre is that it will be considered as part of the e-government strategy of the Republic of Bulgaria.

CROATIA

There are three main areas of development of cadastre including land registry in Croatia covered by the National Program of State Survey and Real-Property Cadastre for period 2001.-2005. and Real-Property and Cadastre Project:

- Big efforts on digitalization of cadastral and land registry data. There are still 80% of cadastral maps to be vectorised (alpha-numerical part is already digitized) as well as 90% of land registry books. At the same time resurveying and renewal campaign is ongoing aiming to sort out cadastral municipalities in which registers are especially outdated.
- Development of necessary GI systems, especially Joint land data base system (including cadastre and land registry) as well as Cadastral information system (based on the new data model) and Multipurpose spatial data information system. All those systems should be Internet based and widely available to users.
- For cadastre special task is transition from the previous tax-cadastre to real-estate cadastre developing efficient rules and procedures for this process also including transformation of SGA towards institution capable to run the system.

CZECH REPUBLIC

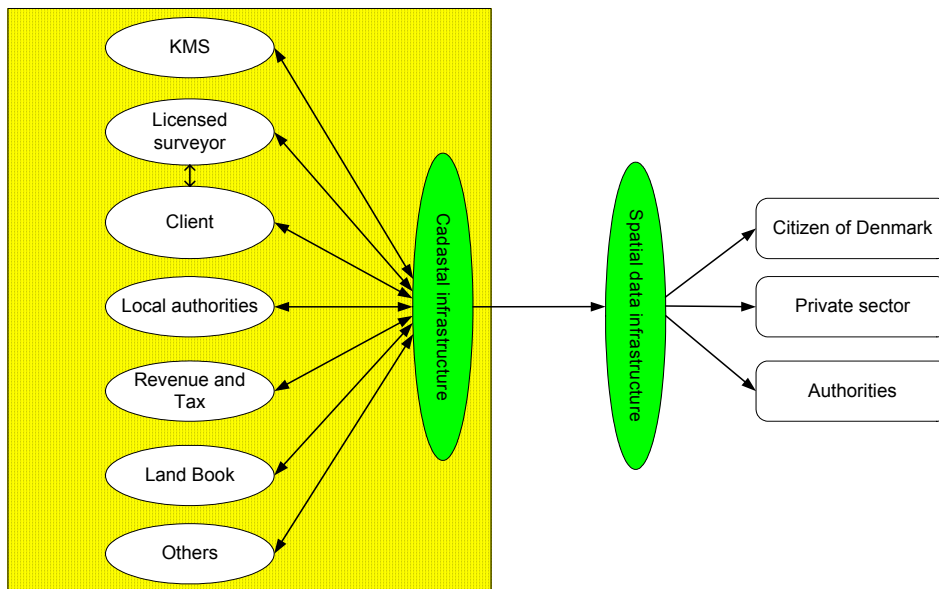
Trends and features include:

- increasing accessibility of spatial data and information via Internet,
- wider use of MIDAS - the Czech clearing house (metainformation system) for spatial data and information
- from GIS supporting single agendas to integrated multidisciplinary solutions supported by integrated information and communication technologies,

- increasing role of regions due to the re-construction of public administration and governance in the Czech Republic;
- from local island GISs to integrated territorial/regional and national based on distributed local/regional databases enclosing a spatial display and analysis of data;
- from parallel incompatible systems and registers to core/authentic registers and built-up services
- from barriers between data owned by individual institutions to sharing data and building networks, organisational frameworks and barriers against misuse of shared data
- increasing communication and co-operation cross institutions and sectors

DENMARK

The development of a new cadastral IT system integrating the cadastral register and map is the most important development. Parallel with this initiative the National Survey and Cadastre and stakeholders work on the concept of creating a Cadastral Infrastructure as illustrated below.



What is cadastral infrastructure? It is at least:

- Legislation
- Regulations, etc
- Technical standards
- Definition of data standards
- Archiving
- Ways of co-operations

Coordination of the development of cadastral process and strengthening of the cadastral infrastructure will include:

- to contribute and promote the development of e-gov
- to stimulate an increased use of real property data – also among citizens
- to promote the development of a inner coherence of registration of real property and land administration

The Danish Land Registry is presently being thoroughly investigated in order to introduce digital lodging of deeds, mortgages, etc. This might have consequences on the future organisation of land registration in Denmark.

Most probably the number of local authorities and counties will be reduced. This can also have consequences for the future land registry process.

FINLAND

There is a national Land Information System that is comprised of the Cadastre and the Land Register. The existing system does not include map/GI data so far. There is in the Parliament a proposal for law on the LIS. This new law together with existing legislation means that the new LIS will contain a nationwide cadastral index map in June 1 2005. The existing LIS will be renewed in order to include map data and provide the needed new data services which will *ineter alia* be based on a map interface.

FRANCE

Ongoing developments relate to the RGE in France where cadastral GIS is one of the components of the reference data, all components of the RGE being made complementary and consistent (reference to Mr. Salgé's presentation at the 7th EC-GI/GIS conference held in Potsdam).

GERMANY

Today, the Automated Real Estate Map (ALK), the Automated Real Estate Register (ALB) and the Authoritative Topographic and Cartographic Information System (ATKIS), which were developed before powerful geoinformation systems were introduced on the market, have become increasingly insufficient.

For that reason, the cadastral administrations of all German states are currently developing the Official Cadastral Information System "ALKIS" which will integrate cadastral data of the ALB and ALK. This so-called "horizontal integration" will guarantee a redundant-free data set for the cadastre. ALKIS will consequently employ the corresponding national and international ISO-standards. In addition, the data model of ALKIS will be identical to the updated Authoritative Topographic and Cartographic Information System (ATKIS).

Because of the unique data model for ALKIS and ATKIS and a systematic semantic harmonization of the object catalogues, it will be possible to use collected data on both the cadastral level and the surveying and mapping level. This "vertical integration" is the first step to the general approach that data should only be collected once and should be used for different scales.

GREECE

There is a clear trend towards digitisation and computerisation of cadastral data. GIS play a central role not only in the data collection procedure of the Hellenic Cadastre but also in its operation. Specifically, prospective contractors of cadastral survey studies are required to prove their skills and competence in the use of GIS technology before they are awarded cadastral survey projects. In addition, the Hellenic Cadastre operates using GIS, DBMS and Internet technologies.

HUNGARY

Over the past decade, the Department of Lands and Mapping with the aid of EU PHARE Programme and, to a lesser extent, of the Swiss and German Governments,

has made considerable investments in the modernisation of the infrastructure for Land Management.

In the framework of the above task, the following actions have been performed or are in progress/preparation (realised or planned deadline in brackets):

- Installation of computerised Real Estate Registration system (property sheet maintenance part) in decentralised form in the District Land Offices (1994) and in the Capital Districts Land Office (1996), connecting more than 2500 PCs in LAN supported by PHARE.
- Loading of all real and land property sheets data (about 7.5 million properties) into the system (1994 - 1997).
- Installation of a TAKAROS (TérképAlapú KAtaszteri Rendszer Országos Számítógépesítése – Countrywide Computerisation of Map Based Cadastre) is completed by the end of June 2000 in all District Land Offices. A version of TAKAROS called BIIR is installed in the Capital Districts Land Office.
- Completing an intranet type wide area telecommunication network TAKARNET (TAKAROS NETwork) for countrywide data access/supply, by connecting the Land Offices with each other and with FÖMI and DLM (1997) as well as with external users (banks, public notaries, local governments etc.), 2002.
- The introduction of the TAKAROS/TAKARNET systems gives opportunity for the Land Offices to transform their information service requirements into proactive suppliers of structured spatial information. The County Land Offices are under development to be regional centres for spatial information (this involves development of marketing skills, product development, project management, and the definition of goods and services to be supplied). A marketing strategy was prepared in 1996-97 for this purpose.
- Development of County Land Office's META system funded by EU PHARE Programme (MEgyei TAKAROS – County TAKAROS). In the framework of META – among others – a Management Information System for monitoring, analysing, controlling and directing all of the activities of the Land Offices is under creation (2001-2003).
- Investigation of demands and opportunities for new market oriented services, and estimation of the expected income from such services (continuously).
- Development and installation of a central and county-level land use monitoring system, supported by META that enables MARD to harmonise the agrarian subsidy system with the EU Structural Funds (1999-2002). The land use registration system is ready.
- Review the legal basis of land management to reflect the requirements of the free market economy and modern technology in use for technical and administration procedures. This required to have passed an Act on Surveying and Mapping (1996), a new Act on land registration was passed (1997), the concept of an Act on land consolidation was proposed (1997) and the other relevant legislation completed (1998-).
- Introduction of an up-to-date land consolidation procedure aimed at improving the land property structure and increasing the competitiveness of agriculture (1999-).
- TAKARNET opens its continuous service for external users (April, 2003).

ICELAND

The Icelandic cadastral GIS is being developed as a means of allowing information on land to be connected with its spatial counterparts. It is envisioned as being based around a framework of cooperation between the Land Registry of Iceland, other

government institutes like the National Land Survey of Iceland and local municipalities.

KOSOVO

About the issue: In Kosovo is under development project for Immovable Property Right Register (IPRR) where are include: Property Rights, Actors (Persons) Legal Entities, Buildings and Apartments, Textual Land Cadastre and Graphical Land Cadastre . improvement of land cadastre maps is possible with additional field measurements and transformation in specific areas.

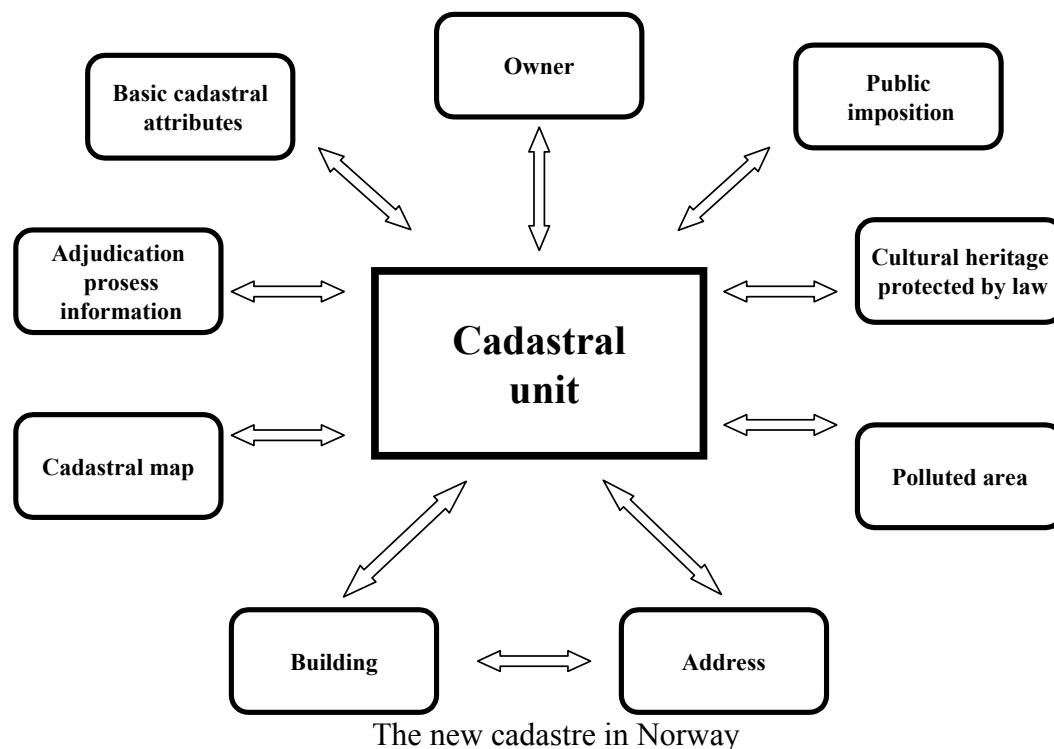
Technology: after finalising IPRR architecture for all land cadastral datasets, there will be possibilities for internet access.

THE NETHERLANDS

Complete business redesign of mapping, registration and distribution activities. An important aspect is the development of object oriented databases and the improvement of the accesibility and interoperability of data for both, existing clients and new clients.

NORWAY

There is a strong focus on standardisation. International standards (OGC and TC211) are being applied. The national cadastre and the national land book is being reengineered. National databases covering the whole country. Several applications is being launched for making geographic data available on internet. Data protection policy is also in the spotlight. To what extent should personal data be available on internet without any access control?



The new cadastre project started in 1999 with analyse and specification, in close co-operation with local municipalities and ministries. **The technical development has been also started.** The new cadastre shall be developed, tested and ready for full

implementation by the turn of the year 2005/2006 with an implementation period of 1 - 2 years

In Norway, about 1 million transactions are registered per year. There are 150.000 sales deeds and 450.000 mortgage documents. The registration fees are between 100 and 150 euros. Total income is about 3 times of the operating costs. Average registration time is 1,2 day.

Counted in manyear: 200 employees; 6 lawyers. Average office staff: 2,5 clerks. Few registration mistakes, compensation paid: 1 % of total fees paid.

Joining the two registers

Parliament decided in 2002 to join the cadastre and the land register in Norway. To transfer the land register registration from the courts to the Cadastre and Mapping Agency, thus placing the two registers under one single administration. The 87 registration offices will be replaced by one single central registration office in order to make registration an administrative effort. , to maintain two registers and two laws, but closely linked and co-ordinated way. The change will take place on office by office basis till 2006. The main reasons of the institutional change were as follow:

- It was facilitated by a political will to make "clean" courts dealing with judging only.
- To reduce the number of district courts on the agenda – paving the way for looking at the registration function.
- Understanding that the administration currently is competent to register.
- Registration with the courts is historically reasoned – no other local competent bodies existed locally in older times .
- Registration does not include elements of judging between competing parties.
- Understanding that the demand for land information is rapidly changing.
- Users request for integrated information – one stop shopping.
- The amount of public restrictions growing rapidly – easy access needed.
- Understanding the importance of coordinating developments.
- Harmonising development of laws, IT-systems and services to users
- can best be achieved by placing these responsibilities in one single authority
- Facilitating technical developments
- Rapid changes in the technical environment; Internet, electronic documents, graphic displays, etc
- The judiciary does not provide the optimal environment for applying modern technology
- Improving services to the public
- Courts do not easily focus this role

The integrated land information system consists of three registers: cadastre, land register and register of zoning plans.

Reflecting the growing importance of public restrictions concerning the use of land and buildings makes a clean cut between cadastre and land register. The cadastre shall include all public restrictions where publicity is the purpose of registration. The land register shall contain private contracts only – contracts which obtain legal protection through registration.

The integrated land information system facilitates also the electronic conveyancing, improves competition in the mortgage market and reduces transaction costs.

Joining the two registers

The registration task will be moved from the first local courts to the NMA, spring 2004. A new system for registration will be introduced by 1.1.2005. The transfer will be completed in 2007. The Ministry of Justice responsible for the project, but the

NMA is participating actively. The largest obstacle is the funding and keeping up the work in the local courts.

POLAND

One aggregated system in which data are entered only once and the generalisation and use goes from down to top and from top to down.

Polish existing GIS works in such a way in great part.

PORTUGAL

The ongoing developments have three main goals:

- concept and definition of a reformulated data model and system, decentralizing the production and update of the geographical database, providing a faster way to access to cadastral information (providing a better multi-purpose use), but at the same time centralizing the management and the regulations nationwide;
- closer institutional networking mainly with the Land Registry Offices, Directorate-General of Taxes and Municipalities in order to have a unique real property identification number used at all public service;
- the indispensable use of the new technology, to accomplish the two wills described above with security and according to the legislation.

SLOVENIA

About issue:

Improvement of land cadastre maps is possible with additional field measurements and transformation in specific areas.

Technology:

After finalising central database architecture for all land cadastral datasets, there will be possibilities for internet access.

SPAIN

The Cadastre is the main public G.I.S territorial database within Spain. Its main advantages are:

The information is treated homogeneously in all the Spanish territory

Due to its taxation applications the information is checked up yearly.

All features of the cadastral lots are represented as a vectorial surface with a reference linked with all the data in the database.

The Cadastral G.I.S is the support to identify urban and rural lots, place and measure them, and allocate a cadastral code

SWEDEN

The trends in Sweden mostly rely on new technology. Thus, some of the trends:

- Navigation and positioning
- Road data
- Transports
- Location-based services
- Telecom
- E-Business
- 3D-visualisation for city planning

Organising the data infrastructure

SWITZERLAND

Current Issues:

Although the new legislation for the digital data format has been passed and put into force in 1993, cadastral surveying is still in the process of transforming old data formats into the new digital AV93 format. In this context, it is facing some challenges:

1. In contrast to land registry, which did not necessarily require a complete coverage for spatial data, land information systems now need complete data coverage over the whole territory in order to be operational and useful. Complete data coverage is needed as soon as possible as the real benefits of digital spatial data cannot take effect without that.
2. The system change in the payment of Federal agricultural subsidies has led to a need for more precise and more up-to-date information about the size of agricultural areas. The problem manifested itself mainly in the transition zones between forest and agricultural areas.
3. There are more and more public restrictions and responsibilities interfering with private land ownership rights. They are documented in different registries and documentation - if at all - and therefore difficult to be aware of. A transparent and fair land market is increasingly in need of a comprehensive cadastral system, which also includes and documents public restrictions and responsibilities.

Current Initiatives:

In response to the above challenges, the Federal Directorate for Cadastral Surveying (V+D) is undertaking the following initiatives:

1. Complete data coverage: V+D adopted a strategy in 2001 for a complete AV93 coverage of all Cantons until the end of 2007.
2. "Land cover" layer in agricultural areas: V+D started a project for the acceleration of the AV93 information layer "land cover" in the transition zones between forest and agricultural areas. Data acquisition is being done mainly through the use of digital orthophoto maps.
3. Integration of public restrictions and responsibilities: V+D and the private sector surveyors have established working groups for the discussion of the technical and organisational inclusion of public restrictions and responsibilities in the cadastral system according to proposals of "Cadastre 2014".

At the same time, a motion to amend the Federal constitution with a new "surveying" article has been put forward. The aim is an improved legal and constitutional basis for the extension of the cadastral system with public restrictions and responsibilities.

UNITED KINGDOM

There is no specific development of a cadastre at the moment within the UK. The answer to question 5 however provides a flavour of some of the initiatives that would serve to support a cadastre in time if it was required.

There is a continuing trend to 'commercial' operation of 'cadastre'. There has been little support in recent years to the merging of OS-GB and the HMLR. These aspects can be seen within the published respective quinquennial reviews of the OS- GB and the HMLR.

There is also growing competition between the public and private sectors data suppliers with a number of national data sets that are available that support the

‘cadastral’ functions. e.g. aerial photography which by enlarge is supplied by the private sector here in the UK.

THE ROLE OF CADASTRAL GIS IN THE NSDI

AUSTRIA

The cadastral GIS can be seen as fundament for the NSDI which will have to be developed in the next years. There are some key reasons for the cadastre to take this role.

- The two levels for legislation in Austria are the federal level, where the legislative power for laws regulating the entire common public administration, cadastral surveying, land registration and professional items is defined. They are the main drivers of the GI data capture and form some kind of umbrella for the laws to be passed on provincial level and in the sense of subsidiarity all provincial laws are in principle following federal regulations but take regional aspects into account.
- The 9 federal provinces of Austria are responsible for legislation in spatial planning, which is interesting as planning is more an general matter but due to federal laws on land administration and cadastre details are already regulated in a unique manner for the entire area of Austria. Building and land reforms are linked to local customs, traditions and conditions and therefore dedicated to provincial level.
- The production of digital data out of existing analogue products has already started in the 80th of the last century. As soon as digital systems were running, more data have been created by continuously maintaining and updating the databases and registers in rather sophisticated systems in all levels. Thus digital cadastral maps, land registers are already available and processes are well defined.

BULGARIA

There is no national spatial data infrastructure in Bulgaria. However, the experiences and new developments in using the cadastre data along with the requirements set by the new Bulgarian e-government strategy can be considered as components for the establishment of the NSDI. It will be the role of AGISEE, to emphasise the link between cadastral data and their information systems, the e-government strategy and the NSDI.

CROATIA

Cadastral GIS together with the CROTIS (CROatian Topographical Information System) will deliver basic data sets for the future NSDI in Croatia. Croatian government has put in her agenda for period 2004.-2007. to establish Croatian NSDI. SGA will be active participant in this process.

CZECH REPUBLIC

Cadastral GIS is backbone for:

LocalSDI –digital cadastral maps and related information on real estate ownership play the key role in the LSDI, especially in the large cities as Prague, Ostrava, Pilsen or Hradec Kralove etc and also in many medium size cities as Kladno, Znojmo etc.

TerritorialSDI – more than 50 % of the district offices in the C.R. use some kind of cadastral maps as background information in their GIS applications. (The overview of existing spatial data and information and other GIS&T related resources was done in co/operation of Czech Association for geoinformation, Ministry of interior and the Office for public information systems and published on [the web](#) and CD-ROM at the end of 2001, see pages 31-33 on www.cagi.cz/midas .)

NationalSDI - the ISKN project in the competence of Czech Office for Surveying and Mapping will enable a web-based approach to the information on cadastre in the Czech Republic. The first stage supporting a www-access to the descriptive information was successfully finished in 2001. There are also several national wide GIS applications using geo-referenced cadastral maps for the purpose of statistics, law implementation control (concerning subsidies in agriculture/forestry or social affairs) and others.

The Programme of Czech National Geo-Information Infrastructure (NGII) was formulated in the year 2001. The programme was approved not only by the national platform called Nemoforum (which was established in 1999 to enable debate on issues related to the information on real estates) but also by the governmental Committee for State Information Policy in September 2001. The programme now represents the most important conceptual background for developing GIS and use of geodata in the Czech Republic. This document does not highlight the issue of cadastre explicitly, but this issue meets many of ten listed goals seen as important for further development of a NSDI in the conditions of the Czech Republic (incl. data policy, core geographic data, standards, education and awareness raising). The goals for the future are designed incl. the basic characteristics of about 20 projects needed for reaching the defined goals.

RegionalsDI – there are several cross-border GIS applications as in the national parks of Krkonose (CZ, PL) or Sumava (CZ, D, A) using in some extent the cadastral maps or other information related to land/forest ownership for the purposes of NP management.

DENMARK

It is recognised that the Danish cadastre provides a basic infrastructure for managing economic interests in land as well as supporting environmental and development interests. The interaction between the cadastre and the Land Book operates very efficiently even though the two systems are maintained in different organisations. The Danish concept for integrated land management is organised as a network of interactive subsystems containing the information that are used very often. The automatic linkage between the subsystems is achieved by establishing the "Cross Reference Register" which contains all key identifications within each subsystem (e.g. the parcel number, the building number, the address, etc.) and the cross reference between these identifications. This means that it is possible to obtain all available information on a specific parcel, property or building by knowing only one of the keys. Furthermore, the identification-keys are linked into the relevant physical element represented in the digital maps such as the parcel, the building, etc. The importance of the cadastre to support land management has steadily increased.

During the first half of the 1900's the cadastral system served as a basis for managing the regulations of the Agricultural Holdings Act. During the second half of the century the cadastral identification has also become an important component for managing a number of environmental acts. In addition the cadastre provides the basic information to support activities such as town and country planning processes, construction planning and implementation, and utility administration. The cadastre is increasingly used as a basic instrument in the planning process. Some local authorities use the cadastre map as the basic layer in the municipal structure planning. This digital process provides a number of opportunities. The land-use regulations are easily identified on the relevant properties with links to the addresses and the name of the

owners. The detailed regulations such as zoning and building restrictions can be identified on the relevant properties and located according to the property boundaries. This facility is also used when presenting the planning regulations on the Internet. The citizens can then achieve any relevant planning information just by asking for the specific property.

In conclusion, the cadastral system is serving not only the process of cadastral management and security of land rights. It is also providing a multi-purpose use and facilitates a global approach to land management through an efficient interaction between the areas of land tenure, land value, and land use. The information in these areas is increasingly available for the mass market through Web-based information systems.

SOURCE:

[HTTP://WWW.SWISSTOPO.CH/CADASTRALTEMPLATE2003/COUNTRYREPORT/DENMARK.PDF](http://www.swisstopo.ch/cadastraltemplate2003/countryreport/denmark.pdf)

FINLAND

Cadastral GIS is a basic component of NSDI for both municipal and state authorities service processes.

There are in Finland over 300 GISs that are available. Their integration with cadastral data has been restricted because no national data service has been available. Also the lack of spatial data in some municipalities has complicated the use.

The renewed LIS will overcome these obstacles. Simultaneously the availability of spatial dimension of real estate units gives the opportunity to describe and update land use rights and restrictions as spatial objects and relation of these with real estate units can be solved by the position. The picture below gives an impression of integration possibilities between different registers

FRANCE

On going developments relate to the RGE in France where cadastral GIS is one of the components of the reference data, all components of the RGE being made complementary and consistent.

GERMANY

The German state of North-Rhine Westphalia (NRW) is implementing GEOBASIS.NRW at the local community level and the Spatial Data (Geo data) Infrastructure (GDI NRW) at the state level to increase the access to existing spatial data across the state. Similar SDI are currently under development all over Germany. With GEOBASIS.NRW, the new German cadastral standard ALKIS will be introduced in a local environment. It will extend the cadastre's formal task of property security to provide a complete georeference service for the whole community. In this function, GEOBASIS.NRW will be the basis enabling solution to georeference-related topics in e-Government. Together with GDI NRW it will also supply reference data, thereby establishing the first link of the value added chain in the field of GI, an important step for location based services.

GREECE

Cadastral GIS would form perhaps the core of the NSDI in Greece. A large number of other activities would rely on a GIS based Cadastre.

HUNGARY

The major actions/elements of the National Spatial Data Infrastructure approved by an Interministerial Committee on October 15, 1997 include also the cadastral information:

- National Spatial Data Strategy
- **National Cadastral Program**
- National Topographic Program
- Geo-coded Address Register
- Administrative Boundary Database
- Extended data content of the Digital Base Map (multipurpose cadastre)
- National Geospatial information metadata service and clearinghouse
- Aerial Survey of Hungary and related products
- Multipurpose parcel based information system

Concerning spatial data, the most fundamental ones are the spatial framework data and that data which are used most generally. They are called basic geoinformation data. They represent the basic data-infrastructure. Cadastral GIS is one of the components of the framework basic data-infrastructure.

The whole area of Hungary is covered by analog cadastral basic maps in scale 1:1000, 1:2000, 1:4000 depending on data density. Approximately 80% of the rural area cadastral maps are in digital form (vector or raster) as a consequence of the compensation act 10 years ago. However their formats are not regular, inhomogenous. Some 7% of Hungary is covered by digital cadastral maps produced in the frame of so called National Cadastre Program and with data content and format defined by a new Hungarian digital map standard MSz 7772-1:1997 harmonised with CEN and ISO GI standards. Recently, an IT development of the Hungarian land offices has been finished providing their computerisation (called TAKAROS system) and connecting them with a nation-wide intranet (called TAKARNET).

ICELAND

The Land Registry Database is already a part of the NSDI in Iceland but its role will be enhanced with the addition of a forthcoming multipurpose cadastre for Iceland. Use of the unique identifiers for land and buildings in the Land Registry Database is already widespread in most governmental, district and local government applications.

KOSOVO

In future (when digitalisation will be finished) cadastral datasets will play an important role in national spatial infrastructure. Cadastral data are core dataset in many of information's systems in Kosovo. Together with register of spatial units are cadastral data common identifiers and key for geolocations and geocoding all other administrative data.

THE NETHERLANDS

The databases LKI and AKR are very important in all processes where properties are involved and without that the security of rights and the financial facilities based on mortgages couldn't exist as it is now.

In the Netherlands a lot of activities are going on in the field of standardisation and interoperability of GI. The Cadaster is intensif and on a high level involved in these activities.

NORWAY

In Norway there is a National SDI. Most of the more advanced municipalities however, do have Local SDI's that fits into the national SDI. The National Standards for Geographical information (the SOSI standard) is applied in local SDI's.

Cadastré is of vital importance. The tendency is that new applications emerge every year. This means that cadastral data find new ways of being used. Examples: When the address database was competed with co-ordinates, this opened for applications in the transport and distribution sector. However – the users must have trust to the data. Completeness is in most cases regarded of being of higher importance than accuracy. In general: the cadastral data is widely used in most sectors in the society. **The role of the cadastre**

give the official identification number for the cadastral units, buildings and addresses

facilitating tasks in local administration

collection of fees

land use planning

protection

construction

facilitating tasks in central administration

statistics

facilitating tasks in private sector

information to the property market, property owners and developers

POLAND

Cadastré is the basis for the Polish GII. Please refer to the Contributor's paper submitted to the 8th EC GI/GIS Workshop, Dublin, 2002 (The technical, legal and organisational aspects are given here without modification).

PORTUGAL

Cadastré will be the core of the NSDI, because it provides innumerable advantages for managing land, the environment and the economy. The interaction of public services (such as Cadastre National Authority and the Land Registry) is one of the keys to the success of a Cadastre GIS, in order to have a more reliable system for the citizens.

SLOVENIA

In future /when digitalisation will be finished) cadastral datasets will play an important role in national spatial infrastructure. Cadastral data are core dataset in many of information's systems in Slovenia. Together with register of spatial units are cadastral data common identifiers and key for geolocations and geocoding all other administrative data.

SPAIN

The Cadastre is the main public G.I.S territorial database within Spain. Its main advantages are:

The information is treated homogeneously in all the Spanish territory

Due to its taxation applications the information is checked up yearly.

All features of the cadastral lots are represented as a vectorial surface with a reference linked with all the data in the database.

The Cadastral G.I.S is the support to identify urban and rural lots, place and measure them, and allocate a cadastral code.

SWEDEN

Cadastral-GIS has legal status where data are regulated by legislation. Thereby, the databases and services are very centralised (government or municipality level). Therefore, the databases and services are built on rigorous security because the authorities are directly liable to pay damages.

Cadastral-GIS is a support for real property formation services. The technical support in the process has increased. The working process is also rationalised. The surveyor carries out all steps in the process, from planning, measurement, map production and GIS to legislation. A direct result of these enhancements is that the fee has decreased. Some numbers of the system described in section 1

“Geography”

The number of persons that have updating grants is 300

The number of users is 1,000 (including updating users)

The number of transaction to check out data is 1,500 per day

The number of transaction to update data is 250 per day

Each transaction to update for “the general build up” is 1,500

Each transaction to update for “real estate formation” is 50

A transaction of 1,000 objects takes less than 10 seconds (including formatting, transformation, checks)

The total number of objects in the database is 100 million (including history data)

The total number of changed objects is 10 million per year

“Cadastral”

The number of persons that have updating grants is 500

The number of users is 30,000 (commercial bank, financial market, authorities, real estate brokers)

The number of transaction to check out data is 300,000 per day

The number of transaction to update data is 750 per day

The total number of register units in the database is 4,68 million

The total number of plans and zoning information in the database is 350,000

The total number of servitudes/easements in the database is 1.1 million

SWITZERLAND

With the introduction of the system-independent data description technique – based on INTERLIS – the conceptual basis for any SDI has been laid. The practical application, however, is taking on slowly, but there is an increasing number of local and regional initiatives for SDI. The Federal Government has established a coordinating body – COSIG – for the coordination of spatial data acquisition, management and distribution.

UNITED KINGDOM

Not applicable as the UK has no GIS Cadastre.

There are however a number of initiatives being carried out by a variety of organisations that are part of the NSDI which will serve to support a cadastre in the UK should one be sought, these include:

- BS7666 addressing standards;
- National Land Property Gazetteer (NLPG) (of address complying with BS7666);
- Master Address Database (for Scotland in support of NLPG);
- Common Address File Project in Northern Ireland;
- Project Acacia considering the merits of collaboration among OS-GB, HMLR, ROS, Royal Mail and the Local Authorities, looking at the potential for building a National Address Database and portal.

National Land Use database – a joint venture between the DTLR and Local government.

CONCLUSIONS

6.1 Verification of EUROGI's advantages, inter-disciplinarity and competence in this field

AUSTRIA

EUROGI has become a very valuable platform for exchange of knowledge and information within Europe and has established a very dense network for GI for the key actors on the GI sector. In this forum there are wide-range representatives from public and private, from national and European level as well. EUROGI has become a key institution especially by some projects on GI, which help to make the topics visible to decisionmakers all over Europe.

BULGARIA

AGISEE, the Association for Geo-Spatial Information in South-East Europe has just been created and starts its activities with increasing membership. AGISEE has established contacts with EUROGI. However, EUROGI has not yet been active in Bulgaria, although EUROGI is nominatively known. The first major activity of EUROGI was its participation in the South-East European Spatial Data Infrastructure conference in Sofia in October 2003, where EUROGI could present its mission and activities. It is expected that now, after the formal establishment of AGISEE, EUROGI will obtain a wider field of action, which can beneficially influence the cadastre sector.

CROATIA

Exchange of knowledge, status information and proposing streamlining in Europe being more and more connected and networked today increases importance of organisations executing those tasks.

CZECH REPUBLIC

EUROGI represents a wide range of national GI associations over a major part of the EU and also the CEECs. This network enables to describe and compare the existing situation in a very comprehensive way and is also an important source of inspiration for the individual participants. Last but not least, the general trends and needs are defined in an objective manner. They offer useful background for preparation and lead to implementation of actions on a European scale.

FINLAND

Significant advantages can be seen especially in the future when the systems are interoperable and seamless.

FRANCE

EUROGI, being the umbrella, coordinates national bodies such as CNIG in France and will subsequently ensure that cadastre is included into the GI topics and concerns.

GREECE

EUROGI assembles a large portion of the know-how at the scientific and professional level to promote agendas.

HUNGARY

Very important. EUROGI supports participation in different EU projects.

ICELAND

The National GI Association LÍSA, which is a member of EUROGI, plays important role in promoting common understanding of principles and ideas for future development of GSDI and NSDI.

NORWAY

Cadastral data are essential in LSDI/NSDI and are data of interdisciplinary value

POLAND

Not enough until now. For the last years, EUROGI has mainly promoted the American industry in GI domain, for which the cadastral specifics are not well known. Firstly during the Pre-accession Countries Workshop in 2000 (November 2000 in Brussels), the cadastre was perceived but in a selective way. Then the Polish contribution in the subject submitted to the Cadastral Workshop in 2001 (June 2001, Budapest) was not accepted. Lastly, regarding the EUROGI invention, GINIE project, it is not friendly targeted to the cadastre.

EUROGI as European organisation should be more oriented on the cadastre features. This will be extorted by the environmental protection needs and the first symptoms are now visible in the INSPIRE project.

PORTUGAL

EUROGI has an important role to play has a place where we can exchange knowledge, data and information at all levels of GI.

UNITED KINGDOM

EUROGI has an important role to play as a facilitator. The AGI has been a member of EUROGI since its inception. The AGI sponsored the EUROGI President from 1999 through to March 2003. The AGI has an elected member on the EUROGI Executive Committee. The AGI values EUROGI as it extends the GI network to the benefit of all and enables the AGI to cost effectively partake in raising GI awareness at the European level and help set the European GI strategy.

6.2 The value of the National GI Associations for the society in the Cadastral GIS field**AUSTRIA**

GI associations on national level help to widen the profession, to get into contact with related professions and to get to some kind of interrelationship between several different professions involved into the establishment of NSDIs. They are sometimes

the only co-ordination point between public and private sector and therefore crucial for preparing GI policy.

BULGARIA

AGISEE, the Association for Geo-Spatial Information in South-East Europe has just been created and starts its activities with increasing membership. Cadastre is part of geo-spatial information and it is expected that AGISEE will play its role in the cadastre field and in particular combine its activities together with Bulgaria's e-government strategy.

CROATIA

Area of GI including also Cadastral GI becomes more and more interdisciplinary. Therefore National GI Associations and bodies have important role in connecting different professions and area of activities as well as harmonize nationwide efforts.

CZECH REPUBLIC

The GI Associations enable a reflection of users' needs and experience on the national level, They open discussion on issues crossing the borders of existing institutions or disciplines and initiate systematic solutions or even participate in their preparation. They transmit and disseminate the international and national knowledge (in the field of GI) in both directions.

FINLAND

GI Association keep up the discussion of the necessary development actions and interoperable technical solutions.

FRANCE

National GI umbrellas are an instrument to ensure consistency between policies related to or affecting GI in a given country. Duality of CNIG (government) and AFIGéO (private and public operational actors) will ensure all vested interests have the possibility to provide inputs to the policy, definition, adoption and implementation

GREECE

National associations can form the locus that would bring professionals together and form proposals for policy making at the national and European levels

HUNGARY

The growth of the National umbrella GI Association HUNAGI is promising. The number of its members were doubled during the past 12 month and it has today 55 governmental and academic institutions, the private sector and NGOs as member on governmental, regional and local level(www.fomi.hu/hunagi). HUNAGI has interdisciplinary character. By organised actions, it makes public awareness by knowledge transfer and information dissemination, which support directly both the key and potential NMA/Land Administration clients' readiness to be informed on the GIS-related developments (INSPIRE, GINIE, LUCAS etc) in the European Union and the implementation of the National Programme of the adoption of the AcquisCommunautaire. HUNAGI organised the 1st EC Workshop on Cadastre (in conjunction with EUROGI and DG JRC) and will host the 6th Global Spatial Data Infrastructure conference in September, where the importance of the cadastral information as one of the fundamental element on NSDI level will be also emphasized (www.gsdi.org, www.eurogi.org).

ICELAND

The National GI Association LISA has succeeded in bringing together various players in the field of GI.

KOSOVO

National GI Association is still on the process of formalisation, until all activities are coordinated by Kosovo Cadastral Agency

NORWAY

Information exchange, Conferences, Training courses in standards and tools

POLAND

GISPOL is the main creators of GI awareness.

PORTUGAL

National GI association can be an important forum to discuss technical problems and their solutions, and promote at a higher level the needs of the professionals.

SLOVENIA

National GI Association is still on the process of formalisation, until all activities are coordinated by associations of surveyors and surveying and mapping authority of slovenia

SWEDEN

Valuable

UNITED KINGDOM

The AGI has an important role to play as a facilitator.

The AGI plays an increasingly significant role with regard to GI within the UK as it represents all interests related to GI and is constantly working to deliver its mission *to maximise the use of geographic information for the benefit of the citizen, good government and commerce*

6.3 EUROGI's role in the field through its relevant project – from the NGIA perspective**AUSTRIA**

EUROGI must be the key platform for GI issues on European level and towards the European Commission.

BULGARIA

AGISEE, the Association for Geo-Spatial Information in South-East Europe has just been created and starts its activities with increasing membership. AGISEE and EUROGI will likely work together and will now define concrete activities and projects that will have their impact on the cadastre sector.

CROATIA

There is clear need to push Europe-wide project like GINIE and initiatives like INSPIRE.

CZECH REPUBLIC

The positives described in the previous items were supported by several projects organised by EUROGI.

FINLAND

GINIE project has vital possibility to develop the cadastral GIS as European reference data

FRANCE

GINIE is the main project which will provide context information and general policy guidelines for European cadastral GIS discussions

GREECE

It would be beneficial to give momentum at the national level where resistance, hesitation and unwillingness to push for changes and institutional reforms exist.

HUNGARY

The 1st Cadastre Workshop of the European Commission held in Budapest in 2001, as well as the GSDI6 Conference held also in the Hungarian capital in 2002, both were organised jointly with DG JRC and EUROGI and hosted by HUNAGI. These events were actions, where the involvement of the Hungarian GI community was beneficiary from the developer/user of cadastral GIS point of view. Recently EUROGI took part extremely useful in the GINIE project implementation by mobilizing effectively the resources, which were available at the members of EUROGI's member organisations country by country.

ICELAND

The National GI Association LISA, which is a member of EUROGI has an important role in raising awareness and promoting coordinating work on data policy and strategic issues

NORWAY

Ideas from information exchange could be spread and help development in this field

POLAND

Not sufficient.

PORTUGAL

Raising awareness and transmitting experiences and knowledge.

SLOVENIA

Experiences and knowledge found at EUROGI website were useful in many cases for the Slovenian projects.

SWEDEN

- policy makers
- Reflection partner
- GI associations are information suppliers through magazines and conferences

UNITED KINGDOM

EUROGI has an important role to play as a facilitator.

Running workshops and shaping GI strategy and policy. Projects valued include:

- The workshop on Cadastral data as a component of SDI in support of agri-environmental programmes held in Budapest in June 2001 at which several AGI members were present and or assisted in producing the report which is of value.
- EUROGI's participation in the GINIE project.

EUROGI's participation in the INSPIRE initiative

6.4 Links between the NGIA and the cadastral GIS operators/agencies

AUSTRIA

There are very strong links between the national GI association and the cadastral GIS agency, it is member as well. Networking has been important for the developments in Austria.

BULGARIA

AGISEE, the Association for Geo-Spatial Information in South-East Europe has just been created and starts its activities with increasing membership. There are no links yet, but they will soon be established formally. Some personalities working in the cadastre field have already become members of AGISEE.

CROATIA

Links are tight even they are not formalized in best way. Stakeholders in cadastral GIS co-operate well gathered around Croatian Geodetic Society and SGA.

CZECH REPUBLIC

Czech Association for Geo-Information co-operates with the Czech office for Surveying, Mapping and Cadastre mainly on the national platform called nemoforum. The COSMC represents the sphere of governmental institutions and municipalities, CAGI parallelly represents the private and Academic spheres. The experts from both of these spheres co-operate in 4 working groups: 1-NGII, 2-spatial identification, 3-cadastre, 4- support of land market.

DENMARK

The National Survey and Cadastre and some Licensed Surveyors are members of Geoforum Denmark

FINLAND

Links are tight, the cadastral GIS operators are clearly fundamental partners in the NAT GIS associations

FRANCE

GI Association keep up the discussion of the necessary development actions and interoperable technical solutions. Cadastre service and chartered surveyors as members of both CNIG and AFIGÉO

GREECE

Membership connections (weak in Greece so far though)

HUNGARY

About 10% of the member organisations and institutions of HUNAGI comes from the Land Administration sector. Cadastral experts are actively involved also in the international events organised by FOMI. E.g. in the GIS Day 2002 devoted to the role

and potentials of GIS in the implementation of governmental policies, which was supported also by Commissioner Erkki Liikanen by sending a dedicated welcome address. The First Congress on Cadastre in the European Union is participated by top managers of the FOMI and Capital Land Office, both member institutions of HUNAGI. The secretariat's infrastructure of HUNAGI, the National GI Association is ensured by the Land Administration since 1994.

ICELAND

LISA and the National Land Survey of Iceland have supported the coordination of a National GI Classification System in Iceland

KOSOVO

There are good cooperation between associations of surveyers and surveying of Kosovo.

NORWAY

Network between municipalities and other GI actors

POLAND

In Poland very strong. GISPOL gives the main creative and critical opinions to the cadastre and GIS development.

PORTUGAL

There's the normal cooperation between both parts, although there's a will of creating stronger ties indispensable for the creation of a Cadastral GIS.

SLOVENIA

There are good cooperation between associations of surveyers and surveying and mapping authority of Slovenia

SWEDEN

Policy

UNITED KINGDOM

The majority of the organisations within the UK that are involved in property registers, land registration, land use, planning, financial organisations and risk assessors as well and land management are members of the Association for Geographic Information. This is one of the great strengths of the AGI that its members are from a very broad church. The following organisations are either sponsor or corporate members of the AGI:.

The HMLR, ROS, OS-GB, OS-NI, NILR, Local Authorities, Department of Transport, Local government and the Regions (DTLR), Department of the Environment Rural Affairs (DEFRA). A number of senior representatives from these organisations will be present at the First Congress on Cadastre in the EU in Granada on the 15th to 17th May 2002

HANDLING STREETS, ROADS, SQUARES AND SIMILAR PUBLIC LANDS

This section is about how the cadastre in various countries deals with land belonging to the public domain e.g. streets and roads.

AUSTRIA

There is no difference between private and public ownership in Austria concerning the cadastre. All parcels open to public are included in the cadastre.

CROATIA

All parcels are represented in the Cadastre, no matter by whom they are owned. Roads, streets, squares, and other public land are represented as distinguishable land parcels depending on who has ownership on them (State, municipalities, etc).

FRANCE

In France, the cadastre just shows the privately owned properties where an individual or a clearly identified entity owns the land. The rest of the territory is considered as one parcel, which is state owned.

The question is how this gigantic parcel is subdivided into smaller entities where the responsibility on handling the parcel is given to an identified governmental service. (This is a new inquiry provided by AFIGÉO. Inquiry: Dept.of Finance, France)

GREECE

In Greece, all parcels are represented in the Cadastre, no matter if they are owned by citizens or the State. Roads, streets, squares, and other public land are represented as distinguishable land parcels depending on who has ownership on them (State, municipalities etc).

ICELAND

The Icelandic Land Registry is in the initial stages of developing a Cadastral GIS thus it has not yet been decided how public land i.e. roads, streets etc will be dealt with.

At present in the Land Registry information regarding such land in the public domain is not recorded.

PORTUGAL

Cadastre doesn't make any distinguish between private and public ownership. At the present time, streets and roads are not considered real properties (they are public domain).

ESTIMATED MARKET VALUE OF THE OVERALL REGISTERED REAL PROPERTY AND LAND ASSETS PER COUNTRY SUPPORTED BY CADASTRAL MAPS

	Real Property	Lands	Total
AUSTRIA	NA	NA	NA
CROATIA	NA	NA	NA
CZECH REPUBLIC			
FINLAND	NA	NA	NA
FRANCE	NA	NA	NA
GERMANY	NA	NA	NA
GREECE	NA	NA	NA
HUNGARY	NA	NA	NA
ICELAND	17,0	3,2	20,2
ITALY	NA	NA	NA
THE NETHERLANDS	NA	NA	NA
NORWAY	NA	NA	NA
POLAND	NA	NA	NA
PORTUGAL	NA	NA	NA
SLOVENIA	NA	NA	NA
SPAIN	NA	NA	NA
SWEDEN	NA	NA	NA
UNITED KINGDOM	NA	NA	NA

(IN BILLION EUROS)

At the REAG Summit in Rome participated by 33 countries in late November last year it was announced, about 3.9 trillion euro is the value of assets which is mortgaged in the European Union, 33 % of the total GDP.

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