GINIE: Geographical Information Network in Europe

IST-2000-29493

Survey of key GI players within Europe

GINIE D2.1.1

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Date 11/11/2003

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Joint Research Centre of the European Commission – JRC
Open GIS Consortium – OGCE

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by
Mark Probert

Disclaimer:

The views and opinions expressed in this report are those of the author and editors alone and do not necessarily represent either those individuals contributing to the survey of key GI players in Europe or the organisations that they represent. The information contained is intended to be correct and current at the time of writing. Readers have been given an opportunity to make comments and to suggest corrections within the first month of the the publication of V.1 of the report on the GINIE web site www.ec-gis.org/ginie. Numerous minor changes have been made following comments received and are incorporated into this second version.

CONTENTS

Introduction

This survey of key GI players within Europe is one of the elements of the GINIE project. GINIE is an IST programme Accompanying Measure intended to develop a European Geographic Information (GI) Strategy based on the EUROGI Strategy. It is also concerned with GI capacity building and awareness-raising. Together with surveys and reports from other GINIE work packages this survey of key players will provide a unique and important reference for the European GI community. The overall project conclusions will be presented at a final conference in Brussels on 13th and 14th Nov 2003.

This survey of key players intends to identify and describe an important component of the developing European GI infrastructure – the organisations providing the products and services that represent the supply side of the market place. As well as identifying individual organisations it attempts to provide some analysis of both the breadth and depth of the market. Its findings, in conjunction with other GINIE inputs and information from other sources (i.e. INSPIRE), will contribute towards the development of a European GI strategy and policy that can support:

- The development of the European Information Age and Knowledge economy;
- eGovernment;
- Transparent government at all levels within Europe;
- Harmonised citizen oriented services for the citizens of Europe;
- The development and implementation of a sustainable European spatial data infrastructure;
- Sustainable democracy within Europe;
- Sustainable policy formulation and implementation within Europe.

And as a result can maximise the effective use of GI for European government, commerce and the citizen.

Purpose of the survey

The effective implementation of a European GI Strategy will be influenced by a number of factors, including the roles played by the key GI players which already exist in each country, and across Europe. The purpose of this GINIE report is to:

- Gather information through a survey of the key market players in GI throughout Europe in order to gain an improved understanding of the geographic information capacity within each country;
- Rank the key players, in terms of GI market impact, both at a national level and at a pan European level;
- Estimate the influence the key players have on the GI market across Europe.

The report was undertaken between 01/06/03 and 31/08/03 as a desk study using facilities such as the internet, email, telephone, source books and trade catalogues, results of market surveys, GI magazines (both paper and electronic) and other materials that may be available on the World Wide Web. The role of national GI associations has been crucial to the success of this survey as they are in a unique position to understand the complexities of their own national GI market.

Scope of the survey

National GI associations from the following countries were invited to participate in the survey:

Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, The Netherlands, and the UK.

From the beginning of the survey it was intended to add other European countries if the information could be located and was available. After inviting contributions from their National GI associations or contact points, it was possible to add information about the markets and key players in Bulgaria, Cyprus, Estonia, Lithuania, Malta, Romania, Slovak Republik, and Turkey. The survey aimed to identify at least five, and if possible more, organisations per country that could be classified as “key players”.

This survey and report is closely related to these GINIE reports:

- The Survey and Analysis of National GI Associations;
- The Analysis and Capacity Building Report of the National GI associations;
- The Final Report and the Recommendations for Action resulting from the GINIE Data Policy Workshop;
- The Survey of Pan European GI Organisations (Sep 2003);
- The GINIE consultation document and reports on the ABGI.

General information

A synopsis of this report and all of the above mentioned reports will feed into the GINIE final Conference report that will be prepared and printed during September and October 2003 in time for the final GINIE conference that will take place in Brussels on the 13th & 14th November 2003, which will be targeted at up to 100 politicians and senior decision makers within the EC. Information regarding the GINIE project can be obtained from the web site: http://www.ec-gis.org/ginie/

Definitions

What do these words mean – "**the key GI players in Europe**"? The last part is perhaps the easiest part; for the purposes of this survey the countries which have been included in this definition of **Europe** are those listed in the "scope" section above. The more difficult elements are "key players" and "GI".

Taking **GI** to begin with, not everyone's idea of GI is the same. Most experts agree that GIS technology includes hardware, software and digital spatial data. They also agree that GIS generally includes query, analysis and graphic display and output capabilities. But because GIS is suited to a range of applications, users and disciplines, people in the industry rarely agree on the definition of GIS. It is even difficult to agree on a name for the technology; it can be geographic information systems, desktop mapping, spatial information systems, geographical information systems or even geomatics. Defining the GI industry as a whole is even more complex. Many technologies and products are often included as part of the industry definition even though they don't meet many GIS definitions. Part of the reason is that GIS can be considered a subset or superset of other things such as image processing, computer-aided design, database software or computer cartography. Because of their similarity to GIS and their usage in getting data into and out of a GIS, many of the companies that develop "GIS-related" products tend to be included in GIS industry statistics[1]. In the past there have been examples of differing descriptions of the GI market because of the different definitions of the organisations included. For example leading industry analysts Daratech and Dataquest differed over their estimation of the worldwide 1994 GIS software market between $505 Million (Daratech Inc) and $759 Million (Dataquest Inc). Much of this difference was due to their respective approaches to defining GIS, with Dataquest including, for example, CAD based systems that were excluded by Daratech. Both sets of research are valid, but start from different assumptions. These days it is even more difficult to define the boundaries, when for example there are new internet service providers distributing a vast breadth of data content which may include "where is the nearest" mapping services or real time traffic information – it may not be GIS but is it part of the GI industry?

Even if we can narrow down the definition of GI it is almost impossible to establish scientific criteria for the definition of a **key player**. For this report it has been decided that "key players" should describe the organisations which are the most *important* or *influential* in the supply of GI products and services in each country. This is very difficult to establish though. How does one determine importance or influence – by annual sales? – but then what about the many national mapping organisations which may dominate the supply of mapping data in a country but only recover a certain percentage of their costs? Large staff numbers might indicate a large volume of work but does that equate to influence? We shouldn't forget the part played by the "Free GIS" Software community, with its products, services and orgasnisations (for example GRASS). And as already discussed there are many *types* of organisations in the GI market – data providers, software vendors, database engineers, on-line service providers... there are national organisations, and then there are pan-European or global players. To take an example from France, in terms of their significance how can you differentiate between the importance of French GIS software such as Geoconcept v the US IBM hardware on which it is running v its US Microsoft operating system v the public sector IGN-F mapping data and the private sector

[1] Geoplace.com: when is a GIS not a GIS?

Claritas lifestyle data it might use?.... and then there are the policy "players" such as the national GI Associations, EuroGeographics, EUROGI or even the European Commission (e.g. INSPIRE)… and the standards influences such as OpenGIS Consortium (OGC) !!

In short it is almost impossible to create scientific criteria by which "key players" can be ranked over such a broad and difficult to define market sector. If we ask people involved in the GI industry however "who are the key players in your country" most will come up with a list of organisations, and those types of organisations are broadly similar from country to country. It is on this basis that the key players survey, and this report are based. It has to be treated with caution then – it is in essence a subjective list, mostly drawn from the opinions of people in each of the National GI Associations of Europe. As such, people will approach it from slightly different viewpoints, with subtle differences of opinion.

One last point on definitions - all national GI Associations were asked to provide their views on the "top 5" key players in their country. Most were able to do so, and many of course discussed the difficulties of deciding, and the criteria. Most picked the key data suppliers, the main software vendors and the implementation companies. A few however also mentioned the organisations deciding policy, that in the longer term are perhaps more important in terms of influencing the supply of GI products and services – the National GI Associations themselves, national GI policy committees (where these exist), pan-European organisations such as EuroGeographics and EUROGI, and of course the EC with its influence via regulations/directives (e.g. Water Framework Directive, Common Agricultural Policy Land Parcel Identification Sytems, Public Sector Information) and INSPIRE.

Assumptions

Throughout the survey and this report there have been a number of assumptions made which are important for understanding the results.

As described above, the report is largely based upon the views of the National GI Associations and their identification of the key players in their country. Their views are subjective, as already described, and although a similar pattern emerged across Europe, there was considerable scope for individual interpretation of what is a key player.

The number of organisations included in the report varies from country to country and is not consistent with the size of the GI market. It could be argued that for countries in which the GI markets are more developed, and where there are larger populations - the UK, France or Germany for example, there should be proportionately more organisations included than for example Malta, or Cyprus. The assumption has been made however that 5-10 "key players" should be included wherever possible for each country, but if a lot of data were returned (as for example Hungary) it would not be omitted just to keep the overall balance of numbers. For this reason some GI markets may appear proportionately more developed or larger than they may really be, and vica verca. It is inevitable also however, that some organisations not included in the report will feel that they qualify as a "key player" (maybe even justifying this point by highlighting an organisation which does not in their opinion justify inclusion) and will be disappointed at their non-inclusion. While an overall pattern of the GI market appears from this report, in a subjective assessment such as this, and with partial information in some cases, there are unfortunately bound to be some inconsistencies.

Most National GI Associations were extremely helpful with their questionnaire returns and subsequent inputs. Others were unable to provide much data, while yet others, for various reasons, could not provide any input at all. Consequently there is a correlation between the size, and possibly the quality, of the country sections of the report and the amount of information received about that country. While most of the tables in each country report list the key players in order of their ranking by the National GI Association some are based on an external evaluation, and some National GI Associations were, understandably, uncomfortable over finalising the "ranking" of the top 5-10.

A huge amount of data was gleaned from the internet during the course of writing this report, much of it is reproduced on the following pages, and while the content of the web pages was assumed to be correct - it might not be, it can often be out of date.

The tables that begin each country section in this report contain the following sections:

Player

Firstly the organisations are (usually) listed in a ranking order from the top down. Where it could be obtained the most recent annual turnover is stated, converted to euro. In cases of currency conversion one of two on-line converters aquariussoft.com or yahoo.com have been used, converting the national currency on the day the report was written i.e. during June/July/Aug 2003. Where used, the term Billion (Bill) refers to the USA definition = 1,000 million. All national flags used as part of the Annex 2 Directory of Organisations are used "courtesy of http://www.theodora.com/flags/ used with permission".

Type
The organisation status is written where it is known. In many cases this is written as the information appears from its source. There are occasions where the term "PLC" is written to indicate a public company although it is understood that the abbreviation PLC might not correspond to all legal jurisdictions or have the same legal meaning in each country (i.e. in France the equivalent would be a Société Anonyme - SA).

Sector
A list of sectors in which each organisation is active is given. The abbreviations used are:

CG	Central Government	Ret	Retail and commercial
LG	Local/municipality Government	Fin	Financial
Uti	Utilities	Def	Defence and Military
Tel	Telecomms	Hea	Health
Tra	Transport	Env	Environment
Ems	Emergency services	Cri	Crime
Edu	Education/Research	Prop	Property/Construction
Con	Consumer	Oth	Other
LBS	Location Based Services		

The list is by no means exhaustive (ESRI, for example claim to be active in 30 vertical markets). For many entries it would have been impossible, for reasons of space, to include all the market sectors served by each organisation (e.g. National Mapping Organisations). For this reason this section of the table in places *only includes the main sectors* served by an organisation, or is indicative of the types of sectors served.

Products
Similarly, for reasons of space, not all products are listed, but hopefully enough to indicate the nature of the business involved, and on occasions individual products (with Hyperlinks).

Turnover
The annual turnover figures that are given are generally accepted as being the gross revenue of the organisation as it is recorded on it's income statement for the financial year in question (e.g. from an annual report, the survey questionnaire or a website). In many cases a turnover figure as such is not appropriate i.e. for a National Mapping Organisation that receives a percentage of its income from revenue and a percentage from Government budget, grants or contracts. Where possible these differences have been quantified in the table or described in the text. In other cases questionnaire respondents have been reluctant to provide a figure because of commercial sensitivity or because the GI part of their business only represents a percentage of the overall figure and to provide a number might be misleading.

Staff
Staff numbers are also taken from the latest available source, usually the annual report, the survey questionnaire or a website.

Directories
The directories in the annexes to this report provide a listing of the organisations features in the main body of the report. Directory 1 is an alphabetical listing. The remaining annexes contain details of the specific product and service types that each organisation provides. At this stage the directories are only populated with the details of organisations for which data was received either directly from them, or via the inputs from the various National GI Associations (mainly from the questionnaires). As such the product and service directories are not a complete listing of all the organisations listed in Directory 1.

Report Structure

Methodology

This report is based upon a variety of inputs but depends largely on a questionnaire sent out to 32 National GI Associations on 9th June 2003. Preceding this, the Associations had been alerted via their umbrella organisation EUROGI. The survey was discussed at the 9th EC-GI & GIS Workshop at A Coruña, Spain (June 25-27 2003) and the European GI community was invited to participate via the "egip" GI discussion list. The Excel spreadsheet based questionnaire sought, for between 5 and 10 organisations per country, a mixture of technical and commercial details – contacts, turnover, staff numbers, products, market sectors etc. The data were returned over the course of the summer 2003, the first reply (Cyprus) being received on 11th June, and the last on 30th August. In a number of cases the questionnaires were sent out by the National GI Associations to organisations for them to complete. Several National GI Associations were unable to complete the questionnaires, while others were unable to complete the questionnaire but could list the key players and provide some information about them. These leads were then followed up via web and document searches. These data then became the foundation of the report. The search of the Internet was via publicly available search engines, usually Google. Initial search expressions were mainly in English but on occasions no English text was available and on-line translations were used where necessary, and possible.

Some of the most regularly visited websites, for source data, included EuroGeographics, EUROGI, Permanent Committee on Cadastre in the European Union, GEO:connexion, and Directions Magazine. Data that was in some cases submitted to the INSPIRE Spatial Data Infrastructures in Europe: State of Play 2002 country reports were available in some instances, but the permission to use the data from the main INSPIRE report could not be obtained in time to help with this key players report. The data from the questionnaires that were sent to the National GI Associations were transferred into the tables for each country report, and into the directories in the annexes to the report. Further details for the report were fleshed out from correspondence, web sites, phone calls etc. The country sections take the form of a table and then a textual description which normally begins with the National GI Association and then moves via the public sector to the private sector, in general following the order shown in the table. Over the course of the survey over 600 emails were exchanged in order to gather the required input.

Acknowledgements

From the author - This survey and report would not have been possible without the help of many people. Annex 8 to this report lists all the correspondents from whom information was received over the three month period during which the report was compiled. The quality of the report is directly proportionate to the input received from the various National GI Associations, or national contact points where formal Associations do not yet exist, which were very supportive, and often untiring in their response to numerous queries.

To the many people who have contributed to this report and who have provided so much help and input I cannot thank you enough for your enthusiasm and professionalism. I must also thank GINIE/EUROGI project leader Chris Corbin for his continuing support and encouragement, and lastly but by no means least, my family who must all have wondered where I had disappeared to for the summer.

Austria

Player	Type	Sectors	Products	Turnover	Staff
Bundesamt für Eich und Vermessungswesen (BEV) Federal Office of Metrology and Surveying	Govt Dept	Def, CG, LG, Tra, Uti, Tel, Con, Env	Austrian Map on-line Real Estate (cadastre) and others	€66 Mill	1350
Umweltbundesamt GmbH	Private company owned by Federal Environment Agency	CG, LG, Env	Österreichische Umweltkarten im Internet		280
Synergis	PLC	CG, LG, Tra, Uti, Tel, Def, Prop, Env	ESRI Leica ERDAS		
GISquadrat	PLC	Env, CG, LG, Tra, Uti, Tel	Geoprovider ResPublica		
Axmann Geoinformation	PLC	Con, CG, LG, Tra, Uti, Tel	Safe FME		
WIGeoGIS	PLC	CG, LG, Tra, Uti, Tel, Def, Con, Env	WIGeoMap WIGeoStreet NextDoorXML		
GEOSPACE Beckel Satellitenbilddaten GmbH	PLC	CG, LG, Tra, Uti, Tel, Def	Raw satellite image data from SPOT, LANDSAT, IRS, ERS-1/ERS-2, Radarsat, NOAA, Meteosat		
PROGIS	PLC	CG, LG, Tra, Uti, Tel, Def	WinGIS		

The National GI Association in Austria is known as Österreichischer Dachverband für Geographische Information (*Austrian Umbrella Organisation for Geographic Information*) or AGEO (**www.ageo.at**). Founded in 1998 it is a non-profit national umbrella association covering GI suppliers and user organisations in the public and private sector. It currently has 47 members representing a variety of institutions, private companies, public bodies and professional associations. Its aim is to promote GI within society and to encourage the use of GI for decision-making in professional activities. Amongst its current priorities are activities aimed at establishing an Austrian S DI, investigation of the market potential for an Austrian Metadata Service, and participation in European initiatives as INSPIRE, GINIE, etc.

Operating under the Federal Ministry of Economic Affairs, The Bundesamt für Eich und Vermessungswesen (BEV) (www.bev.gv.at/) is the Federal Office of Metrology and Surveying and acts as both the national mapping organisation and the national cadastral agency. Its principle activities are:

- Fundamental and legal metrology;
- Providing national standards for the legal units of measurement;
- Administering the cadastre of real estate of the whole territory of the Republic;
- Producing the topographic and cartographic infrastructure of the whole territory of the Republic;
- Providing ground related data for applications on Geoinformation Systems by remote sensing
- Creating topographic mapping and cartographic elaboration on different scales and thematic issues;
- Producing aerial photographs for surveying and documentation;
- Keeping an archive of aerial photographs with a stock of 400.000 images;
- Keeping an archive of historical maps and charts.

Data produced for the Austrian GI market includes “Basic Data” - Georeferenced topographic & cartographic models, aerial images, orthophotos, “Real Estates” - Information derived from the Real Estate Database, and the “Topographic Database” - Landscape Model (different Layers), 3D-Terrain

Model of Austria, and the "Cartographic Database" - Cartographic Models, thematic versions and military applications.

The Federal Environment Agency Austria Ltd or **Umweltbundesamt GmbH** (www.ubavie.gv.at/) was founded in 1985.Its 280 staff members are based in a central office in Vienna (265 staff) and a branch office in Klagenfurt (15 staff). It is is the Specialist Institution of the Minister for the Environment and provides expertise on:

- the condition of the environment and environmental changes, and
- measures to avoid or reduce environmental pollution.

Bound by law to supply the public with environment information, it does so increasingly via the Internet and its Österreichische Umweltkarten im Internet has become an award winning[2] window into Austrian environmental information.

In the private sector Synergis (www.synergis.co.at) is the Austrian distributor for ESRI and a key player in the provision of GI software and solutions.

GISquadrat (www.gisquadrat.com) is another leading GIS company in Austria. It has used Intergraph's GeoMedia technology in important projects for many of its customers, including local mobile communications provider mobikom Austria, the Austrian Federal Forests Stock Company and the Federal Office of Metrology and Surveying of Austria (BEV).

Axmann Geoinformation (http://www.axmann.at/) is a GIS consultant, services and software sales and development company. The company is specialised in data conversion (import/export for loading/retreival purposes) to and from all types and products of GIS, CAD-systems and databases. The company possesses special application expertise in the fields of transport, energy supply and public administration (cadastre), land use planning. As consultants the company have designed a nationwide transport information system for the Austrian Federal Ministry for Transport, Infrastructure and Technology. Axmann has also completed a project to put the official street (non-coordinate) reference system onto a nation wide street network graph (1:10k). The result of this project forms the basis of the (planned) Austrian road pricing system and the Austrian national road and rail planning system. Axmann Geoinformation is a reseller of the data conversion product: Safe Software's (www.safe.com) "Feature Manipulation Engine" (FME) and Axmann provided products feature in a huge number of Austrial spatial data applications.

WIGeoGIS (www.wigeogis.com) was founded by Zoltán Daróczi and Georg Magenschab as an offshoot of a research group at the University of Economics of Vienna (Wirtschaftsuniversität Wien) in 1993 and claims to be one of the leading European companies in the fields of geomarketing and Internet/mobile GIS today. WIGeoGIS has branch offices in Munich, Vienna and Salzburg. The company has two main areas of expertise. As a data refiner WIGeoGIS relates digital maps of Austria and Germany with demographic, economic and company information. These data packages are used for marketing purposes and company management. Secondly, WIGeoGIS offers and develops information and search services for the Internet, PDA and mobile phones. WIGeoGIS products are used by over 300 companies in fields such as company management, marketing, sales and services. Its customers include clients such as Allianz, Bank Austria, Hans Müller Verlag, max.mobil, Mediaprint, mobilkom, Shell, Spar, Telekabel, tele.ring, and Volkswagen.

GEOSPACE Beckel Satellitenbilddaten GmbH (www.geospace.co.at) is a company which describes itself as an institute for applied research in, and practical application of satellite remote sensing and GIS. The company was established in 1986 in Bad Ischl/Austria when Satellite Remote Sensing was internationally commercialised (SPOT Image, EOSAT, etc). In 1994 Geospace moved to the Technology Center in Salzburg where it offers remote sensing services to users from all sectors, and it creates remote sensing products for the general market.

PROGIS (www.progis.com) is worldwide supplier of PC based GIS software (WinGIS, WinMAP, WinMAP LT) mainly aimed at the agriculture and forestry sectors, and pipeline (oil,gas,water) management.

In the world of academia the **Technical University of Vienna**, Institute for GeoInformation, (www.geoinfo.tuwien.ac.at) has for many years had a high profile in the GI world. As well as conducting research in areas such as real time WAP applications, navigation in real and virtual

[2] Umweltbundesamt GmbH was an ESRI "Special Achievement in GIS" 2003 award winner

environments, and the economic value of GI, it has been involved with many pan-European projects such as ETeMII, GISMO, and Panel-GI.

The centre for geographical data processing at the **University of Salzburg (ZGIS)** (www.zgis.at/) has been in existence since 1988 at the Institute for geography and applied geo-computer science at the University of Salzburg. The most important activities performed by ZGIS are training, research and development, development of international relations and organising trade conferences.

The **GIScluster** (www.giscluster.at) is an interesting model for the supply of GI products and services. It is a collaboration amongst companies that offer a broad selection of know-how and services around the GIS chain of added value. The group of firms with 140 collaborators originated in 1999 in the course of the Initiative Digital Media of the County Salzburg.

Belgium

Player	Type	Sectors	Products	Turnover	Staff
Institut Géographique National – Belgique (IGN-B)	NMO, public service under the Ministry of Defence	LG, CG, Uti,Tel, Tra, Prop, Def, Env, Edu	Top10v-GIS Top50v-GIS, Top250v-GIS CORINE DTED, Admin-v, Aerial photos and digital orthophotos cConvert, P7, Libgeo	€13.5 Mill (2002)	269 (2002)
Administration du cadastre, de l'enregistrement et des domaines	Gov Dept	CG, LG, Prop	Cadastral maps: Cadnet On-line access for notaries to Parcels/owners data base Boundary line		4,800 (2001)
Centre d'informatique pour la Région Bruxelloise (CIRB)	Public Agency	Con, LG, CG, Uti,Tel, Tra,Edu	Brussels UrbIS		
Ministere Wallon De L'Equipement et Des Transports (MET)	Regional Gov Dept	LG, CG, Uti,Tel, Tra, Prop	BRIGIT WALCORS PICC		
Vlaamse Landmaatschappij (VLM)	Regional Gov Dept	CG, LG, Uti,Tel, Tra, Con	GIS-Vlaanderen		
Star Informatic	PLC (SA)	LG, CG, Uti,Tel, Tra	STAR Line APIC Line Mercator	€4.8 Mill (2002)	53 (2003)

Within Belgium the two principal sources for GI data are the **Institut Géographique National Belgique** (IGN-B) and the **Administration du cadastre, de l'enregistrement et des domaines** (Belgian Cadastre Agency).

The **Institut Géographique National – Belgique** (IGN-B) (www.ngi.be) is the Belgian national mapping organisation created in 1976 on the basis of a long tradition and history started in 1831. IGN-B has a mandate to establish and maintain national planimetric and altimetric networks, to maintain aerial photographic coverage of the country, produce and maintain topographic databases and the related cartographic products, accomplish works related to remote sensing data exploitation for geographic purposes, coordinate national GIS applications and produce GI products and services. Studies and developments related to these activities are also to be carried out. IGN-B has to publish and distribute all documents related to its basic mission in graphic, photographic or numeric form. IGN-B is working in collaboration with the national, regional and local actors to collect, manipulate and update topo-geographic data.

The **Administration du cadastre, de l'enregistrement et des domaines** (The Belgian Cadastre Agency) (fiscus.fgov.be) is part of the Ministry of Finance and is currently in the process of computerising its cadastral map production "to expedite the 200,000 modifications that are made annually to the database. During the first phase, the vectorised cadastral maps will be managed with the new tools. At the same time, the geometric quality will be cross-checked and significantly improved. The goal is to move towards an enterprise GIS environment."[3]

The **C.I.R.B.**, **C**entre of **I**nformation Technology for the **Re**gion of **Br**ussels, is a public body created in 1987 which has become a key GI player in Belgium. Its main objective is to computerise the data held by the public authorities of Brussels-Capital Region. Its role is to organise, promote and disseminate the use of computer and communications techniques among local authorities and the various departments of Brussels-Capital Region. To help it do so it has developed the "Brussels UrbIS®©" Regional Digital Map. This administrative map database is the regional standard and is used by more than 50 public departments and private companies. CIRB also acts as a service centre able to demonstrate the feasibility of telematics applications for public departments and between public departments and the citizen. The government developed a three-year programme to prepare public sector bodies to make optimal use of this CIRB network and the Ministry of Telecommunications has

[3] ESRI Press Release, Feb 2003 : http://www.esri.com/news/releases/03_1qtr/esribelux.html

allocated over €21 Million to connect the entire Belgian school system to an RNIS network (Reseau Numerique a Integration de Services or Integrated Services Digital Network - ISDN). Today, 150 computer scientists and programmers work at the CIRB and provide services and ready-to-use applications for the various regional departments, in particular relating to EU and Federal Departments of Scientific, Technical and Cultural Affairs projects. The web site is http://www.cirb.irisnet.be and the geomatics department, which manages the development of the Brussels UrbIS, is described in detail in its website at www.cirb.irisnet.be/ci/FR/Departements/Geomat.

As Belgium builds its regional SDIs two organisations in particular are leading examples of key GI players. In the Walloon region of Belgium the **Ministere Wallon De L'Equipement et Des Transports** (known as MET) comprises four departments (DGs) responsible for civil engineering, environment, traffic, and IT. The MET is far sighted in its approach to GI and is an influential player in the supply of GI products and services as it establishes the building blocks of a regional SDI. The Walloon Government decided on May 23, 1991, to create the "Computer Project for Continuous Cartography" (PICC) within the Topography and Cartography Department of the MET. From this cartographic base the department has produced a database called BRIGIT. The MET realise the importance of not duplicating data collection and it is discussing with the cadastral administration and the IGN over how the organisations can cooperate and work in partnership. The cartographic data and associated information available in BRIGIT are available free of charge to public entities and administrations. One other development that should be mentioned is the WALCORS (WALlonia Continuous Operating System) network. This is still being developed at the time of writing but will comprise 23 permanent reference GPS stations. With the help of this network, it will be possible for topographers to know the position of points in real time, while possessing only a single mobile GPS receiver.

In the federal state of Belgium, responsibility for the living environment lies with the federal regions. The policy in the case of Flanders is determined by the Flemish government and implemented by the departments of the Ministry of the Flemish Community and by a number of Flemish public companies, including the Flemish Land Agency. The **Vlaamse Landmaatschappij** (VLM) (www.vlm.be) or Flemish Land Agency employs some 650 staff and is a decentralised organisation with a central directorate in Brussels and four provincial divisions. Within the VLM is the second example of regional SDI development. In order to make the GI held by the various Flemish authorities more accessible and easier to exchange the GIS-Vlaanderen (www.gisvlaanderen.be) (GIS-Flanders) was established in 1995 and is managed by the GIS-Vlaanderen Support Centre within the VLM. The Centre plays an organisational and coordinating role, preparing policy and providing a service and acting as a leader and catalyst within GIS-Flanders. One of the latest projects to be instigated by GIS-Vlaanderen is a web based "demonstration project for innovative electronic information services based on a high resolution raster images, and on the technology for GIS and internet, in support of the local policy concerning spatial (town and country) planning"[4].

Another GI initiative in Belgium is a grouping of the most important utility companies to provide their own basic digital mapping[5].

EUROSENSE (www.eurosense.com) established in 1964, is probably one of the most prominent European commercial remote sensing organisations. With a total staff of 230, it has branches in Belgium (Wemmel, near Brussels), The Netherlands (Breda), Germany (Cologne and Berlin), France (Lille), Hungary (Budapest), The Czech Republic (Prague), Slovakia (Bratislava) and Poland (Nadarzyn, near Warsaw). Services offered include: aerial photography, photo interpretation, processing and interpretation of digital satellite images, production of photogrammetric and topographic maps, airborne laser scanning (LIDAR) for height measurements, GIS/LIS and AM/FM database development and consultancy, city and landscape planning, inventory of forests and natural resources, digital orthophotography, cartography, hydrography, environmental studies, and other remote sensing based activities.

Other particularly active organisations in the supply of GI products and services in Belgium are Bentley (www.bentley.be), ESRI (www.esribelux.com), STAR (www.star.be), and Oracle (www.oracle.com/global/be) as software suppliers, and CGEY (www.cgey.be) as service provider.

[4] Intergraph Press Release, http://www.intergraph.be/press.htm
[5] GIS Diffusion in Local Governement, England, Oct 93, Abstracts: http://www.shef.ac.uk/uni/academic/D-H/gis/absdiff.html

Bulgaria

Player	Type	Sectors	Products	Turnover	Staff
Ministry of regional development and public works	Gov Ministry	CG, LG, Env, Uti, Edu, Def			
Geodesy and Cartography Directorate	Gov Dept	CG, LG, Env, Con, Edu, Def			
Cadastre agency	Executive Agency under Minister for Regional Development and Public Works	CG, Lg, Env, Uti, Edu, Def	Cadastre		
Military Topographic Survey	Gov Dept	Def, CG,LG			
Ministry of Environment and Water	Gov Dept	Env, Tra, Uti, CG,	Hydrology		
Ministry of Agriculture and Forestry	Gov Dept	Env, Agr, CG, Uti,			
ESRI Bulgaria Ltd	PLC	CG, LG, Env, Tra, Uti,	ESRI		
Datecs Ltd GIS Centre	PLC	CG, LG, Env, Tra, Uti,	MapInfo		
Datamap-Europe Ltd.	PLC	CG, LG, Env, Tra, Uti,	Intergraph		
Geomatics	PLC	CG, LG, Env, Tra, Uti,	ESRI Military Mapping		
Technical University of Sofia	University				

The main cartographic and geodetic activities in Bulgaria, as well as the provision of quality spatial data, are largely the responsibility of two state organisations; the department of "Geodesy, Cartography and GIS" of the Ministry of Regional Development and Public Works, and the Military Topographic Service (Ministry of Defence). These two organisations can be called the national cartographic agencies. The tasks of cartography and topographic-geodetic activities are distributed between these two institutions which are described below.

The **Ministry of Regional development and Public Works** (www.mrrb.government.bg) is responsible for most of the policies relating to GI: regional policy, strategic planning, physical and urban planning, public works, housing, registration of the citizen, etc. The Ministry has a number of directorates that have responsibilities for GI related activities including the Geodesy and Cartography Directorate (http://dgk.mrrb.government.bg/) and the Road Executive Agency. The Cadastre Agency (www.cadastre.bg) is subordinated to the Ministry of Regional Development and Public Works, but has more autonomy than a directorate.

The Geodesy and Cartography Directorate is responsible for the collection, maintenance, and dissemination of large-scale topographic data (1:5k-1:10k) over the whole of Bulgaria and the maintenance of the national levelling network. The large scale maps are in the process of being digitised. A DEM is available for the whole country. This directorate has also recently begun work on a website (dgk.mrrb.government.bg) from which the public will be informed on the issues concerning the purpose and objectives of the directorate, background information on the activities in the field of geodesy, photogrammetry and cartography in Bulgaria, and current projects.

The Cadastre Agency (www.cadastre.bg) is responsible for the national cadastre and property register. To co-ordinate national data the Agency is responsible for the creation and maintenance of a national integrated collection of geodetic, cartographic, cadastre and other data. The agency collects data from ministries and other organisations, such as the border police (administrative data of the country borders), the 28 administrative regions, the Ministry of Agriculture and Forestry (data of agriculture and forest lands), and others. The cadastre is in the process of being digitised, with approximately 10% of the urban area converted, although the agricultural and forest cadastre is digitised for the whole country. To help with the maintenance of the cadastre a new GPS control network is being developed, comprising 430 control stations spread over the country, one station per 250 km^2, meaning a control station within a range of 10 km of any location.

The Cadastre Agency provides administrative data for the whole territory, with accuracy 1:5000 and smaller. It also provides administrative data to EuroGeographics for inclusion in the SABE product.

Other key agencies are the Military Topographic Service of the Ministry of Defence, which provides topographic data at 1:25,000 scale and lower, the Ministry of Agriculture and Forestry, and the National Statistical Office. All organisations (except Military Topographic Service) collecting GI have to follow the regulations issued by the Ministry of Regional Development and Public Works.

The Ministry of Defence with its **Military Topographic Service** (MTS) originally carried out all cartographic and geodetic works in Bulgaria. In 1952, some of the functions of the Military Topographic Service were transferred to the then department of Geodesy and Cadastre of the Ministry of Building (now Ministry of Regional Development), by Decree of the Council of Ministries. Today, the main tasks of the MTS are firstly cartography and the production of topographic maps of scale 1:25k, 1:50k, 1:100k, 1:200k, 1:500k and 1:1Million, and secondly the maintenance of the State geodetic network of the classes I, II, III, and IV. The products of the MTS include topographic maps in the scales 1:25k – 1:1Million, thematic maps and photo-documents, urban plans, astronomic and geodetic data, and military-geographic descriptions etc. The MTS provides topographic data principally to the Army but also to other organisations. GIS is now used by MTS to provide the Bulgarian Army, government institutions, the state economy and private companies with digital geographic products and information.

The **Ministry of Environment and Water** (www.moew.government.bg) create and maintain hydrography, watershed and other environmental medium scale thematic datasets, while the **Ministry of Agriculture and Forestry** (www.mzgar.government.bg/) and **The National Statistical Institute** (NSI) (www.nsi.bg/Index_e.htm) also hold, maintain, and provide digital data. The NSI provides demographic data on national, regional and local level, both in analogue and digital form.

The main private sector players in Bulgaria are ESRI. Datecs Ltd, DataMap Europe Ltd, and Geomatics Ltd. **ESRI-Bulgaria**'s (www.esribulgaria.com) customers are primarily governmental institutions including the Ministry of Defence, Ministry of Environment, Ministry of Regional Development and Construction, Ministry of Internal Affairs, Ministry of Agriculture, National Statistical Institute, Bulgarian Telecom, and many others. Some of ESRI-Bulgaria's biggest customers among private companies are in the field of telecommunications. Other major clients are large municipalities including Sofia, Varna, and Burgas[6].

Datecs Ltd (http://www.datecs.bg) was founded in 1990 by a group of researchers from the Institute of Applied Cybernetics in the Bulgarian Academy of Science. DATECS is a private corporation with a total workforce of over 200 employees. DATECS works in a number of IT areas and provides a range of GIS & mapping services. Its GIS Centre is an Intergraph provider, a MapInfo Authorised Partner and specialises in digital cartography, typology building, thematic mapping and all kind of databases and Internet applications relevant to the geographical, geological and demographic sectors. A particular speciality is its use of Cyrillic software. In 1997, Microsoft purchased a Datecs license for the distribution of the Cyrillic spelling and hyphenation software product - Flex Word.

DataMap Ltd (www.datamap-bg.com/bul) is another private company, offering data, maps and atlases, and software solutions for a range of GI applications including vehicle routing and LBS.

Geomatics Ltd is a private Bulgarian company which was founded in 2000 from a team of highly qualified specialists working in the fields of geodesy, GIS and GPS technologies. The company is entirely devoted to collection, processing and analysing of digital information and implementation of GIS. The company's activities include GIS Implementation, GIS database design, data automation and Import/Export control, consultant support for different projections and coordinate systems conversion, GPS fleet management solutions, GPS technology location services and consultancy for digital data collection, processing and analysis. Geomatics has an ESRI development license and has distribution rights for Military Topographic Service GI products, mainly 1:25k to 1:1 Million.

Although Bulgaria does not have a national GI association the **Technical University of Sofia** (http://www.tu-sofia.bg/) plays an important role through its activities and international collaboration in raising awareness and bringing together interested parties. It also assumes the role of the GISIG national secretariat for Bulgaria and for the neighbouring countries. In this context it could be ranked amongst the "key players".

[6] ESRI Press Release, Mar 2001, http://www.esri.com/news/releases/01_1qtr/esri-bulgaria.html

For much of this section of the report the GINIE project is indebted to Ulrich Boes who is involved with the GI in South Eastern Europe (GISEE) (http://www.gisig.it/gisee/) project. The overall aim of the GISEE project is to "provide a comprehensive documentation of spatial data infrastructures in the countries Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Macedonia, Romania, Turkey and Yugoslavia, describing data, **actors** and applications". More information on the project can be found at the GISEE website.

Czech Republic

Player	Type	Sectors	Products	Turnover	Staff
Czech Office for Surveying, Mapping and Cadastre	Govt Sector	CG,LG, Prop, Tra, Ems, Agr, Cri, Env, Tel, Hea	- Large, Medium and Small Scale Maps of the CR; - Thematic State Map Series; - digital raster maps, digital vector maps, esp. ZABAGED; - Cadastre, including ISKN - the enhanced Internet version	€ 66 Mill (A.R.2002)	5700 (2002)
The Forest Management Institute	Govt Contributory organisation	For, Agr, Env, Edu, Pro	forestry maps and the national web map server for forestry	€ 5 Mill (1 Mill from it for IDC) (2002)	487 (2002)
Czech Geological Survey	Govt Institution	Env, Agr, Edu, Tra	geology maps and the national web map server for geology		333 (2003)
GEODIS BRNO, spol. s r.o.	PLC	CG, LG, Env, Agr, Tra	- Seamles ortho-photomap of CR; - Flood monitoring; - Overview of services in photo-grammetry, surveying and geodata provision – see www.geodis.cz	€ 13.5 Mill	320
T-MAPY, spol. s r.o.	PLC	CG, LG, Fin, Env, Prop,	T-MapServer; T-WIST, T-MapViewer Geodata Map of Europe	€ 1.5 Mill	50
GEPRO, s.r.o.	PLC	CG, LG, Ems, Tra, Uti, Fin, Envi, Prop,	MISYS, Kokeš, LUPUS, MAPA3, KOMUNIKACE, ATLAS - DTM, PROLAND	€ 1 Mill	30
ARCDATA PRAHA, s.r.o.	PLC	CG, LG, Env, Ems, Def, Edu,	ESRI and RDAS products; satellite images, Satellite Map of the CR, ArcCR 500, ArcCR City		
Integraph CR, spol. s r.o. (HQ in USA)	PLC	CG, LG, For, Agr, Uti, Tra, Ret,	Intergraph products		
Czech Association for Geoinformation	civil professional association		MIDAS (national clearing house of geodata, see http://www.cagi.cz/midas	€ 60.000 (2002)	4 (2002) (127 indiv. and 31 collective members)
Nemoforum	association without legal entity		NGII Program for 2001-2005	secretariate hosted by COSMC	2 (17 collective members)

The National GI Association of the Czech Republic is called the "**Czech Association for Geoinformation**" (**CAGI**) (http://www.cagi.cz/)[7]. CAGI has been an active player in the GI sector since 1997 and represents the Czech Republic in EUROGI. It joins mainly GI oriented firms and academic and research institutes and GIS specialists and students. Nemoforum is a national platform for cross-sector communication and co-operations in the field of GI and cadastre. Nemoforum was established in 1999 and acts as a network linking public, private and academic sector representatives.
The two main Government providers of reference and core data in the Czech Republic are the **Czech Office for Surveying, Mapping and Cadastre** (joining the Land Survey Office; Research Institute of

[7] CAGI is described in detail in the GINIE Survey of National Geographic Information Associations in Europe, pages 22-30. The association Nemoforum and the NGII Program were introduced in the GINIE report on Spatial Data Infrastructure, Country Reports 2002, see p. 11-13. Published on www.ec-gis.org/ginie

Geodesy, Topography and Cartography; Survey and Cadastre Inspectorates; Cadastral Offices; and the COSMC HQ in Prague) and the **Topographic institute of Czech Army (VTOPU)** in Dobruska, http://www.vtopu.army.cz

The Czech Office for Surveying, Mapping and Cadastre (COSMC) (www.cuzk.cz), which has an HQ staff of 65, is an autonomous supreme body of the state administration of surveying, mapping and cadastre in the Czech Republic. The president of COSMC is subordinated only to the prime minister of the Government. The role of the organisation is as follows:

- Complete administration of the Cadastre (including legal relations to real estate property),
- Maintenance and modernisation of horizontal, vertical and gravity control in the Czech Republic,
- Large-scale mapping (cadastral maps, derived 1:5.000 State map),
- Medium-scale mapping (Base map of the Czech Republic 1:10.000, 1:25.000, 1:50.000, 1:100.000, 1:200.000),
- Small-scale mapping of the Czech Republic (1:500.000, 1:1.000.000),
- Creation of the Fundamental Base of Geographic Data (ZABAGED),
- Geodetic surveys and documentation of state boundaries,
- Development and maintenance of the Information System of Surveying, Mapping and Cadastre in the Czech Republic,
- Standardisation of geographical names,
- Coordination of research and international cooperation in geodesy, cartography and cadastre.

Administration of the Cadastre of Real Estate is performed by cadastral offices (77) in districts and branch offices (35) in larger towns. Since 1993 local cadastral offices have been given the power to make decisions about entries of proprietary and other rights in relation to real estate into the cadastre. Maintenance and modernisation of the fundamental geodetic control, medium- and small-scale official mapping, creation of the Fundamental Base of Geographic Data (ZABAGED) and geodetic surveys and documentation of state boundaries are mostly carried out by the Land Survey Office in Prague (380 employees). 7 Survey and Cadastral Inspectorates (90 employees) supervise the performance of cadastral offices (5200 employees) and those activities of private companies and licensed surveyors performed for the state administration. COSMC with approximately 5700 employees in total has its own account in the State budget of the Czech Republic. Its total expenditure budget in 2002 was about €66 Million. The GI products available from COSMC include:

- A wide range of analogue and digital mapping;
- The digitized national cadastre of real estates. The descriptive information files are in digital form. (They contained on December 2001 data on: 14,7 Mill existing parcels of land and buildings, 6,8 Mill parcels of owners incorporated into large blocks of land during communist collectivisation, 7,4 Mill owners and co-owners, 4,7 Mill property sheets, 13,8 Mill land evaluations by “bonita” classes.) The map sheets have been converted into digital format since 1997. This task is complicated due to the non-homogenity in scale, projection and content of existing maps;
- Enhanced Cadastral Information System (ISKN). ISKN was developed during the late 1990s. It provides access to cadastral data extended to the whole Czech Republic not only to individual Cadastral Offices but by Internet to the citizens, too. It has been operating as a commercial service since 2001.

Apart from the two organisations already mentioned there are other Government GI product and service providers concerned with specific data types, particularly aspects of the environment. GI players such as the **Czech Hydro-meteorological Institute** (http://www.chmi.cz/indexe.html) and the **Czech Statistical Office** (http://www.czso.cz/eng/redakce.nsf/i/home) are organisations with a long-term tradition of production and systematic maintenance of highly complex spatial information; both of them are pioneers in development of digital GI, national map-servers and opening access to the public via the Internet.

The Forest Management Institute (FMI) (www.uhul.cz/en/) is a government organisation established by the Ministry of Agriculture. It is located in Brandýs nad Labem. The institute is specifically charged with executing forest inventory in the Czech Republic, and the elaboration and administration of regional plans of forest development. The Forest inventory is an independent survey of forest lands and their development. Regional Plans of Forest Development (RPFD) are the defining principles of forest management according to the natural forest areas in the Czech Republic. They stem from the concept of sustainable forest management and hope to minimise conflict between societal interests

and those of particular forest owners. A RPFD Data Warehouse - Set of maps has been established which covers the whole Czech Republic and enables open access via Internet. It is maintained by the Information and Data Centre (IDC) for forest and game management in the Czech Republic. IDC executes the administration of the central database and archives on forests and game management in the Czech Republic which includes monitoring data and other related information. The most important function is the maintainance of forest management data collected in the Czech Republic and disseminating this data to other government departments and to the general public. In addition to the above activities the FMI contributes to the annual "Forest and Forest Management Report of the Czech Republic". The FMI is also involved in domestic and international research projects as well as working in the area of consultation, methodological and edification activities.

The **Czech Geological Survey (CGS)** (www.cgu.cz/), which was previously known as the Czech Geological Institute, goes back to 1919. Its mission is the administration of the state geological survey in the Czech Republic. The CGS collects and assesses data on the geological composition of the state territory and provides them to the authorities for political, economic and environmental decision-taking. The CGS is a state budget organisation and a member of international geological organisations – EuroGeoSurveys, FOREGS (Forum of European Geological Surveys) and ICOGS (International Consorcium of Geological Surveys). The CGS Map Server, which was launched in early 2003 provides information about maps, geodatabases and related data sources in the CGS Data Warehouse. Metainformation on maps from 1919 to the present day enables access to maps and geodatabases (GEOCR50) on the territory of the Czech Republic to members of the general public. The CGS also published an interactive Czech-English DVD-ROM comprising a complete set of scanned geological maps (1955–2001) at the scale 1:25k. This provides a unique collection of 940 geological maps of the Czech Republic.

There are more than 40 private organisations providing geodata, GI, GIT or GI underpinned services within the Czech Republic. Some of these companies are purely Czech enterprises while some represent a Czech branch of an international corporation. The three main companies detailed below have been active in the Czech GI market since the early 1990s. They differ in their size and specific orientation but all of them are key players in their field of activities. GEODIS provides large volumes and high quality of geodata and GI services, including remote sensing. T-mapy provides GI underpinned webservices for different application areas. Gepro developed and uses an original Czech GIS tool and builds up or integrates powerful applications for specific agendas and services of public administration. Both Gepro and T-Mapy have won the Czech Republic geo-application of the year contest thanks the practical usage of GI based sevices.

Geodis Brno, spol s.r.o. (www.geodis.cz/www/) is a commercial company providing services in the domain of photogrammetry, geodesy and distributing surveying, laser and medical instruments. The main corporate activities cover software provision, automatic data processing, training, land surveying, aerial photography and project management. GEODIS BRNO claim that their department of photogrammetry of is one of the best equipped photogrammetric working places in Europe[8]. It's services cover all aspects of remote sensing and aerial photography. The Surveying Department of GEODIS BRNO provides complete surveying services and CAD/GIS data digitisation. GEODIS BRNO also claims to be is the biggest producer and supplier of digital geographical data in the Czech Republic. It offers a wide spectrum of nationwide or regional data products. The basic product offered is a colour orthophotomap of the Czech Republic at 1:5k scale, with a resolution of 1 pixel = 0.5m. These data, which currently cover 70% of the Czech Republic, are intended to be available for the whole country by the end of 2003. Geodis Brno also provide a satellite orthophoto in coordinate systems S-1942 and S-JTSK, built from 9 LANDSAT 7 scenes taken in 1999 - 2001.

The company **T-MAPY spol. s r.o.** (www.tmapy.cz/) was founded in 1992 as a daughter company of the company T-KARTOR Sweden AB. From the outset the company has specialised in GIS and cartography based on ESRI software products. It provides a range of GI services and products including:

- GIS "fully completed" for public service (district, town and municipal authorities), institutions and professional firms
- data processing (digitisation, scanning, vector graphics, analysis, visualisation)
- user applications including the utilisation of the GIS technology in the Internet or Intranet environments)

[8] http://www.geodis.cz/www/english/index.php?page=fotogrammetrie_aktualne

- creation of digital cartography products with a utilisation of geographic databases, which are in existence - town maps, maps of land-registry numbers, maps of regions, wall maps, map enclosures to the professional studies, etc.
- sale of ESRI software including T-MapServer (Intra(Inter)net technology)

A wide range of data is offered by T-Mapy including data covering the whole of the Czech Republic at 1:50k, and town maps. Other data includes raster maps based on data from cartographic publishing house Shocart Zlín.

The company **Gepro s.r.o.** (www.gepro.cz/) is concerned with the development of GI software program tools and equipment and the supply of geodata. It offers complex services including system integration in the following application areas: Information systems for towns and municipalities; GIS; Utilities; Cadastre; Specialised geodetic systems; Intranet and Internet based services; Specific database applications; Monitoring and Navigation of vehicles and vessels; Design of land-reforms; Urban-planning documentation; Management and protection of environment; Production of Digital terrain models.

Other important GI players in the Czech Republic are **HSI s.r.o.** (www.hsi.cz/), **Geovap, s.r.o.** (www.geovap.cz/), and **Berit, a.s.** (www.berit.com). A particular group in the private sector concentrates mainly with delivery of GIS and the development of GIS services. There are different providers of original Czech GIS (**Topol**, www.topol.cz; **Hydrosoft Veleslavin** with its WebMap or Digital Flood-protection Plan www.hv.cz; **Foresta** with PUKNi, www.forest.cz and others). ESRI and Integraph products are key players in this market, alonf with Autodesk and Bentley.

Cyprus

Player	Type	Sectors	Products	Turnover	Staff
Department of Lands and Surveys	Government Department	CG, LG,Prop,Uti, Tra, Env,Def, Tel	Topo Map Series Cadastral Plans Road Maps Hydro data & maps	€66.5Mill	1300
Department of Geological Survey	Government Department				
Statistical Service of Cyprus	Government Department			€35,000	110
Cyprus Telecommunication Authority	Semi-Government Organisation	CG, LG,Prop,Uti, Tra, Env,Def, Tel	CYTANET NetRunner Web connectivity Web hosting		
Electricity Authority of Cyprus	Semi-Government Organisation				
Department of Information Technology Services	Government Department				

The **Department of Lands and Surveys** is a government department offering services in the areas of land registration, survey, cartography, valuation, state land management, tenure and administration. DLS is operating under the Cyprus Ministry of the Interior. DLS undertakes all the work associated with land registration, geodesy, topography, mapping, photogrammetry, hydrography, cadastral surveys, land tenure, land consolidation, management of state land, property valuation and the implementation of an integrated national GIS[9].

The **Cyprus Telecommunication Authority (CYTA)** has as its mission – "the continuous improvement of the entrepreneurial capability and quality of life of our customers, by providing competitive electronic communications services" and a vision of working together to make **CYTA** the leading competitive enterprise of Cyprus. Its CYTANET is one of the largest and most experienced Internet Service Providers (ISPs) in Cyprus and the Eastern Mediterranean region, providing both dial-up access (PSTN, ISDN and GSM) and leased line access along with a vast portfolio of Internet Services and customised solutions.

The Statistical Service of Cyprus (CYSTAT) is the competent authority responsible for the compilation and the publication of most of the official statistical data in Cyprus. CYSTAT (until January 2000 under the name Department of Statistics and Research) functions under the Ministry of Finance. It was set-up in 1950 as a small administrative unit while its real function started after Cyprus became independent, in 1960. CYSTAT is mainly concerned with the initiation, organisation and carrying out of various censuses, surveys and statistical enquiries of an economic or social content and the publication of the results with the intention of assisting both the government and the private sector in policy-making and the planning of their activities. Amongst the data provided by CYSTAT is Land Use/Cover, address and population.

The **Department of Information Technology Services** (DITS) is the Government Department responsible for ensuring that the full potential of Information Technology is harnessed to support the policies and objectives of the Government of the Republic of Cyprus. This department was formed in 1980, as the Data Processing Services Department and in 1997 it was renamed to Department of Information Technology Services. It was formed within the scope and implementation of the Public Service Reform Plan. In terms of its importance to the GI sector the department plays a significant role in the area of IT consulting and project implementation in the Government Service. DITS is also responsible for computer hardware tender specifications and evaluation for all Government Departments. It is the official Government Department which acts as a consultant for all Government IT projects.

[9] http://www.eurogeographics.org/AboutUs/Members/nma_info/Nma_Cyprus.html

Denmark

Player	Type	Sectors	Products	Turnover	Staff
Kort & Matrikelstyrelsen (KMS) National Survey and Cadastre	Public Sector Body	CG,LG,Env,Uti, Tra,Tele,Ems, Edu, Ret, Fin, Def, Prop	KMSTrans Spot-FM / NAV-DK WEB-Cadastre Kort10/vector Nautical Publications Aerial Photos	€37.1Mill (2002)	434 (2002)
COWI A/S (incl. Kampsax)	Limited Company			€231Mill (mostly non GI) Kampsax €54.8Mill (Not all GI)	2400 (mostly non GI) Kampsax 500 (Not all GI)
BlomInfo A/S	Limited Company (HQ Norway)				49 in Denmark 250 global
Informi GIS A/S	Limited Company				45
Geodata Danmark I/S	Owned by 54 municipalities				50
Scankort A/S	Limited Company				30
Carl Bro Gruppen	Limited Company			€296,000 (Not all GI)	3000 (Not all GI)

The national GI Association in Denmark is called **Geoforum Denmark** (www.geoforum.dk) and as well as dealing with Danish issues it is very much focused on co-operation between all Nordic countries. In addition to being represented at GI conferences in Norway, Sweden and Denmark, it is one of five organisations that, in rotation, organise the annual Nordic GIS conference[10].

Kort & Matrikelstyrelsen (KMS) (www.kms.dk) is the Danish National Mapping Organisation and land registry. It is part of the Ministry of Housing and Building. In recent years, in line with many other European National Mapping Organisations it has re-focussed its objectives and reduced its staff numbers to reflect a changing role, and changes in funding. The change in focus is "to ensure that potentials for society can be realised as financing, organisations, and techniques develop and mature with future users. The KMS vision is to act as an active asset in the implementation of the Government's plans to modernize the public sector and to develop and realise the Digital Denmark"[11]. Although its objectives and focus has changed KMS's main responsibilities and areas of work remain unchanged. In 2001 KMS reduced its activity level significantly and further initiatives were required in 2002 as it carried out extensive reorganisation. KMS had to lay off about 100 employees in two rounds of redundancies and a further 25 employees resigned of their own accord. This meant a total reduction in personnel of about one quarter in 2002. In its new role concentrating on provision of core spatial infrastructure elements KMS places an emphasis on greater cooperation with private partners. Amongst KMS's main responsibilities are:

- Geodetic Surveying - responsible for the geodetic surveying of Denmark, the Faroe Islands and Greenland;
- Topographic Mapping - responsible for the national military and civilian topographic mapping in Denmark, the Faroe Islands and Greenland;
- Greenland and the Faroe Islands - responsibility for surveying and topographic mapping of Greenland is divided between the Greenland Home Rule Administration and the Danish government;
- Nautical Charts - responsible for the hydrographic charting of the waters surrounding Denmark, Greenland and the Faroe Islands;
- Cadastral Registration - Cadastral Registrations and Authorisation of Licensed Surveyors;
- Research - KMS is a government research institute for geodesy, seismology, mapping and geodata; and
- GI Coordination - KMS is in charge of coordinating the public sector's production and use of maps and geodata. This of course entails close co-operation with Geoforum, the Danish National GI Association.

[10] EUROGI Member Profile, Geo:connexion magazine

[11] www.kms.dk - vision

Taken over in Jun 2001 by **COWI A/S** (www.cowi.dk), **Kampsax A/S** (www.kampsax.dk) is a private sector organisation with activities in 40 countries around the world. Although it's corporate emphasis lies in civil engineering (which should be taken into account when looking at the data in the table above) its has a strong GI presence in Denmark and in recent years the GI division of Kampsax has helped the company to developed into a "key player" in and beyond the Danish GI market. Kampsax claims to be the only company producing and offering nationwide othophoto and height datasets - DDO (Denmark's Digital Orthophoto) and DDH (Denmark's Digital Height Model). Internationally, Kampsax is one of the largest suppliers of aerial photography with approximately 25,000 aerial photos taken annually. In September 2002 Kampsax won a contract estimated at over €35 Million for the provision of aerial photography, mapping, and related services over a five year period, to Ordnance Survey GB. The production of digital maps based on the aerial photographs will be done by Kampsax' Indian subsidiary in New Delhi. At a regional level Kampsax is an integral part of the Danish GI infrastructure with over 150 of 275 municipalities and 10 out of 14 Danish counties using GIS software and consultancy services provided by Kampsax. A key part of GI implementation for these administrations is the integration of the Danish cadastral system, the building and housing register and other administrative registers. Within Central Government Kampsax customers include The Cultural Ministry, The Ministry for Food (Agriculture and Fishing) and The Ministry for Environment and Energy.

Since its establishment in May 1998, **BlomInfo A/S** (www.blominfo.dk) has become another leading mapping and GIS company in Denmark, undertaking projects in both Denmark and abroad. The company has more than 35 employees in Denmark and can also call on the resources of its Norwegian parent company - Blom ASA (www.blomasa.com/), claimed by the company website to be a "world leading group of companies in geographic data capture and processing". BlomInfo A/S has offices in Copenhagen and Aarhus and representatives based in North America, Slovenia, Romania and United Kingdom. The company specialises in city/landscape modelling, photogrammetry, GI software development/implementation, data conversion, web authoring, visualisation and consultancy. For example BlomInfo A/S has generated a 3-D model covering the total area of Copenhagen municipality. BlomInfo A/S provides a complete production flowline from aerial photography and land survey through photogrammetry and input to a GIS database, to output as printed material or data products. Software development covers a range of the most common GIS products (from ESRI, MapInfo, Bentley Systems and Intergraph) and standard software development platforms including Java, C, Visual Basic, COM, CGI, ASP, HTML, DHTML, VBScript, JavaScript and JSP. Database expertise covers Oracle, SQL Server, MS Access and Informix. Examples of recent projects include:

- The Internet portal www.visitdenmark.com providing tourist information on the Internet (Danish Tourist Board);
- IT systems for route planning and distribution;
- Municipal Internet and intranet solutions;
- GIS consultancy and technical assistance within agricultural information systems and property registration systems in Hungary, Lithuania and Denmark

Informi GIS A/S (www.informi.dk) is the Danish distributor for ESRI and ERDAS. Some of its recent implementations include:

- Enterprise GIS – Informi GIS, have provided NESA (www.nesa.dk), Denmark's largest electricity company, with a GIS based system for management of its distribution and transmission network system[12].
- Transport Management – Within Copenhagen Transport and the regional transportation companies, Informi GIS have developed applications based on Oracle timetable databases and base data and cartography from KMS's TOP10DK vector data set. The Danish State Railways and the DB & T consortium of the suburban traffic companies in Denmark have signed a contract with an international consortium, including Informi GIS for the creation of a nationwide timetable information system[13].
- The Active Map of Aalborg - an internet application developed for the municipality of Aalborg, by a group including Informi GIS, the SAS Institute, and COWI (see above) a large engineering and GI company[14].
- Military Command and Control Systems - Maersk Data, part of the A.P. Moller Group, was contracted in 1998 to develop DACCIS as a ready-to-use command and control system based

[12] ESRI Press Release, Spring 2003

[13] ESRI Map Book Vol 16

[14] Digital North Denmark, Project of the Month, Nov 2002

on Microsoft Windows NT, the standard operating system in the Danish Army. The system includes more than 85 military applications developed by Maersk Data, Informi GIS, and EDS[15].

Owned by 54 Danish municipalities **Geodata** (www.geodata.dk) provides a range of GI products and services covering a wide range of commonly used GIS and database packages.

SCANKORT A/S (http://www.scankort.dk) was founded in 1970 and converted into a private limited company in 1999. In 2001 it acquired the assets of LLO A/S. SCANKORT, which has approx. 40 employees, offers specific services and consultancy within the fields of aerial photography, digital mapping, digital orthophotos, 3D-modeling, GIS, technical surveying, GPS-surveying, and utility mapping. Its main customers are local authorities, county councils, utility companies, national transport authorities – including railway and highway networks, KMS, and the Ministry of the Environment. Projects have included the Storebælt (The Great Belt Bridge) and the Øresundskonsortiet (The Øresund Bridge).

Carl Bro Group (http://www.carlbro.dk) is a Danish IT consulting company with 3,000 employees, offices in 80 locations worldwide, and divisions covering environment, industry, marine, GIS & IT management, building, transportation and energy. Its GIS-IT division includes consultancy, project management, system development, product development, and mobile applications. Its Digital Municipal Planner is an example of one of its GIS applications. The system gives citizens, politicians and administration access to the municipal planning documents. By means of dynamic maps one can navigate the municipality, zooming in on areas of personal interest and reading the attached planning texts. An already implemented solution can be seen at www.hadsund.dk under ”Kommuneplan”

Other prominent GI players in Denmark are GIS software vendor **Intergraph** (www.intergraph.dk), and engineering and IT company **Niras** (http://www.niras.dk) which includes the City of Copenhagen and the Danish National Survey and Cadastre among its customers.

[15] Microsoft Case Study, Mar 2000

Estonia

Player	Type	Sectors	Products	Turnover	Staff
Estonian Land Board	Gov Dept Ministry of Environment	CG, LG, Env,	Estonian Basic Map, Estonian National Topographic Database Cadastral Information System Estonian Soil Map	€5.2 Mill (2001)	234 (2003)
Estonian Map Centre	100% state owned	CG, LG, Env	Producer of Estonian Base Map and Basic Map; Digital orthophotos 1:2000 and 1:10 000; Photogrammetry		22 (2003)
Regio Ltd	PLC	Tel, Ems, Tra,Uti, Prop, LG Con	Database of Urban Areas 1:5000; Estonian Database 1:50 000; Address Points; Estonian Census Map; Public map servers; Road Atlas of Estonia; Location-based services;	€1.5 Mill (2000)	60 (2003)
E.O.Map Ltd	PLC	CG, LG, Env	Road atlas of Estonia 2002/2003 Map of Estonia Web Maps vector & raster data		71 (2003)

The **Estonian Land Board (ELB)** (www.maaamet.ee) was established in 1990 for the implementation of the land policy of the Government of Estonia. It is responsible to the Minister of Environment for the maintenance of the Land Cadastre, co-ordination and the execution of land reform, organisation and co-ordination of the activities in the field of land consolidation, land assessment, geodesy, cartography, and GI. The Land Board also manages contracts for cadastral and geodetic surveys, and for topographic mapping. The Board has 234 staff, of which 70 are in the Board's Tallinn headquarters and the remainder divided between 15 County cadastral offices. The activities of the Board are financed 100% from the state budget; all revenue earned by the Board goes back to the state budget. The total budget for 2001 is equivalent to €5.2 Mill. In terms of wider European activity ELB is active on a number of fronts. Bilaterally ELB is involved mainly in the field of cartography, GIS and geodesy with the National Land Survey of Finland (http://www.nls.fi), the Finnish Geodetic Institute (http://www.fgi.fi), and the National Survey and Cadastre of Denmark (http://www.kms.dk) for the establishment of Estonian geodetic database. On a regional basis ELB, working within the framework of the Baltic Council of Ministers, is involved with the MapBSR (http://www.mapbsr.nls.fi) digital map of the Baltic Sea Region project, and co-operation in the field of real estate valuation. Wider still, in terms of pan-European activity, ELB is a member of EuroGeographics (http://www.eurogeographics.org) and is participating in the EuroGeographics SABE and EuroGlobalMap projects. Within EuroGeographics' EuroGlobalMap project ELB is the Baltic Region Sub-regional Coordinator. The ELB has also been a partner in several EU PHARE projects, the aims of which have been the acceleration of the land reform process and setting up a cadastral and land information system.

The **Estonian Map Centre** (www.ekk.ee) was established in 1993 for the implementation of state operated contract work in the field of geodesy and cartography for government institutions and

municipalities. The Estonian Map Centre activities cover mapping, photogrammetry, surveying, GIS-applications, supply of software, processing of satellite and aerial photos.

The Estonian Map Centre have produced the Estonian Basic Map (1:50 000), digital orthophotos at scale 1:10k (for most of Estonia), and digital orthophotos at scale 1:2k (many Estonian towns). The Estonian Map Centre also supplies ESRI and ERDAS software.

Regio Ltd (www.regio.ee) is a private GI company founded in December 1990 by four individuals. In the early years Regio's main business activity was map publishing. Today it is active in three principal fields; cartography, production of spatial data, and GIS. Although map production accounts for only 30% of its turnover, Regio is primarily known as a maker of printed maps. Regio produces around 500 different maps every year mostly in small numbers. It's most well known products include the Regio Estonian Road Atlas, the physical map of Estonia - scale 1:200 000, and Estonian marine charts - scale 1:100 000. Cartographic activity also includes defining cartographic specifications for maps. Important work in this area includes the Estonian nautical mapping specification and the census map specification for urban areas. Regio Ltd. is a member of International Map Trade Association IMTA.The production of spatial data is one of Regio's most important activities, accounting for 30% of the company's turnover. Production of spatial data primarily comprises of the production of digital maps and the compilation of spatial databases. More important projects include the Regio Road Atlas Database - scale 1:50 000 and the Urban Areas Census Map Database - scale 1: 5 000. Regio has placed a great deal of emphasis on the maintenance of digital data and it sets itself the goal of keeping its databases continuously up-to-date. In conjunction with the adoption of digital technology Regio also began selling GIS software and solutions, with specialization in Mapinfo, Bentley, Intergraph and Oracle technology. Increasingly it sees the need to focus on the growing Location Based Services market.

Cartography and geodesy private company **E.O.Map Ltd** (www.eomap.ee) was founded towards the end of 1991 in Tartu and officially registered in 1992. The company has three main subdivisions that operate in a number of related GI fields:

E.O.Map Lõuna Ltd	*Lihtsad Maapoisid Ltd*	*OÜ Maamõõdukeskus*
cartography	marketing	engineering/geodetic survey
GIS systems	publishing	land readjustment
reprographics	advertisement and design	GPS - survey
lamination/framing for maps		

EO Map has published several editions of county and town maps, and claims a market leading position in regional maps. It has recently produced a new Estonian Road Atlas 2000, a 1:25k Tallinn Tourist Map and a 1:500k Estonian Road Map. In its survey capacity EO Map claims an advantage over competitors in having offices all over Estonia and using real time Javadi GPS-GLONASS system in geodetic and land survey as well as land readjustment. E.O.Map Ltd is a member of Association of Estonian Surveyors and Estonian Chamber of Commerce and Industry.

Finland

Player	Type	Sectors	Products	Turnover	Staff
National Land Survey of Finland	Government Organisation	CG,Env,Uti, Ret,Tra,Def, Tel, Fin, Forestry	MapSite Maastotietokanta Kiinteistörekisteri Digiroad SLICES Ilma- ja ortokuvat Maastomalli	€46,5Mill (2002)	1855 (2002)
Association of Finnish Local & Regional Authorities	Association of Regional Government	CG,LG, Tra, Uti, Env			
Geological Survey of Finland	Government Research Institute	Prop,Env,Uti, Edu,LG	Maaperäkartta 20/50 000, Kallioperäkartta 200 000 Geokartta Active Map Explorer Geologinen retkeilykartta Geoimage	€ 48,2Mill (2002)	809 (2002)
Finnish Environment Institute (SYKE)	Government Research Institute		Land Cover Corine2000 River (+lake) network Natura2000 Snow extent Water quality	€36.8Mill (2002)	598 (2002)
FM-Kartta	PLC	CG,LG,Tra	Aerial photographs		
Genimap Corporation	PLC	CG,LG,Uti,Prop, Tra,Ems	Maastotietokanta Kiinteistörajakartta GT Kartta 200 000	€12Mill (2002)	110 (2002)

ProGIS (www.progis.fi) is the National Association for GI and the Finnish member of Eurogi. It is an open forum for users and data producers, system and service providers. Membership includes about 40 organisations and 140 private persons. Co-ordination of data policy in Finland is managed by the multi-agency body set up in 2001 and called the Finnish Council for Geographic Information (FCGI). This permanent co-operation between ministry departments, national institutions and private companies acts as the central part of the Finnish SDI institutional framework and is currently coordinating NSDI development.

In Finland, national surveying and mapping is guided by the Ministry of Agriculture and Forestry, but the **Finnish Geodetic Institute** as the mapping research institute, and the **National Land Survey of Finland** (**NLS)** (www.maanmittauslaitos.fi) a decentralized government agency, are responsible for the actual land survey duties. The Ministry of Agriculture and Forestry is also responsible for the creation and maintenance of an agricultural land parcel system, a core national dataset that is at the heart of the Integrated Agricultural Control System required by the EU.

The **NLS** produces and provides information on and services in real estate, topography and the environment for the needs of citizens, other customers and the community at large. It is also responsible for Finland's cadastral system and general mapping assignments. It also promotes the shared use of geographic information. It produces a range of digital data products from 1:20k through to 1:4.5 Million and also maintains the National Geographic data description directory. The NLS consists of 13 District Survey Offices, five national operational units and the small central administration. The NLS has staff of over 2,000 of whom over 80% are employed in the District Survey Offices. The Land Information System (LIS) managed by the NLS integrates both rural and urban information systems to provide a common service for the whole country. A public website portal called MapSite provides access to browsable topographic maps at various scales from all over Finland. MapSite provides services to two types of users: "Citizen's MapSite" is available free of charge to all Finnish users, whereas "Professional's MapSite" offers a more varied range of maps and additional on-line Ordering Services which are subject to charges. The NLS Service Centre acts as a broker or clearinghouse, connecting several databases to users' own applications. The ordering and delivery of data is based on standardized messages.

As in Sweden the local and regional administrations play a large role in the supply of GI data, providing, for example, city plans and other core datasets. The City of Helsinki for example was the first one of 120 cities or municipalities to develop an advanced GIS/Survey department. In total 87 cities have legal cadastres and have developed GIS. Others are dependent on consultants and state data. The 446 municipalities are less concerned with data production. The 87 major Finnish cities are

responsible for maintaining their own real estate registers, covering around 10% of the country, while NLS are responsible for the remaining 90%. The different levels of administration and the NLS co-operate well together and a project to harmonise these various datasets is underway. In Finland these levels of government are co-ordinated via the **Association of Finnish Local and Regional Authorities** (www.kunnat.net). In mid 2002 the Association of Finnish Local and Regional Authorities in cooperation with a number of stakeholders launched a project to create a Municipal Geographical Infrastructure (MGI) that will be based on Municipal registers and databases. The aim is to improve the availability of up-to-date municipal geographic data in public administration and private organisations. The project runs to December 2005 and will be financed by government (National and local level) and eventually by GIS Industry and users. More recently (April 2003) the Association has become involved with a consortium of organisations in another GI project called "The Regional Cluster for Innovation focusing on European Cross-Border GIS and Mobile Applications Using Public Sector Data". The core members of the cluster are Genimap (www.genimap.com), Helsinki University of Technology Department of Surveying (http://www.hut.fi/), National Land Survey of Finland, Public Register Centre of Finland (www.vaestorekisterikeskus.fi), Syslore (www.syslore.com), TeliaSonera Finland (www.sonera.com) Tietoenator (www.tietoenator.com) and the PRELUDE partner Kouvola Region Federation of Municipalities.

Part of the Ministry of Trade and Industry, the **Geological Survey of Finland (GTK)** (www.gsf.fi) is a Government Agency research centre that provides geoscientific information and services for the assessment of raw materials, environmental studies, construction and land use planning. GTK has offices in Espoo, Kuopio and Rovaniemi. The mission of GTK is "to produce and disseminate geological information to promote the controlled and sustainable use of the earth's crust."

The **Finnish Environment Institute** (SYKE) (http://www.vyh.fi/eng/syke/syke.htm) is the national environmental research and development centre of the environmental administration. Research and development in the SYKE deals with changes in the environment, cause and effect relationships, means of resolving environmental problems and effects of policy measures. SYKE is the national environmental information centre and provides expert services and takes care of certain national and international statutory tasks.

Within Finland **FM-Kartta Oy** (http://www.fm-kartta.fi/index.html) is the leading provider of aerial photography in Finland with almost 60% market share in air photo based geographic information data. It has also been involved in various international projects. As well as supplying aerial photography FM Kartta is also involved with the production of digital maps, terrain models, and the production of geographic information for cellular network design. Its range of GIS-related products and services includes aerial photography and photo production, digital mapping, TENET products, photogrammetric surveys, geodetic surveys, cartography, forest management planning and surveys, industry related consultation and R&D, and air photo archive services.

Genimap Corporation (http://www.genimap.fi/) is a division of SanomaWSOY Group which is the biggest media conglomerate in the Nordic Countries. It is one of the leading private sector mapping organisations in Finland, dealing with "tailored project solutions, commercialized Internet and Mobile Solutions, Map Publishing and services related to map production". While it is particularly focused on developing location-based services it owes a lot of its success to the creation of its own digital map database.

France

Player	Type	Sectors	Products	Turnover	Staff
Institut Géographique National IGN-France	Publicly-owned establishment related to administration	CG, LG, Uti, Tel, Ret, Tra, Edu, Con, Fin, Def, Hea, Prop	RGE-BDTopo RGE-BDParcellaire RGE-BDAdresse RGE-BDOrtho BDCarto Géoroute BDAlti GeoFLA Raster databases les services en ligne	€118.5 Mill (2002)	1798 (2002)
Direction Générale des Impôts (DGI (The French Cadastre)	Min of Fin	CG, LG, Uti, Tel, Ret, Tra, Edu, Con, Def, Prop	Cadastral data		7,500
EADS-S&DE-ISR-geomatics (HQ Germany) + FLEXIMAGE	PLC	Env, Def, Uti, Edu, CG, LG	HotSpotsTM ISTAR OPTIS, GeoGrid		300
GeoConcept SA	Société Anonyme	CG, LG, Def,Ret ,Edu	ESSENTIAL STREETS ESSENTIAL COMMUNES ESSENTIAL IRIS-2000, G5	€6,8 Mill (2002)	70 (2002)
ESRI-France	PLC	CG, LG, Uti, Tel, Ret, Tra, Edu, Con, Fin, Def, Hea, Prop	ArcGIS family ERDAS GEOROUTE Raster, CS Raster ArcData, INSEE, Panorama, Mediapost	€14.3 Mill (2002) + €0.7 Mill for Cartosphere	110 (2002)
Claritas	PLC	CG, LG, Uti, Tel, Ret, Tra, Edu, Con, Fin, Def, Hea, Prop	MapInfo AddressMap® Les Francièmes®	€23 Mill (2002)	130 (2002)
Intergraph France	PLC	CG, LG, Uti, Tel, Ret, Tra, Edu, Con, Fin, Def, Hea, Prop		€38 Mill[16]	60
Wanadoo	PLC		Mappy.com	€11.3 Mill (2002)	75
Apic S.A. (subsidiary of Star Informatic S.A., Belgium)	PLC	Util, CG, LG, Env, Agr,	Apic4 Apic Shift		
Spot Image	Société Anonyme	CG, LG, Uti, Tel, Ret, Tra, Edu, Con, Fin, Def, Hea, Prop	SPOT Imagery SPOTView		
Planfax		Con, Tra, Edu	www.1bis.com	€2.0 Mill (2002)[17]	60 (2001)
Generale d'Infographie		CG, LG, Env, Agr,	Giris, Lilis, Saga PropGeo Clicad		
Geosys		CG, LG, Env, Agr,	Mona ProEurope Geosys Data		
SCOT		CG, LG, Env, Agr, Tra, Uti	Geonline	€5 Mill (2002)	50 (2002)
GDTA			RS Training		
Maporama					
Webraska	PLC	Tra, LBS	SmartZone		

[16] Intergraph France Website

[17] http://www.eadp.be/main6/body6.asp?langue=E&code=1&point=581

The National GI Association in France is the **Association Française pour l'Information Géographique (AFIGéO)** (French Association for GI) (http://www.afigeo.asso.fr). It was established in 1987 as a forum to coordinate activities and to promote the development and use of GI among both public and private sector organisations. It is the French EUROGI member. Alongside this, at national level there is the **Conseil National de l'Information Géographique (CNIG)** (National Council for Geographic Information) (www.cnig.fr) which is the official policy advisor to the government on GI-matters. Established in 1985 to develop the use of GI in the public sector, it coordinates the GI-related activities and policies of public authorities. At a regional level there are approximately one hundred Comités départementaux de l'information géographique (Departmental Committees for GI) which co-ordinate GI at the local level. Establishing regional SDIs is mainly the goal of the ad-hoc organisations at départment or région levels. Examples are the CRIGE-PACA in Provence-Alpes-Côte-d'Azur or RGD74 in Haute-Savoir.

The **Institut Géographique National (IGN-France)** (French National Geographic Institute) (www.ign.fr) is the French National Mapping Organisation and of course a key player. It was founded in 1940 and transformed into a public establishment in 1967. IGN-France is responsible for the production, the update and the dissemination of referential GI in France both at the "raw" level (geodetic data, levelling data and aerial photography) and the "processed" level (maps and databases). Apart from its traditional mapping responsibilities IGN-France is involved with documentation, training (the National School of Geographic Sciences [ENSG] belongs to IGN France and is part of the prestigious "Grandes Ecoles" higher education system in France) and research, which helps to improve methods of data capture and management. IGN-F also has a very active international branch. In recent years IGN-France has gone through much restructuring (in common with most NMOs) largely as a result of the Mandelkern and Lengagne reports[18] that have led to the development of the Référentiel Géographique à grande Echelle (RGE) (Large Scale Geographical Reference Frame). The RGE is a national reference set of large scale data - part of a national SDI, that will include orthophotos, topographic data, cadastral data, administrative boundaries, and addresses. Other datasets will eventually link to this core set, including nautical charts, geological data and socio-economic data. IGN-France's role is crucial as the main data provider and co-ordinator, and the compilation of the RGE has to take place in a structured way with the National Statistical Institute (INSEE) and the National Tax Office (DGI) - responsible for the French Cadastre, as the other key data providers. The Mandelkern and Lengagne reports also both have implications for the policy on pricing and licensing of "national" reference data. Most of the core activities to develop the RGE are funded by the government; the cadastre, national statistics, and nautical charts for example are 100% funded, but IGN-F is approximately 50% funded with the remaining income coming from revenue generated by sales/licensing of products and services.

The **Direction Générale des Impôts** (**DGI - The French Cadastre**) needs little introduction of course, going back to the 18th century and the original Napoleonic cadastre covering all French territories. Beginning for tax purposes the cadastre has evolved to be more a multi-information tool, but is still the responsibility of the Ministry of Finance (www.minefi.gouv.fr/ministere). The French system uses a staff of almost 7500, which doesn't include the cadastral surveyors, and in essence contains a map of each land parcel and its associated alphanumeric data. The mapping is done at scales between 1:500 and 1:5,000. The 35 million owners, 100 million plots, 13.5 million buildings and 600,000 street names are all now computerised, although the task to digitise and harmonise the graphic elements is far from completed. With an eventual objective of creating a uniform digitised cadastral coverage of all France (as a sub component of the RGE) the Ministry of Economy, Finances and Budget is on the one hand scanning by 2004 all cadastral maps not yet vectorised, and on the other hand helping to co-ordinate the efforts of the communes (responsible for the digitisation in vector mode) within its "Computerisation Master Plan"[19].

There are some very "key" private sector players with headquarters in France. **EADS-S&DE-ISR-geomatics** (www.eads.net/eads/fr) is the French based subsidiary of EADS. It is difficult to know where to start, or finish, when describing **EADS**. It is the largest aerospace company in Europe and the second largest worldwide. It is active in the fields of civil and military aircraft, space, defence systems and services although only a fraction of its activities are directly related to GI. The company came into being on 10 July 2000, emerging from the link-up of the German DaimlerChrysler Aerospace AG, the French Aerospatiale Matra and CASA of Spain. In 2002, EADS achieved revenues

[18] These reports are discussed in GI Policies in Europe: National and Regional Perspectives, EUROGI-EC Data Policy Workshop, 1999

[19] The French Land Administration, Stéphane Gil, PCC document

of € 29.9 billion, of which 80 percent were achieved in the civil market and 20 percent in the military market (Airbus also plays a role in this distribution). The company employs over 100,000 people at more than 70 production sites, above all in Germany, France, Great Britain and Spain. Although EADS is an N.V. according to Dutch company law, is quoted on the Frankfurt, Madrid and Paris stock exchanges. More than 34% of its shares are widely distributed among different shareholders but it has a strong French association through the French holding company Sogeade (Lagardère, French state) which holds over 30% shares, and the EADS Strategy, Marketing and Legal Affairs headquarter functions being located in Paris. EADS SPACE, which is the important company division in terms of the supply of GI products and services, represents roughly 10% of the activities of EADS. It is present in four European countries, France, Germany, UK and Spain, with revenues of €2.6 billion (2002) (with Astrium consolidated at 100%) and 12,300 employees (2002). In terms of GI EADS is a world leader in earth observation satellites, is a prime contractor for over 60 communications satellites, and is a key player in the Galileo European satellite navigation system. Also in the GI sector, it is responsible for Spot Image (distributor of GI derived from the SPOT programme Earth observation satellites), Infoterra (UK/Germany - supplier of GI products and services for agriculture, forestry, oil and gas-exploration, telecommunications, mapping and security–policy markets, based on airborne and satellite-based sensors), Eurimage (Italy - content provider of multi-satellite data (LANDSAT, ERS, RESURS, IRS, RADARSAT) and derived products, and Galileo Industries (Belgium, Italy - joint venture with Alenia Spazio and Alcatel Space as main contractors of the Galileo European satellite navigation system).

Founded in 1990 under the name ALSOFT, **GeoConcept SA** (www.geoconceptsa.com) has specialised in the creation and publication of PC based GIS software systems. In order to acquire the resources to export its technology, the company took on three French investors in 1996 after which it launched its product range in Italy, Switzerland and Belgium, and south-east Asia. In 1997, encouraged by these first international steps, GeoConcept SA strengthened its European stance and prepared its entry onto the Japanese and American markets. GeoConcept SA has developed international strategic and technological partnerships to support this global expansion. One such partnership is with Business Objects, the "world leader in integrated decision-support tools"[20] and with Itochu, the fourth largest Japanese industrial group. GeoConcept now has over 12,000 users in Europe alone. The principle GeoConcept product is the object based GeoConcept G5 software, which is the basis for enterprise, internet, transport, logistics, sales & marketing, defence and mobile applications. A particular strength of GeoConcept is its geo-marketing software and data; it was rated No1 in Europe for Geo-marketing in 2001 with 11% of the global market according to Daratech 2003.

ESRI France (www.esrifrance.fr) claims to be the GIS market leader in France. It aims to provide a total solutions service with the full range of ESRI products and recognises training as an important part of the GI implementation equation. As well as being a key player in the provision of GI products and services ESRI France has also been involved in a number of EC backed GI projects, for example La Clef. It has an impressive list of strategic partners, including among others IBM, ORACLE, Microsoft, SAP, HP, Leica and Trimble. On the international front ESRI France has set up an export agency to manage commercial activity outside of the metropolitan French territory and the overseas French departments and territories. ESRI France is particularly active in Africa, being the ESRI local distributor in Algeria, Ivory Coast, Madagascar, and Senegal. Some examples of recent implementations include:

i) a partnership with the Technical Institute for Cereals and Forage (ITCF) to develop prototype precision agriculture software
ii) TIGER (Computerized Treatment of the Management of the Network of the Sewers) for monitoring sewer networks
iii) in conjunction with Planfax (more below) an internet search service has been developed (research by street, company, service or place)
iv) An internet application has been developed for network of management and monitoring water in the Artois-Picardy basin (http://www.eau-artois-picardie.fr)

Claritas (http://w3.claritas.fr/france/) is part of the multi-billion dollar media and information company, VNU and with more than 1,000 lifestyle characteristics about more than 35 million people throughout Europe, it claims to be the "leading lifestyle data supplier in Europe since 1985". Claritas France is part of the Claritas Europe group which also includes offices in Germany, Italy, Poland, Portugal, Spain, the Netherlands and the United Kingdom integrating direct marketing, database marketing and

[20] GeoConcept Website

micromarketing techniques. Based mainly on MapInfo GIS software Claritas France has a wide range of GI data especially tailored for geo-marketing applications (e.g. market analysis, retail outlet locations, sales patterns etc) in France such as street maps, administrative areas, post codes, and addresses (AddressMap®). An indication of the changing role of geography in society is given by a recent press release from Claritas France[21] announcing a database of SMS addresses in France – 4 million records with multiple attributes showing sales behaviour and lifestyles to be used for targeting direct advertising.

Created in 1981, **Intergraph France** (http://www.ingr.com/France/), the French subsidiary company of Intergraph Corporation is located at Rungis, Paris (close to Orly). It employs a staff of approximately 65 and has an annual turnover of more than €38 Million[22]. The registered office also includes the training centre and software development department, with a specialist division covering Mapping & GIS Solutions (Geographical Information systems, Cartography, Civil Engineering, Networks, Communication, etc).

Although data providers and software vendors have traditionally dominated the GI scene it is increasingly the new players such as those providing internet services who are more visible and more important to the general public - the citizen. The internet is also increasingly important in terms of business to business trade. In Wanadoo and Planfax (described later) France provides two good examples of these relatively new players. **Wanadoo** (www.wanadoo.fr) a subsidiary of France Telecom, is France's number one internet provider and one of Europe's leading Internet and directories companies with nearly 9 million active subscribers (including Eresmas in Spain), 20 million unique visitors per month and more than 650,000 advertisers. It claims to have a database of 100 million business addresses. In 2000 Wanadoo was reported to be the leading French mass market internet access provider with some 1.8 million customers, a 39 per cent market share, and revenue of some €97.6 million (1999)[23]. Wanadoo Maps' services are produced in 6 languages, and are firmly aimed at the European audience, its partner agreement with Tele Atlas enabling access to all of Tele Atlas' European maps and databases which include detailed road maps (including the direction of traffic), the rail network, rivers and lakes. Tele Atlas data is also used to calculate the itineraries proposed by Wanadoo Maps. These itineries are based on 5,600,000 kilometres of roads and streets in France and in Europe and a detailed database of over 335,000 towns, villages and localities in Europe[24].

In June 2003 **STAR INFORMATIC** (http://www.star.be/) acquired a majority shareholding in **APIC SA** (http://www.apic-sa.com) one of the leading European suppliers of GIS and GI software products. Working with business partners who have specific industry expertise, APIC SA concentrates solely on developing, marketing and supporting software for managing spatial data. It has a long track record of implementation, especially with utility companies and emergency services applications. Apic software is at the core of the United Kingdom Coal Authority Mining Reports and Surface Damage System (MRSDS - developed by Cap Gemini and Apic) which was awarded the respected UK AGI awards (Association of Geographic Information) for GIS Technological Achievement and GIS Best Practise in Central Government. Apic software is also used as the kernel of a number of third party products including Building-One and Cable-One from Absia - used to manage cabling infrastructure. Other prestigious implementations include Northumbrian Water Limited, Essex & Suffolk Water, Deutsche Bank, Lyonnaise des Eaux Gibraltar, Michelin, and the Direction Générale des Impôts (French Cadastre Service).

SPOT Image (http://www.spot.com/) provides earth observation products for such diverse applications as agriculture, cartography, cadastral mapping, environmental studies, urban planning, telecommunications, surveillance, forestry, land use/land cover mapping, natural hazard assessments, flood risk management, oil and gas exploration, geology and civil engineering. SPOT Image is "the world's leading supplier of geographic information from optical and Earth observation satellites"[25], compatible with all image processing and GIS systems. Its range of products include geocoded and orthocorrected images, DEMs, and land classification datasets.

With 600,000 monthly visitors to its 1bis.com website (March 2001) and 350 partners and affiliates, including ESRI, ATOS, and TeleAtlas, **Planfax** claims to be Europe's leading multimedia map

[21] See Claritas website
[22] Intergraph France Website
[23] http://www.expressindia.com/fe/daily/20000630/fns30027.html
[24] http://www.directionsmag.com/pressreleases.php?press_id=6450
[25] Spot Image Website

publisher[26]. The company was set up in 1992 with a product range tailored to the telephone and the Minitel service but since 1997 Planfax has offered an internet based service with content now delivered via the Web, PDA, SMS, Vocal, I-mode etc. Planfax offers GI content on its www.1bis.com website, based on the "Yellow Pages" concept. This service automatically places the information from the telephone directory onto maps. www.1bis.com is relayed to leading portal sites and Internet service providers. In the business to business market, Planfax has set itself up as a service provider marketing its mapping & database platform. The French online post-office directory (www.laposte.net) now incorporates the maps and itineraries of Planfax. The online post-office directory includes 1.9 million businesses and all the private telephone subscribers. For every address in the directory there is an "access plan" link which calls up a map centred on the desired address. The user can move about the map by means of a cursor on the screen and can also have the map printed and sent by e-mail. Without making a search for any particular address, it is also possible to click directly on "itineraries and plans", to obtain any map in France, an itinerary from one town to another, or the shortest or quickest route between two addresses.

Created in 1991 and with a staff of 90, **Générale d'Infographie** (www.generale-infographie.fr/) has been one of the French key players in GI for many years. It works with a broad range of partners, including for example ORACLE, Intergraph, Claritas, ESRI, Bentley, GeoConcept to bring a range of GI solutions. Chief application areas are central and local government, town planning, utilities, defence, environment, and transport. Some specific product examples are NetGeo (for the management of telecommunications network infrastructures) and PropGeo (layout and design of refuse collection rounds).

Going back to 1987 and with a background in remote sensing and agricultural research **Geosys** (www.geosys.fr) is now a more broad based GI company with its main activities now being related to remote sensing, GPS measurements, surveying and sampling, aerial photography, etc. Supply of GI products and services include data (over 10 satellite sources, altimetric data, digital aerial photography), agricultural monitoring, provision of crop databases, and precision farming.

Another major player in the fields of GI and earth observation is **SCOT** (www.scot.fr). It is located in Toulouse**,** in the Midi-Pyrénées region, and provides information for the agriculture, environment and urban & rural planning sectors in particular. Created in 1987 by the Centre National d'Études Spatiales (CNÉS) (http://www.cnes.fr/) it is now 62% owned by space and aeronautics group CS (http://www.c-s.fr/), and 38% by CNÉS. SCOT designs, develops and operates GI systems which integrate a wide variety of data; space imagery, aerial photographs, existing maps, field surveys, statistical data. Some examples of its work include 200 images processed a year (8 campaigns in 15 countries), Common Agricultural Policy (19 French departments in 2002), regional agricultural maps in Tunisia (20 regions, 4000 maps), rural cadastral mapping in Lithuania (2000 maps), and digitisation of cadastral maps (>1 500 000 plots digitised in 2002). With over 50% of its turnover earned abroad SCOT includes among its customers organisations such as European Space Agency, Asian Development Bank, World Bank, Food and Agriculture Organisation (FAO), Ministry of Agriculture Tunisia, Ministry of Agriculture Russia, United Nations Development Program (UNDP). Its on-line application Geonline is used as a basis for applications as diverse as municipal information (E-Cité), a metadata server – (GEO-OSS) and town planning (Arcview2GeOnline®).

GDTA is an organisation jointly owned by CNES, the French space agency, IGN-F, and until the end of 2003, BRGM: Bureau de Recherches Géologiques et Minières (French Geological Research Bureau), and IFREMER: Institut Français de Recherche pour l'Exploitation de la Mer (French institute of marine research and exploration). It is a training organisation with a staff of 30 who train users in both France and overseas on the subject of satellite-based remote sensing.

Maporama (www.maporama.com) claims to be "the world's leading enterprise location-centric services Application Service Provider (ASP)." Maporama was established in France in 2000 with €4.1 Mill venture capital financing by Galileo Partners, FD5 and Financière de Brienne. Its products and services are based on network (including internet) enabled road and address based applications. Global 500 companies such as Accor, Bridgestone, L'Oréal, Diageo, Shell and more than 500 other customers use GI Maporama products and services to "instantly localize street addresses in over 50 countries across all continents; pinpoint addresses of a total population of over 2 billion consumers worldwide; integrate seamlessly location-centric applications at an international level; and exploit the most frequently updated and constantly extended array of cartographic data" Maporama has partnered with other European key players such as TeleAtlas, GeoStrategies, NavTech, AND, and

[26] http://www.1bis.com/1bis/planfax/about_us.asp

Mapsolutions AS to bring to the market what it claims to be "The market's most comprehensive global coverage". Main sectors using Maporama products and services are Telcos, Retail distribution, Travel, Automotive, and Banking.

Webraska (www.webraska.com/) claims to be "the worldwide provider of location-based services and telematics software solutions". It began developing GI markets in 1998 by integrating mobility, Internet technology and navigation. Webraska has its worldwide headquarters in Paris, France, and offices around the world. The company currently powers the LBS and telematics offering of service providers in four continents, including, E-Plus, Sensis (Australia), Telecom Italia Mobile, O2, and Orange, and has partnerships with leading technology providers including Ericsson, SAIC, IBM, Nortel and Openwave. Webraska has long been recognized as a leading player in the location-based services and telematics worlds, winning awards from Unstrung Magazine, TIME, Business Week, Tornado Insider and Frost & Sullivan. "Webraska has established itself as an international leader in the provisioning of services and software for the development and deployment of telematics and location-based services (LBS) solutions"[27].

With a GI market as well developed as that of France's it is difficult to include all organisations within a brief report such as this; other names that might well appear as key players include Asterop, Autodesk, Bentley Systems France, Loxane, ILOG, Magellan Geomatique, Blay Foldex, BRGM (French Geological Survey) SHOM / EPHOM (Hydrographic Office), Eurosense (see Belgium), Geoimage, IFEN (Institut Français de l'Environnement), INSEE (the French statistical office, co-editor of GeoFla), Interatlas, ISTAR, Michelin, and SAGEM (Defence market).

[27] http://www.webraska.com/

Germany

Player	Type	Sectors	Products	Turnover	Staff
DDGI: German Umbrella Organisation for Geoinformation					
Bundesamt für Kartographie und Geodäsie (BKG)	Governmental Agency under the federal Ministry of Interior	CG, LG, Tra, Uti, Tel, LBS, Def		€1Mill (budget approx €25 Mill)	300 (2003)
ESRI		CG, LG, Tra, Uti, Tel, LBS	ARCInfo ARCIMS	€15 Mill	80
Intergraph		CG, LG, Tra, Uti, Tel,	GeoMedia		
Deutsches Fernerkundungsdatenzentrum (DFD)		CG, LG, Uti, Tel, Def		€450 Mill (small % for GI)	5,000 (small % for GI
Infoterra		CG, LG, Tra, Uti, Tel, Env	IKONOS Landsat SPOT Orbview-3		
Netsolut GmbH		CG, LG, Tra, Uti, Tel, LBS	portalMap24 businessMap24 businessMap24 Easy mailMap24 link2Map24 freeMap24		

The National GI Association in Germany is the **Deutscher Dachverband für Geoinformation (DDGI - German Umbrella Organisation for GI)** (http://www.ddgi.de) bringing together all the GI institutional players and data providers from across the country, with members from the private sector and academia. It is an interdisciplinary, official, non-profit and neutral organisation that aims at optimising the economical use of GI by quality and contents' standardization, and improving the availability and usability of GI. Through its initiatives it promotes synergy across the main stakeholders at state level, and linkages to the European dimension via EUROGI.

The structure of Germany has often been compared to a mini-Europe, with many independent states/regions (Länder) under the umbrella of an overall administration (the federal government). In the GI world there are three main organisations which play key roles in the public sector:

The **Bundesamt für Kartographie und Geodäsie (BKG)** (Federal Agency for Cartography and Geodesy) (www.bkg.bund.de) is a federal authority reporting to the Federal Ministry of the Interior and is in effect the German National Mapping Organisation. The BKG is responsible for national geodetic framework, small scales mapping, and international activities, while the responsibility for acquisition and provision of basic (large scale) topographic data and technical geodata mainly belongs to the Länder. In more detail, the responsibilities of BKG comprise:

- provision of basic geodata for the territory of the Federal Republic of Germany;
- advice to the Federal Government in the fields of geodesy and geo-information;
- representation of the interests of the Federal Government at international level.

In the field of Geodesy BKG is the provider of planimetry, altimetry and gravimetry networks of the Federal Republic of Germany. The service is based on methods such as Very-Long-Baseline-Interferometry to quasars (VLBI), Laser Ranging to Satellites (SLR) and to the moon (LLR), Global Positioning System GPS and GLONASS. BKG operates about 30 other GPS stations in Germany, Europe and Antarctica, contributing to the international GPS service for the definition of the global reference system and position determinations. The German GPS Permanent Stations Network GREF forms the connection to the satellite positioning service SAPOS (reference system of the state surveying and mapping agencies of Germany developed by AdV). BKG contributes substantially to international cooperation projects serving the set-up and maintenance of geographic data bases at the European and global level, for example EuroGlobalMap, EuroRegionalMap, and SABE. A metadata information system informs users about the availability and quality of such data as a central service on behalf of AdV (see below).

To co-ordinate the GI activities of the Länder, and applications across the boundaries of the individual Länder, the Federal Government established the "Interministerieller Ausschuss für Geoinformationswesen (IMAGI)" (Interdepartmental Committee for Geoinformation) (www.imagi.de) in

1988 and transferred its secretariat to the BKG. The members of IMAGI all are federal ministries and IMAGI tries to organize effective data collection and exchange among them.

The third body in the German public sector GI picture is the **Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder der Bundesrepublik Deutschland** (**AdV**) (Working Committee of the Surveying Authorities of the States of the Federal Republic of Germany) (www.adv-online.de). The state survey offices of the Länder, responsible for the state survey and the real estate cadastre, cooperate with AdV to discuss technical matters of fundamental and supra-regional importance with a view to agreeing uniform regulations. The necessary resolutions are passed by the plenum of the AdV. In this way AdV can be seen as a co-ordination body, developing agreed standards and working practices, and representing the Länder at both Federal and international levels. Also belonging to the AdV are the BKG, the Military Geographic Service and the waterway transport department of the Ministry of Transport, Building and Housing. Guests are the Federal-Regional task force for rural development and the German Geodetic Commission. AdV provides common documentation of the geodata available and a pricing policy, and coordinates data collection. There is a general arrangement between the federal administration and the Länder on the production of topographic data and maps. All scales larger than 1:200,000 are the responsibility of the Länder, whilst the smaller scales are compiled by BKG.

In the development of a national SDI GI data is being standardised in accordance with ISO/OGC to create homogenous topographic data objects (1:10k to 1: 1Million), and cadastral data (1:500 - 1: 5k) as part of the multipurpose land cadastre database known as GDI-DE. The foundations of the GDI-DE are ATKIS, the Authoritative Topographic Cartographic Information System and ALKIS (the cadastral database).

At the regional level some interesting examples are emerging of Public/Private Partnerships and co-funding. One key player in terms of innovative GI development (in this case regional SDI) is the state of North Rhine-Westphalia (NRW). The State is unique in Germany because data about land ownership is managed not at the state level, but by large cities and counties. The variety of software tools used across the state had provided extensive technological freedom, but made data sharing difficult. “Realising geographic information as a basic economic good” [28], NRW has therefore started to set up the GDI NRW, based upon GI international norms and standards. The initiative is seen as crucial to the stimulation of the GI market. The GDI NRW is part of a general software initiative the Minister President of NRW started in 1999 with the aim of stimulating the NRW software market. The GDI NRW is intended to provide solutions for technical, legal socio-economic and institutional questions regarding an open GI market, co-ordinated under the leadership of a GI committee with representatives from the Minister President’s Office, the Ministry of the Interior, the DDGI and the software initiative.

The technical basis of the GDI NRW is an open geographic data network following the OpenGIS concepts and the ISO TC 211 standards. Access to all available public and private data in NRW is possible using a central geographical data clearing-house. An important factor in the creation of the GDI is the intention of liberalising access to publicly held data, and securely transferring data via the Internet. The project is also an important “test bed” for socio-economic aspects such as pricing and licensing and e-commerce solutions. The GDI NRW is closely connected with another project in NRW called GEOBASIS.NRW. The aim of this project is to establish network-based GIS solutions for local communities integrating all geographical data handled by the communities, the basis of which will be the German cadastral standard (ALKIS). The challenge of the project is interoperability within towns and counties, because in most cases different GI systems are installed for different applications. Therefore, in this project also, component-based architecture following the rules of OpenGIS is being developed. The communities will be part of the GDI network and their data will be provided to the GDI by special servers. GEOBASIS.NRW includes more than 100 participants from towns and counties, GIS companies, state institutions and public and private users. 5 pilot scenarios will be established representing the situation in NRW[29]. Back in 1999 Landesvermessungsamt NRW (the State mapping agency) were, along with Intergraph, Microsoft, the Deutche Post Direkt GmbH, Rapid Eye AG, and IMMO-CHECK GmbH, a partner in the Terramapserver project. The company set up to manage the project, Terra Map Server GmbH was described at the time as “setting up Germany’s first internet portal for geographic data on the basis of the so called terramapserver, which with its 51,000 Gigabyte is the largest geodata server in Europe”[30]

[28] JRC Workshop Paper
[29] OGC Press Release, Apr 2001
[30] Geoinformatics, Issueonline, Oct/Nov 2000

In the private sector ESRI, Intergraph and Infoterra are all key players in the German GI market. **ESRI Geoinformatik GmbH** (http://ESRI-Germany.de) was founded in the mid-70's and in the following decades has moved from a service provider to a software supplier and finally to a technology partner. Initially, ESRI Germany focused on environmental engineering projects. By developing solutions for the newly founded National Park in Berchtesgaden, they completed the first GIS-based project in Germany. The company also contributed to the construction of the country's first mobile telecommunications network, DETECON. Its partnership network (50 throughout Germany and Switzerland) have created "practice-orientated solutions for many branches of industry"[31]. Customers include T-Mobil, ADAC, DaimlerCrysler, GM, VW, and most canton authorities of Switzerland.

In April 2003 **Intergraph Deutschland** (http://www.intergraph.de) announced that Intergraph had acquired the company Terra Map Server GmbH (Dortmund, Germany). Terra Map Server serves as a central GI data and application services portal with 24x7 availability and more than five terabytes of online geo-data. GI products and services include a broad range of information layers, such as orthophotos, cadastre and NAVTECH data. Users include organisations from the real estate, retail, utilities, government, logistics and communications sectors, including PLEdoc, Ruhrgas, Evans & Sutherland, Vodafone, Immocheck Immobilienbewertungsportal and Prospect Bausparkasse. Terra Map Server has been chosen to serve as a hosting platform for the location-based services project for the 2006 world soccer championship.

The **Deutsches Fernerkundungsdatenzentrum (DFD)** (www.caf.dlr.de) is the German Remote Sensing Data Centre of the German Aerospace Centre (DLR) and as principle supplier of space imagery has a key role to play in the German GI market. It has offices in the DLR locations at Oberpfaffenhofen, Neustrelitz, Köln-Porz and Berlin-Adlershof. The DFD develops products and system solutions for applications related to the environment, security (humanitarian aid) and GI, with an emphasis on agriculture, forestry, land degradation, planning, and ecological cartography. Data from optical sensors (Landsat-ETM, IRS-LISS, etc.) as well as DFD's own aerial spectroscopic data (gathered with the DAIS instrument) are utilised, as are radar data from the Shuttle Radar Topography Mission SRTM and ERS and ENVISAT data for digital elevation models and special research topics (Antarctic). The DFD also coordinates the Hysens Large Scale Facility on behalf of the European Union. The areas of technical specialisation are:

- Developing and operating a global network of receiving stations for remote sensing data;
- Supplying an information technology infrastructure for sustainable safeguarding of the data archives of the National Remote Sensing Data Library;
- Providing online access to data and products via the Internet;
- Developing processes and methods to operationally generate customized products in the fields of environment, security, geoinformation, climate and atmosphere;
- Realizing application projects in close cooperation with partners from the science, government, public and private sectors;
- Promoting the scientific and commercial potential of remote sensing;
- Arranging services in the field of remote sensing.

DFD recently announced that, as part of DSL, it will operate as EUSI's (European Space Imaging) Regional Operations Centre. EUSI, headquartered in Munich, Germany, is a commercial Regional Affiliate of Space Imaging Inc. The company was established October 2002 with the main investor being Space Imaging Middle East LLC of Dubai, UAE. EUSI has two main strategic technology partners: GAF AG of Munich, Germany, and DLR/DFD. EUSI a supplier of IKONOS satellite imagery and derived information products.

Launched in January 2001, Infoterra is a 100% owned subsidiary of EADS Astrium, Europe's leading space company. Infoterra was formed by integrating the 'Earth Observation Services' department of Astrium, Germany and the National Remote Sensing Centre Ltd. (NRSC Ltd) UK. Infoterra is comprised of Infoterra Ltd in the UK and **Infoterra GmbH** (www.infoterra-global.com) in Germany and has a number of other partners around the world, including joint ventures in the Arabian Gulf and Hungary. Infoterra GmbH is a founding member of GEOkomm, a federation of the geo-information industry in Berlin / Brandenburg. Although it gets involved with a wide range of GI products and services Infoterra specialises in airborne and satellite data, with its main customer sectors being

[31] www.bizzcontact.com

geological exploration, environmental management, agriculture, forestry, cartography, and telecommunications planning.

NETSOLUT GmbH (Netsolut GmbH) was founded in 1996 by Thomas Golob and Alexander Wiegand. Its main product/service is called Map24. This is an internet mapping portal for interactive online road navigation and routing. It is based on the NETSOLUT technology MapTP™, an Internet protocol for the use of maps in the Internet and in mobile computing.

Map24 and the Internet technology MapTP provide online vector or raster maps directly to users via the Internet. The Map24 uses map data by Tele Atlas N.V. and can be integrated into business applications such as fleet management, call centres, standard software or Intranet applications, Internet portals or online services. Features of the interactive Map24 products include:

- Map display of branches, distributors and other addresses on any homepage (with logos, links and additional text)
- Search for any addresses
- Proximity Search for the nearest location
- Search for predefined locations such as points of interest or branches
- Route planning between variable addresses down to the house number level
- Map display of geographical information (e.g. in online magazines)
- Corporate layouts for embedded Map24 applications

Greece[32]

Player	Type	Sectors	Products	Turnover	Staff
Hellenic Military Geographical Service (HMGS)	Govt Dept	Def, CG, LG, Tra, Uti, Tel, Con, Env			
Hellenic Mapping and Cadastral Organisation (HEMCO)	Agency under the Ministry of Defence	CG, LG, Tra, Uti, Tel, Def, Prop, Con, Env	GIS Data	€0.3Mill revenue (budget approx €5.5 Mill)	
The Ministry of Agriculture – Dept of Surveying Dept of Forests & Natural Environment	Govt Dept	CG, LG, Tra, Uti, Tel, Def, Prop, Env			
The Institute of Geology and Mineral Exploration (IGME)		Env, CG, LG, Tra, Uti, Tel			
National Statistical Service of Greece	Govt Dept	Con, CG, LG, Tra, Uti, Tel	Digital Cartographic Data (DCD)		
Ktimatologio S.A.	Private Company 100% owned by Ministry of Environment, Physical Planning and Public Works	CG, LG, Tra, Uti, Tel, Def, Con, Env	Hellenic Cadastre		
Marathon Data Systems	PLC	CG, LG, Tra, Uti, Tel, Def	ESRI GIS ESRI IMS		
GEOAPIKONISIS Ltd	PLC	CG, LG, Tra, Uti, Tel, Def	Photogrammetry Remote Sensing GIS Cadastre		

Formed in 1998 and now with 200 members The **Hellenic Geographic Information Society (HellasGIS)** (www.hellasgi.gr) is the Greek national GI association, and is a member of EUROGI.

In the past the coordination of state cartographic and cadastral activities in Greece occurred under the auspices of several ministries and state services. This has gradually been rationalised and now takes place within two main organisations - the Hellenic Military Geographical Service (HMGS) and the Hellenic Mapping and Cadastral Organisation (HEMCO).

The main cartographic activity in Greece has been the responsibility of the **Hellenic Military Geographical Service (HMGS)** (EuroGeographics - profile), part of the Ministry of Defence, for over a century. HMGS is responsible for the compilation and maintenance of national mapping series at 1:5k and 1:50k scales. Most of these are now digitised, the 1:50k also being used to create a national DEM. HMGS is also responsible for most geodetic and photogrammetric activities. HMGS is carrying out a digital cartography project for the compilation and the revision of the following map series using digital methods: 1:Million, 1:1Million tourist map, 1:100k, 1:100k relief maps, VMAP 1:250k, DTMs at 100m resolution for the whole country and at 30m resolution for smaller areas. Also 1:500k and 1:50k for military use.

The **Hellenic Mapping and Cadastral Organisation (HEMCO)** (www.okxe.gr) was founded by law no. 1647 in 1986. It is a state organisation under the auspices of the Ministry of Environment, Physical Planning and Public Works (http://www.minenv.gr/). Its responsibility is the overall management of the creation and maintenance of a cadastre for Greece, co-ordination of the geodetic coverage and mapping of the country, mapping the Greek natural resources and creating a land and environment data base. The current Greek National Cadastre project began in 1994 and builds upon the deeds registration system that has been in place since 1853. Managed by Ktimatologio SA in conjunction with HEMCO, and under the overall responsibility of the Ministry of Environment, Physical Planning and Public Works, its main goals are stated as:

[32] For a large part of this section of the report GINIE is indebted to Dr Chryssy Potsiou, Researcher, National Technical University of Athens and Technical Consultant to KTIMATOLOGIO SA for the National Report: Existing Activity in Geoinformatics and the Need for a NSDI in Greece

- Ensure the security of tenure of private rights and the operation of an efficient land market;
- Determine state lands and all public rights;
- Establish a large scale cadastral infrastructure for Greece (currently approx 15%);
- Establish a 1:5000 digital orthophoto map base for the nation (currently approx 80%)

Some of the more specific projects with which HEMCO has been involved include the 1:100k CORINE Land Cover database (1987-1990) with a resolution of 30m on the ground. HEMCO was also responsible for the European coastal zone project LACOAST which monitored the land use of European coasts at a width of 10km along the coastline, at the scale of 1:100k. HEMCO has also prepared a digital 1:50k administrative database of the country (which contributes towards SABE) and a 1:250k road network.

In July 1994 HEMCO began the task of establishing the **Hellenic Cadastre (HC)** with substantial funding from both the European Union and the Greek Government. The management of the HC project was given to Ktimatologio SA (www.ktimatologio.gr), a private company, which belongs to the Ministry of Environment, Physical Planning and Public Works and which is also supervised by them. The basic mapping work for this purpose is produced under contract photogrammetrically, at scales 1:1k in urban areas and 1:5k in rural areas. The scale 1:5k is already used for the topographic map series for general use produced by HMGS and which covers the whole Greece. The creation of the HC has been extremely problematical. Described by some in the Greek press as "a fiasco"[33] the project has in the past failed to deliver to expectations and has run into serious financial difficulties. Following widespread strikes by contractors and the filing of criminal charges for corruption, the original board of Ktimatologio resigned at the end of 2001. After seven years the project had produced registrations covering less than 25% of the area anticipated at more than double the budgeted cost. The variation was enough to provoke the EU to refuse funds to cover the excess and to demand a return of some of the funds already provided. The project is currently being examined by the EC to determine the most effective way forward to ensure value for money for EU citizens, and in particular the citizens of Greece.

Other Public sector GI players are the Ministry of Agriculture, especially the Surveying and the Forests & Natural Environment Departments, and the Institute of Geology and Mineral Exploration of the Ministry of Development. **The Ministry of Agriculture** (www.minagric.gr) has created mapping which covers almost 35% of the estimated 4 Million Ha of rural land in Greece. This mapping includes digital orthophotomaps, available at the scale 1:5k and covering 60,000 sq km of rural land. They provide the basic mapping for the monitoring and management of the cultivated land according to the EU CAP. A DTM has been produced during the creation of the digital orthophotos. Another project is currently underway for the management of olive trees and vineyards. The Ministry of Agriculture also have land consolidation maps (1:5k and 1:2k) for more than 1 Million Ha of rural land. **The Institute of Geology and Mineral Exploration (IGME)** (http://www.igme.gr) part of the Ministry of Development, was founded in 1976, and by legislation is the State's technical adviser in geoscientific matters. Its fundamental aims are the geological study of the country and the exploration/evaluation of the mineral raw materials (except hydrocarbons) and groundwater resources. IGME has produced 1:50k analogue colour geological maps which cover the whole country, which are currently being digitised, and various other map series for special studies. The **National Statistical Service of Greece** (www.statistics.gr), which belongs to the Ministry of National Economy and Finances (www.ypetho.gr), also has a range of digital data available, including:

- 1:1 Million colour geophysical maps;
- 1:200k colour maps of all prefectures;
- 1:5,000, 1:2,500, 1:1,000 topographic urban maps (1991)

A new 1:100k thematic land use map is under preparation, and data for the 2001 census will be based for the first time on GIS technology with the collected data available in digital form. The Hydrographic Service of the Ministry of Defence has general nautical charts in a wide range of scales from 1:4,200,000 up to 1:2,000 in places such as the Ionian and Aegean Seas.

A great amount of digital data is also held by Local Authorities or private companies. Examples in the private sector include **Marathon Data Systems** (http://www.marathondata.gr/) The Greek ESRI distributor**, Z/I Imaging Hellas** (www.intergraph.com/international/#Greece), an Athens-based subsidiary of Z/I Imaging Corporation (an Intergraph company), and **GEOAPIKONISIS Ltd**.

[33] The Katherimini journal 6th 7th October 2001, www.ekathimerini.com

(www.geoapikonisis.gr) which is a GI service provider that specialises in photogrammetry, remote sensing, and GIS. It is very actively involved in the Hellenic Cadastre work, and lists many Greek Public Departments and European Commission amongst its customers. Its website also provides a good overview of some Greek GI sources. Mentioned already further above, **Ktimatologio S.A**. (www.ktimatologio.gr) is a private sector firm which is definitely a key player because of its central role in designing, developing and operating the Hellenic Cadastre. The Company was established by a joint decision of the Ministries of National Economy, Finance, and Environment, Physical Planning and Public Works. It operates according to the rules that govern private sector companies. Ktimatologio S.A. does not belong into the category of organisations and enterprises of the broader Public Sector and, therefore, it is not subject to terms and regulations that govern such organisations and enterprises. The sole shareholder of the company is the Ministry of Environment, Physical Planning and Public Works.

Hungary[34]

Player	Type	Sectors	Products	Turnover	Staff
Institute of Geodesy, Cartography and Remote Sensing (FÖMI)	Government Dept	CG, LG, Ret, Env, Edu, Uti	DTA 100 K, DTA 10 K Cadastral maps CORINE TAKAROS Aerial photo EL_DDM Geodetic points	€10.3 Mill (2002)	152 (2002)
MoD Mapping Co	Government Dept	CG, Def, LG, Ret, Env, Tel	1:50K digital, 1:25-250 K analogue map 1:20K - 1:40K aero photos DTM	€6.4 Mill (2002)	160 (2002)
Hungarian Geodetic and Mapping Company Ltd	Government Dept Company	Sdev, Agr, Env, Edu, Úti,	Cadastral Maps, Orthophoto, Public Utilities Mapping and registration, Land Surveying	€ 6.0 Mill	320
Cartographia Ltd	PLC	Ind.		€5.1 Mill	136 (2002)
FlexiTon Kft	PLC	CG, LG, Tel, Edu	ARIADNE TÉRKÉPTÁR Contex	€3.3 Mill (2002)	56 (2003)
Geometria Ltd	PLC	CG, LG, Tel, Uti	GTT, SGM, Mirtusz	€3.3 Mill (2002)	80 (2003)
VARINEX Informatics, Inc	PLC		Autodesk 1:50K, 1:100K digital maps Address and Post codes DTM Geomark	€2.4 Mill (2002)	22 (2002)
Geoviw Systems Kft	PLC	LG, Uti, Tel, Emg, Env,	DC, GL GISTools, Greenline MAP server, ÁrINFO etc.	€2.3 Mill (2002)	34 (2002)
graphIT Ltd	PLC	Tra, Tel, Uti, Fin, CG, LG, Def,	Budapest 1:4k National Road Network GIS Database 1:200K Address Matching Intergraph GeoMedia Route-R	€2.1 Mill (2002)	18 (2002)
piLINE Software Develpoment Ltd	PLC	GIS development for high pressure pipelines and around	NYIR_Pipeline Inf System; PRISMA_Frame System; PipeDynSeg MovingMap	€1.5 Mill	25
Kommunálinfo Inc	PLC	Ind, tel, Uti	BP 500 DTA, SDTR Utility maps, Address gazetteer	€1.4 Mill	74 (2002)
HungaroCAD Information Ltd	PLC	LG, Tel, Env, Uti, Ret	MaspGuide Autodesk	€1.3 Mill (2002)	14 (2002)
ESRI Hungary Ltd	PLC	CG, LG, Def, Edu, Ems, Env, Cri, Tra, Ret	ESRI Products	€1.2 Mill (2002)	20
Eurosense Ltd		Ind. Env	Digital	€1.2 Mill	20 (2002)

[34] N.B. Information in this country report is largely that supplied by the institutions/companies listed who have participated in the survey on voluntary basis. The list is ranked by yearly turnover but, as in other countries, in total does not necessarily represent 100% of the GI-related businesses. As well as receiving much assistance from Dr Gábor Remetey-Fülöpp (HUNAGI) the report is indebted to the valuable input of Katalin Toth (FÖMI)

			orthophotomaps of Hungarian settlements		
Datakart Geodézia Kft.	PLC	Ret, Env, Prop Env, Edu	IP Softwares (communal GIS) OKA street databank	€1 Mill (2002)	52 (2002)
ALFÖLD-GIS Information Ltd		CG, LG, Def, Edu, Ems, Env, Cri, Tra, Ret	MicroAtlas-J MicroCity-J FireGIS Garmin GPS	€0.6 Mill (2002)	7 (2002)
DigiKom Ltd. Surveying and GIS	PLC	LG, CG, Con	GI software applications	€0.4 Mill.	14
DigiTerra Information Services Ltd.	PLC	Ret, Env, Edu	DigiTerra MAP DigiTerra FIS Forestry IDigiTerra Explorer	€0.3 Mill (2002)	6 (2002)

The National GI Association of Hungary is **HUNAGI** (www.hunagi.hu). It is a non-profit cross-sector umbrella association established in order to promote the competitiveness of Hungarian GI players in the rapidly growing European GI content market. It was founded in 1994 and registered by the court in 1996. It has full member status in EUROGI, became member of its Executive Committee and has been acknowledged as member of the steering committee of GSDI. The HUNAGI community includes 79 member institutions, organisations and sustaining members from the private sector but has also student division.

Between 1996-1999, under the auspices of the Prime Minister's Office, Hungary established a National Spatial Data Strategy document and SDI core data definition in inter-sectorial co-operation involving the NGOs and academia, bringing together a number of strategies under a common plan, and co-ordinating work being done in existing programmes such as the National Cadastre Programme, the National Topographic Program and the Aerial Survey of Hungary. The main provider of GI in Hungary is the Ministry for Agriculture and Rural Development. Its institutional network includes 136 District and County Land Offices and the **Institute of Geodesy, Cartography and Remote Sensing (FÖMI)** (www.fomi.hu), a leading GI data provider and R&D institute. The activities of FÖMI are divided into the following sub-divisions:

- Department of Surveying,
- Management and Central Data Archive,
- Department of Land Registry,
- Section of State Boundary Survey,
- Department of Surveying and Cartographic Research,
- Satellite Geodetic Observatory and
- Remote Sensing Centre.

FÖMI makes much of its GI products and services available on-line via its "Land Information Services on the Web" (FISH) website. Products and services available include:

- data (topographic mapping 1:10k – 1:100k, boundaries, DEM, Gazetteer, and CORINE),
- paper maps (1:10k – 1:200k and thematic mapping),
- cadastral mapping (1:1k – 1:10k), and
- services e.g. co-ordinate transformation.

The FISH website is also connected to TAKARNET the extranet of the Hungarian land-registry. **The Hungarian Institute for Town and Regional Planning**, which also belongs to the Ministry of Agriculture and Regional Development, is responsible for data used for regional development, an increasingly important area of policy in all the accession countries. Other key providers are the **Mapping Agency of the Home Defence Forces**, the **Central Statistical Office (HCSO)** (www.ksh.hu), which also has an Internet based mapping service, and the **Ministry of Environmental protection**.

The **Ministry of Defence Mapping Company** (www.topomap.hu) was formed on 1st January 2001, although the history of independent Hungarian military mapping goes back to the break up of the Austro-Hungarian empire and the creation of a "Hungarian Military Mapping Team" in 1919. The duties of the Ministry of Defence Mapping Company include the "supply of state basic data and maps to

civilian users"[35]. The Ministry of Defence Mapping Company also has a regulatory role for aerial surveying and the use of small and medium scale state topographic maps. As well as producing a range of paper wall maps, road and city maps for general consumer use it has been digitising maps since the early 1980's and has produced a Geodetic Database (GAB), 1:50k digital mapping (DTA-50), 1:200k digital mapping (DTA-200), and 10m x 10m and 50m x 50m digital relief models (DDM-10 DDM-50). It also produces cartographically enhanced orthophotography for settlements in Hungary.

The **Hungarian Geodetic and Mapping Ltd** (http://www.fomi.hu/) has been established for over 50 years. The company has offices in fifteen settlements in the country employing 320 people. Work within the company has been done under ISO9001 quality assurance for five years in almost all aspects of geodesy. The main activities of the company are vertical and horizontal GPS networks, digital mapping, digital stereo photogrammetric restitution, DTMs, GIS and LIS development, and digital orthophoto mapping.

Cartographia Ltd is a 100% state owned company and a key player in map and atlas production. Its main activities are digital cartography (70% of turnover), digital thematic mapping (20%), and digital surveys for mapping (10%). Main products include City, County, Tourist and Road maps. Geographic and historic maps of the world, atlases, wall maps, a multimedia CD atlas of Budapest, Hungary and some other principal Hungarian cities.

FlexiTon Ltd (www.flexiton.hu) is a Finnish-Hungarian joint venture owned by private individuals and established in 1990. FlexiTon has developed a GIS based turn-key solution called ARIADNE for managing complex telecom networks, after many years of experience of delivering software solutions and data, for leading telecom providers in Europe and in Japan. The ARIADNE product family offers wire based and mobile network operators a wide range of services in resource/capacity management, network records, network planning, trouble ticketing, and customer care. Parallel to the telecom solution development FlexiTon has built-up an operation for large quantity data production of GIS databases, digital terrain models, digital maps, engineering documents and has become one of the major data engineering companies.

Geometria Ltd. (www.geometria.hu) established in 1986 is a privately owned Hungarian company which since its foundation has been the leading service supplier of GIS applications in Hungary. Geometria provides turn-key solutions, mainly for the public utility, telecommunication and central government sectors. Geometria's products like Mirtusz supports the work of customer's call centres and dispatch services. Geometria's other main product is GTT (Geometria Telecom template) is a generic telecommunications application but it also serves as a foundation for developing more specialist modules for applications such as SGM (Bandwidth Management System) and high speed networks (e.g. SDH, PDH, IP, ADM, FrameRelay etc.).

Since 1991 **VARINEX Informatics, Inc** (www.varinex.hu) has specialised in the GIS and CAD market. The company develops software applications based on MapInfo and Autodesk platforms mainly for telecomms, transport, facility management and financial sectors. One of the main applications is land development/water management using Autodesk technologies. The company also develops photogrammetry and remote sensing applications.

Geoview Systems, (www.geoview.hu) was founded in 1991 and has developed a differentiated product and service portfolio for the GI market. Originally the firm focused solely on GIS systems and applications and became one of the first enterprises to identify and exploited the opportunities in internet based information systems. Today, Geoview Systems provides complex system integration solutions for clients (private enterprises and public institutions) applying information technology as a strategic resource. The main fields of activity include GIS development and sales, development and implementation of electronic and work-flow based applications for private and public organisations, and development and implementation of internet based portal systems.

Founded in 1997, **graphIT Ltd** (www.graphit.hu) provides GI products and services to help customers implement GI and PLM (product lifecycle management) systems. Solutions developed by graphIT are often based on Intergraph products. graphIT develops and maintains digital map and content data about Hungary and develops GI solutions both for the internet/intranet and desktop environment.

PiLine Ltd (www.piline.hu) was founded in 1994. Its activities cover system planning, system development, system integration, system operation and maintenance, data conversion, data

[35] Hungarian MOD Mapping Company homepage

processing, training, consulting, and the distribution of software in these areas. Its main activity is GIS development and implementation. piLINE has developed the largest existing GIS network system in Hungary and contributed to the elaboration of a number of wide-area GIS systems throughout the country. piLINE exports software for end-users, as well as GIS base-software.

Kommunálinfo (www.komunalinfo.hu) was founded in 1991. Main activities are the surveying and mapping of utilities, data collection and update of databases, GIS for local governments, GIS software development. Products include the BP500 DTA Budapest Digital Database of Utilities, SDTR Structured digital maps of utilities, and the KÖZTER gazetteer of addresses.

HungaroCAD Information Ltd (www.hungarocad.hu) was founded in 1991 and has become one of the largest authorised Autodesk product distributors. Specialist application areas include precision agriculture and environmental monitoring.

Founded in 1989, **ESRI Hungary Ltd** (http://www.esrihu.hu) is the Hungarian official representative of ESRI Inc and delivers a wealth of GIS experience and knowledge to the Hungarian market. Their wide customer base includes, among many others, governmental departments, public administrations, scientific institutes and educational institutes.

Eurosense (www.eurosense.com) was founded in 1993 by the Belgian Eurosense Ltd. Its main activities are aerial surveys, digital image processing, digital mapping, photogrammetry, environmental assessment, GIS development. The firm owns all the equipment necessary for aerial survey and digital photogrammetry: Cessna 402B aeroplane, DPS navigation system, Wild RC 30 camera, photo laboratory, automated printing machine, photoscan precision scanner, photogrammetric work stations. Main products are high resolution digital orthophotographs, and digital elevation models.

With a staff of 55, **Datakart Geodézia Ltd** (http://www.datakart.hu) was established eight years ago by Hungarian and German owners in order to provide geodesy, cartographic and related software services for the GI market. Its main activities cover digital photogrammetry, geodesy/GPS, data collection, digitising, and data conversion. It also distributes IKONOS space images.

Founded in 1990, **Alföld-GIS Ltd.** (www.alfoldgis.hu) develops interdisciplinary GIS processes and end user solutions. It is currently developing platform independent applications that meet OpenGIS requirements. Besides local network applications its Java development environment is used to create Internet applications.

DigiKom (www.digikom.hu) is a surveying and GIS oriented service company, founded in 1993. It has created several thousands digital maps for the German market. Its activities cover creating databases, digital maps and applications for GIS and CAD systems, mainly for municipality applications. DigiKom is member of HUNAGI Hungarian GIS Umbrella Organisation, GITA (Geospatial Information and Technology Association), Chamber of Hungarian Engineers and other societies.

DigiTerra (www.digiterra.hu) was established in 1996 and while it has a general expertise in GIS systems design and development, digital photogrammetry, image processing and terrain modelling, its speciality is forestry and environment database development and mapping. The principal software is called **DigiTerra Map** which is a highly integrated, general purpose, professional GIS program able to manage country sized spatial and attribute data. DigiTerra has been responsible for the design and development of spatial forestry information systems for Hungary, digitising of Hungarian Forestry base maps, and digitising Hungarian cadastral maps.

GeoData Services Ltd. (www.geoadat.hu, gdsh@axelero.hu) was established in 1997. It creates and manages large volume GI databases. The main field of specialisation within its database servicing are: project management and realisation, capacity allocation, quality assurance and consultancy. The company offers database building within Hungary and in specific EU countries (Austria, Germany, and The Netherlands). Customer's applications include those in the cadastral, topographic, agricultural and industrial sectors.

Cadmap Ltd (www.cadmap.hu) specialise in Autodesk and Microstation.

Iceland

Player	Type	Sectors	Products	Turnover	Staff
The Agricultural Research Institute,					
Hnit. Hf	Private Company	CG, LG, Uti, Tel, Env, Def	Consultancy GI implementation data	€4.6Mill (2001)	50 (2003)
Loftmyndir ehf					
National Land Survey of Iceland	Gov Agency	CG, LG, Uti, Tel, Env, Def	Raster and vector data 1:25k to 1:1Mill Air photos *Maps of Iceland* *Flying over Iceland*	€662,500 (2002)	35 (2002)
The Reykjavíkurborg GIS	Municipal Authority	Con, LG, Uti	Landupplýsingakerfi Borgarvefsjá	€558,000 (2002)	7,284 (200)
The Icelandic Meteorological Office					
Icelandic Institut of Natural History					
Landsiminn					
National Energy Authority					
Public Road Administration,					
Isgraf ehf	Private Company		Intergraph Bentley		
Samsyn ehf	Private Company		Arc IMS ArcInfo Arcview		

The **Agricultural Research Institute (RALA)** (www.rala.is/) was established in 1965 and it has a mission to provide access to agricultural information and develop new knowledge and technology needed to solve urgent agricultural problems of broad scope and high national priority. The headquarters of the institute are at Keldnaholt, Reykjavik. The institute runs four experimental stations around the country with emphasis on agronomy, sheep production and physiology and dairy and beef production.

HNIT Consulting Engineers (www.hnit.is) was founded in 1966, began full operations in 1970, and is now one of the "key players" in GI in Iceland. With departments specialising in surveying, cartography & data processing, GIS, and software development HNIT has built up an impressive list of key customers including the National Power Company, the National Land Survey of Iceland (surveying and net adjustment of the horizontal grid system of Iceland), the US Naval Air Station, Keflavík Airport, the National Power Company of Iceland, The National Energy Authority of Iceland, The Public Road Administration and numerous municipal and county councils in Iceland. Hnit has been a consultant to the City Engineer of Reykjavik and the Utility Companies of Reykjavik from the beginning (1988) of the development of the city's geographical information system (LUKR). Hnit has also developed solutions in Oracle and SDE for disseminating graphic data on the web.

Loftmyndir ehf, www.loftmyndir.is

As in all countries the National Mapping Organisation, **National Land Survey of Iceland** (LMI) (www.lmi.is) is of course a key player in the supply of GI. LMI became an independent institute under the Ministry for Communications in 1956, and since 1990 it has been under the auspices of the Ministry for the Environment. The institute moved from Reykjavík to Stillholt 16-18 in Akranes on 1 January 1999 and currently has a staff of 35. The largest and most important project in recent years for LMI has been the development of a digital database at 1:50k scale covering the whole of Iceland. The first release of data from this database is due to take place in 2003. Like other GI organisations LMI is making data available on-line. Its Map Window is a development project aimed at making digital map data available to consumers via the internet.

Within the **Reykjavíkurborg (Reykjavik Municipality) GIS**, (www.rvk.is) are the Landupplýsingakerfi or LUKR (The Land Information System of the Reykjavík Area, www.rvk.is/lukr) and the Borgarvefsjá (City Webview, www.borgarvefsja.is). LUKR is a joint GIS-system of the municipal technical departments of the city of Reykjavik, plus the state owned Telecommunications of Iceland, including the entire public utilities systems in Reykjavik, and includes data showing cold water, hot/geothermal water, electricity, telecommunication, sewage, buildings, street curbs, street centrelines, parcel boundaries, coastal lines with lakes and rivers, and contour lines. The LUKR system covers the

Reykjavik area of 270 km^2, including an urban area of 45 km^2. The project was started in 1988, and since then the surrounding municipalities and some of their public utilities have also been included in the GIS-system. The buildings and parcels shown in LUKR are connected to corresponding records in the Building Inspector's database and the National Real Estate Registry, which also has connections to the National Population Registry, thus enabling municipal employees to make sophisticated queries concerning demography, value etc. of areas of interest. The Borgarvefsjá ("City Webview", is an internet tool intended to allow the general public to obtain maps and to make some of the data and features of LUKR and connected databases available. All texts in the Borgarvefsjá are in Icelandic but some themes and options have been translated into English.

Other key players include The **Icelandic Meteorological Office**, (www.vedur.is), **Icelandic Institut of Natural History** (www.ni.is), **Landsiminn** (www.siminn.is), **The National Energy Authority** (www.os.is), and the **Public Road Administration**, (www.vegagerdin.is)

For more than 14 years **Isgraf ehf (**www.isgraf.is) has been a reseller for Intergraph and Bentley in Iceland. In that period systems from these vendors have been implemented at the majority of the Icelandic municipalities and utilities that are using GIS. During the last 4 years Isgraf's main focus has been on Internet/Intranet solution and in partnership with Loftmyndir ehf has successfully implemented such systems in many sites. Isgraf has from the beginning specialized in GIS systems for civil engineers and has today over 80% of the Icelandic market share in DTM and road designing.

Samsyn ehf (www.samsyn.is) is the official distributor of GIS related software from ESRI (Environmental Systems Research Institute). Samsyn ehf is also a reseller of GIS data from The National Land Survey of Iceland and Reykjavik GIS (LUKR). Among customers of Samsyn ehf are some of the largest communities and companies in Iceland, such as the City of Reykjavik, Iceland Telecom, Og Vodafone, The Land Registry of Iceland, National Land Survey of Iceland and Reykjavik Energy with its world's largest and most sophisticated geothermal district-heating system, to name just a few.

Other private GIS organisations in Iceland dealing with consultancy, and software systems implementation include **Snertill**, www.snertill.is/eng (Autodesk), **Landmat**, www.landmat.com (mobile services) , and **Trackwell**, www.trackwell.com (LBS).

Ireland

Player	Type	Sectors	Products	Turnover	Staff
Ordnance Survey of Ireland – OSi Suirbhéireacht Ordnáis Éireann	NMO (Min of Fin)	CG, LG, Def, Edu, Ems, Env, Cri, Tra, Ret, Con	Leisure Maps Guides Atlases Digital Data PLACE Air Photos GeoDirectory	€8.5 Mill Revenue €15.9 Mill budget (2002)	302 (2003)
The Land Registry					
Irish Central Statistics Office (CSO)	National Agency Gov Dept	CG, LG, Edu, Ret, Con	DataBank Direct		
The Geological Survey of Ireland		Env, Con, Uti, Prop, Con, Edu, CG, LG	Web Mapping		
Heritage Service of Ireland (Dúchas)		Con, Edu, Env, CG, LG	SAC, SPA, NHA Canals Nature Reserves		
ERA-Maptec Ltd	PLC	Env, Con, Uti, Prop, Con, Edu, CG, LG	Ireland Vector Landsat SPOT CORINE		
GAMMA Ltd	PLC	Env, Con, Uti, Prop, Con, Edu, CG, LG	OSi Products Addresses INCA		
Paradigm Technology	PLC	Env, Con, Uti, Prop, Con, Edu, CG, LG	Autodesk Microstation		
ESRI Ireland	PLC	Env, Con, Uti, Prop, Con, Edu, CG, LG	ESRI GIS/IMS etc		

The Irish National GI Association is called **IRLOGI (Irish Organisation for Geographic Information)** (http://www.irlogi.ie). It is the umbrella organisation for the GI industry (public and private) in Ireland and is a member of EUROGI. It is an Irish Registered Company Limited by Guarantee. IRLOGI was formed in 1995 to represent the Irish GI community. Its mission is to stimulate the development and effective use of Geographic Information in Ireland. The organisation's strategic objectives are to act as a focus for the collection, exchange and dissemination of geographic information, to encourage the development and adoption of quality and reliable standards for GI, to represent the interests of the Irish GI community nationally and internationally, and to encourage and support education and training in GI. Its membership is drawn primarily from within Ireland, but also from outside the country.

IRLOGI and the GIS Laboratory at Trinity College Dublin (www.tcd.ie/Geography/GIS/) have jointly developed Geo-ID (Geospatial Information Directory) a meta-database launched on May 1st 2000. The information comes from the key central government producers of GI, the National Statistical Office, local authorities and private data producers. Geo-ID aims to promote co-ordination and awareness within the Irish GI industry through the maintenance and further development of a meta database of available geographical information resources within the Republic of Ireland and forms part of IRLOGI's contribution to the development of an NSDI.

The **Ordnance Survey Ireland (OSi)** (www.osi.ie) is the National Mapping Organisation in Ireland. The agency is responsible for the production and sales of all state mapping (>7 mill Ha) and is an office of the Civil Service under the control of the Minister for Finance. Legislation is being drafted to reform OSi into a State Agency. OSi's Mission is "excellence in providing quality mapping and geographic information services to meet society's needs"[36]. The Ordnance Survey Office was established in 1824 to carry out a survey of the entire island to update land valuations for land taxation purposes. Since the 1970s, OSi has invested heavily in the use of developing mapping technology. Today the organisation is one of the most technologically advanced organisations of its kind in the world. Of its budget of €15.9 Million p.a. the organisation invests over €1.9million in new technology every year. It generates revenues of over €8.5million per annum from its activities. OSi's primary product is mapping services. It produces urban, rural and tourist and leisure mapping at a variety of scales. This mapping is produced in digital form as well as on paper. The main scales of topographic data are very large scale: 1:1000 and 1:2500, large scale (local & regional) (1:15.000, 1:25.000, 1:50.000), small to very small scale (regional and European) (1:100k, 1:150k, 1:250k, 1:500k, 1:600k.

[36] OSI Mission Statement: OSI Website

The 1:50k is complete for all Ireland, as is the 1:1,000 for urban areas. The 1:2500 and 1:5,000 datasets are currently being completed. In addition, the base data used to create the map series is also used to produce other products such as aerial photography and Digital Terrain Models. OSi licenses the use of its data for a wide range of computer-based applications such as Computer Aided Design (CAD) and GIS. As with other NMOs OSi is increasingly working with Agents and Value Added Resellers to ensure that its data is available in the right form and with the applications that end users require. OSi has developed a Real Time Kinematic (RTK) GPS surveying service for Dublin and its environs that enables GPS surveyors to accurately position themselves in real time to RTK standards using a single GPS receiver. The Dublin RTK network comprises of four permanent active GPS stations and has been designed to provide RTK coverage within a 15km radius of any of the four stations by means of GSM mobile phone communications. Testing is currently being carried out to evaluate the RTK coverage within a 25 - 30km radius of any of the four stations. OSi is an active member of EuroGeographics and is involved with the creation of EuroGlobalMap (1:1 Million) and EuroRegioMap (1:250,000)[37].

The Land Registry (www.landregistry.ie). There are two separate systems for recording transactions in relation to property in Ireland namely the Registration of Title system operated by the Land Registry since 1892, and the Registry of Deeds system operated by the Registry of Deeds since 1708. Both systems are under the control of the Registrar of Deeds and Titles. For administrative purposes both Registries form part of the one organisation and are collectively referred to as 'The Registries'. The Registrar is Chief Executive of the organisation. The principal aims of the Land Registry are to maintain and develop a uniform and efficient land registration system, to guarantee legal title on behalf of the State to interests in land, to provide ready access to accurate land information, and to achieve continuously improving levels of service delivery to its customers[38]. The Land Registry website includes an “Electronic Access Service” (EAS) which has been developed in response to the Government of Ireland's 'Information Society' and Electronic Government initiatives, and its 'Strategic Management Initiative' and 'Delivering Better Government' programme (httwww.irlgov.ie). The EAS was launched in August 1999, initially with on-line access only to the Land Registry’s database of Dublin folios. Since then the EAS has been rolled out nationwide and since November 4th 2002, it has become available for the entire country. Running in tandem with the creation of structured electronic folios is a document imaging project which will result in all folios and existing Filed Plans being available online for every county on a phased basis by the end of 2004.

The Central Statistics Office (CSO) (http://www.cso.ie) collects, compiles, analyses and disseminates statistical information relating to the economic and social life of Ireland. It is also responsible for co-ordinating official statistics of other public authorities and for developing the statistical potential of administrative records. The CSO is located in offices in both Dublin and Cork. There are approximately 440 core staff in the Cork office and 160 in the Dublin office. Statistics are distributed on-line, including some mapping (e.g. Census 2002 maps).

The **Geological Survey of Ireland (GSI)** (http://www.gsi.ie/) was founded in 1845 and is responsible for providing geological advice and information, and for gathering, storing and disseminating geological information. GSI produces a range of products including maps, reports and databases. It functions as a line division of the Department of Communications, Marine & Natural Resources (DCMNR) and has 50 permanent and up to 40 contract staff. The GSI maintains an ever-growing store of earth-science GI including:

- paper maps and reports, ranging from the original sets of six-inch hand-coloured manuscript maps of the 19th Century, through reports submitted to GSI by outside bodies, to published reports and maps;
- physical materials, such rock samples, thin sections, as an extensive fossil collection, and an enormous library of drill core;
- an extensive library of earth sciences journals and books;
- digital information, which at present consists principally of metadatabases, but will be complemented over the next few years by digital versions of most current paper reports and maps, together with a country-wide Geographic Information System

The Information Management Programme is a relatively recent undertaking at GSI, intended to address the areas of digital products and cross sectional projects with a major IT component. The current GI related projects managed by the GSI IT staff include the Centrally Organised Network of Records (CONOR), an integrated database contract (British Geological Survey), a Document

[37] See Geoconnexion Magazine article on OSi
[38] Land Registry & Registry of Deeds: About Us

Management System & Data Capture Project (Centra/Spectrum-UK), GSI Web Mapping, an eCommerce Facility (ESAT), and a Geotechnical Database with GIS functionality (with ESRI -Ireland). For the Web Mapping project GSI are using proprietary Web Mapping software (ESRI's ArcIMS©) to place GIS enabled maps on a web accessible server.

The **Heritage Service of Ireland (Dúchas)** (http://www.heritageireland.ie/) includes the six National Cultural Institutions in Ireland which were established in the 19th and 20th centuries. In addition to housing many of Ireland's cultural artefacts, they also serve as venues for contemporary art exhibitions and performances of music. The six Institutions are located in Dublin City. In terms of GI the Heritage service of Ireland has Map Sheet Indices, Canals Mapping, Monuments in State Care, Sites and Monuments Register, Excavation Register, Urban Archaeological Survey, Special Areas of Conservation (SAC), Special Protection Areas (SPA), Natural Heritage Areas (NHA), Nature Reserves and a National Architectural Inventory[39]. It also began a project in 2002 (in conjunction with Digital Documents and Compass Informatics) to digitally capture the 1,600 maps of the First Edition Six Inch national survey of Ireland. This series was initiated in 1824 and was the first complete national survey of Ireland. The maps are being scanned and rectified to the Irish Grid[40].

As in many European countries the Irish **Department of Agriculture and Food** (www.irlgov.ie/daff/) is an important player when it comes to the use of GI. The agriculture and food sectors in Ireland account for 13% of GDP, 12% of employment and one third of net foreign earnings from exports. The future of the sector is vital therefore not only for the rural communities but for the economy as a whole. The Department of Agriculture awarded the Irish Land Parcel Identification Project to Northern Ireland company Mallon Technology. This project was a direct result of a European Commission directive on the auditing of the administration of Area Aid grant payments to farmers. The EU Commission directed that all member states must implement a system whereby grant claims could be audited. When this project was awarded it was the largest GIS project of it's kind anywhere in Europe[41]. The project entailed creating the specification, designing and developing a GIS system, and also the capture of a one million land parcel data set. Having successfully developed and integrated a system for the Irish Government (LPIS) Mallon Technology was awarded the Finnish LPIS project.

At a local authority level the **Local Government Computer Services Board** (www.lgcsb.ie/) is a public sector organisation, closely aligned with local government in Ireland. Its role is to provide local authorities with the best possible solutions to meet all their Information and Communications Technologies needs, to help local authorities develop appropriate strategies to underpin their business needs and to help them implement appropriate solutions. Some of their GI specific projects include MapRoad Fastmap GPS Surveyor and PlaniGIS.

Key players in the private sector include ERA-Maptec, GAMMA Ltd, and Paradigm Technology Ltd.

ERA-Maptec (http://www.era.ie/) is a group of consultants specialising in the application of remote sensing, structural analysis, GIS and digital cartography. The company was established in 1983 and has carried out projects in over 50 countries world-wide, providing high quality, confidential reports tailored to individual or multi client requirements. ERA-Maptec supplies and processes satellite data and is an agent for Eurimage, SPOT, Image and Worldmap. The company has built up an impressive portfolio of international clients with the most expert and professional service of its kind anywhere in the world today. Ireland Vector Landsat MSS for Ireland. Landsat TM for IrelandSPOT Images for Ireland CORINE Land Cover Project for Ireland[42]

GAMMA Ltd (http://www.gamma.ie/) is a leader in the field of database analysis and spatial solutions. Established in Dublin, Ireland in 1993, the company has expanded to become "a leading provider of information systems, micro-marketing solutions and geographical analysis services"[43]. GAMMA has developed advanced spatial databases and GIS to deliver products and services for the financial, telecommunications, retail, government and environmental sectors. Through its specialised business units, the company provides a full range of systems and services from database segmentation and address validation to environmental mapping and route optimisation. GAMMA is an authorised reseller and developer for the principal spatial data providers and has strategic alliances with several leading international corporations. GAMMA is also a value added reseller of OSi Data.

[39] Metadata from Geo-ID
[40] Compass Informatics Press Release
[41] Mallon Technology Website: Case Studies
[42] Metadata from Geo-ID
[43] Gamma Website: about us

Paradigm Technology Limited (http://www.paradigm.ie/) was established in October 1992 as the result of a merger between Benchmark Ltd. and McGrane Computer Systems Ltd, the two market leaders in the CAD and GIS fields in Ireland at that time. Both Benchmark and McGrane Computer Systems each had 12 years previous trading experience in the successful installation and support of professional CAD and GIS Systems. Since then, Paradigm Technology has specialised in the provision of high quality systems, and professional services for CAD, GIS and related applications. At the beginning of 2002 Paradigm transferred its GIS business to ESRI (Ireland) and now focuses entirely on the provision of professional solutions for Architectural and Civil Engineering applications, including the supply of software and services designed to assist clients maximize their productivity, efficiency and the return on their IT investment. Paradigm is an Autodesk Authorised Reseller and a Bentley Systems Business Partner and offers the full range of Autodesk/Bentley design solutions for Architectural and Engineering applications. Paradigm also markets "Archetype" Architectural practice management software[44].

[44] Paradigm Website: Company profile

Italy

Player	Type	Sectors	Products	Turnover	Staff
Istituto Geografico Militare Italiano (IGMI)	Ministry of Defence	CG, LG, Uti, Tel, Env, Def, Con, Edu	Raster products Vector products		
Agenzia del Territorio (Cadastre Agency)	Ministry of Economy and Finance	CG, LG, Uti, Tel, Env, Prop, Con	Services for the Citizen Services for the Professional		
The Istituto Idrografico della Marina (IIM)	Ministry of Defence	CG, LG, Uti, Env, Def	ECDIS Nautical Charts		250
L'Istituto Nazionale di Statistica		CG, LG, Uti, Edu, Env, Con	Statistical Products and Services		
Eurimage	PLC	CG, LG, Uti, Tel, Env, Def	Landsat Quickbird Ikonos		
Planetek Italia s.r.l.	PLC	CG, LG, Uti, Tel, Env, Def	Cart@net	(Company funds €88k)	41 (2002)

The National GI Association in Italy, and EUROGI member, is **AM/FM** (www.amfm.it). Established in 1990, and based in Rome, it is a non-profit association which has 102 members comprising GI institutions, companies and users. The aim of the association is to promote GI & GIS in Italy, to diffuse information and knowledge of GI within Italy, to increase collaboration between partners in the GI & GIS sector and to foster coordination among the partners. Apart from organising newsletters and workshops in order to further its aims of developing interest in GI and diffusing information, AM/FM is a key player in the "Intesa Stato-Regioni-Enti Locali sui Sistemi Informativi Geografici" (Agreement of central, regional and local government on GIS) (www.intesagis.it) which is a national project aimed at building an Italian SDI. This is a further development of agreements made in 1996 and 2000 between the State and Regions to create a "Cartographic Reference System". There is another GI association called **GISFORM** (www.gisform.it). It has similar objectives to AM/FM and undertakes similar activities i.e. education and awareness raising, supporting standards work, etc. Established in 1996, GISFORM explicitly aims at bringing together the private and public sector. Other associations and co-ordinating bodies important to the GI sector include, Società Italiana di Fototgrammetriae Topografia (SIFET) (http://www.sifet.it/), Associazione Italiana di Telerilevamento (AIT) (http://www.asita.it/ait/), Associazione Italiana di Cartografia (AIC), Federazione delle Associazioni Scientifiche per le Informazioni Territoriali ed Ambientali (Federation of Italian Scientific Associations for Geographic and Environmental Information (ASITA) (http://www.asita.it).

As a part of the development of the Italian Cartographic Reference System, the Italian Ministry of the Environment has developed, in collaboration with Planetek Italia, a public web site (http://www.atlanteitaliano.it), allowing unrestricted Internet access to various types of maps and photographic images covering the whole of Italy[45]. The types of data available on-line include black and white and colour orthophotos at 1m resolution (nominal scale 1:10k); maps of the Italian Geographic Military Institute (IGM), scale 1: 25k, 1: 100k, 1:250k, and 1:1Million); and a DEM. The data, compressed in ECW format, are distributed using Image Web Server with the specific advantage that the imagery may be accessed via the Internet in real time in two ways; either through the website using a common browser or directly inside any common supported desktop GIS application using the individual image URL (only registered and entitled users are permitted access to the URL's).

At a national level, within the public service, there are a number of key players including the Istituto Geografico Militare Italiano (Italian Military Geographical Institute) (IGMI), The Cadastral Agency, the Navy Hydrographical Institute. There is also the Air Force Geo-topographic Information Centre, the National Technical Service and the National Statistical Institute. The **Istituto Geografico Militare Italiano (IGMI)** (Italian Military Geographical Institute) (www.nettuno.it) is the Italian national mapping organisation, and a member of EuroGeographics. Its main responsibilities include geodesy - installation, maintenance and updating of the geodetic and high precision networks; GI - production, updating and distribution of the national official GI at medium and small scales; aerial photography; training and education; and research. IGM has produced 1:50k and smaller scales topographic maps, raster topographic maps at scale 1:10.000, 1:25.000 and 1:100.000 and a DTM. It contributes Italian administrative boundaries to the EuroGeographics SABE product.

[45] Directions Magazine, Jun 2003

The **Agenzia del Territorio** (AT) (www.agenziaterritorio.it) is the Italian Cadastre Agency which is a public body that came into being in 2001 after a 1999 law which resulted in the re-organisation of all the Italian public administrations. According to the law, the Agency is the public organisation responsible for topographic and cadastral survey and recording, land title registration, observation of real estate market and land evaluation for tax purposes[46]. While it is the AT which is the technical body that co-ordinates the work, it is the municipalities that technically own the cadastre. The cadastre contains 300,000 map sheets, 48 million plans, and data on 53 million owners. In serving its customers in 2001, the AT provided 16 million abstracts, 1 million map extracts, and dealt with 1.5 million real estate transactions. Its customers are a mixture of professionals, citizens, notaries, municipalities, private companies and utilities. Work began in 1986 to digitise the 310,000 cadastre map sheets. Approximately one third of the national territory is now digitised (2002) and brought into a single consistent reference framework[47].

The **Istituto Idrografico della Marina (IIM)** (www.marina.difesa.it/idro/) (The Italian Navy Hydrographic Office), based in Genoa, is a state owned cartographic Institute established in 1872. Its purpose is to carry out hydrographic surveys and produce charts and nautical publications relating to navigation on the Italian seas and the Mediterranean; disseminate information for the safety of navigation; conduct oceanographic research with the production of morphobathymetrical charts; and study the marine environment. It employs a staff of approximately 250 military and civil persons.

The **Centro Informazioni Geotopografiche Aeronautiche (CIGA)** (Geo-Topographic Information Centre) (described on the Intesa GIS website) was established in 1976 and is responsible for the aeronautic charts of Italy. The **Servizio Geolgico Nazionale Italy (SGN)** is the national Geologic Service of Italy which has by Italian law the responsibility of surveying, maintaining and publishing geological maps of Italy at various scales. There is national coverage at 1:100k (277 sheets) and a 1:50k database is under construction. The activity is based on a regional basis, as is much public administration, for example see the work being done in the Emilia-Romagna Region**. Istituto Nazionale di Statistica (Istat)** (http://www.istat.it/index.htm) is the Italian Statistical Office. It provides social-economic data at municipal level (including population figures) and census parcel level. It has gradually converted its data publication from paper format to an on-line (Internet and data banks) and off-line (disks and CD-ROMs) diffusion. Istat places great emphasis on its on-line services. A section is specifically dedicated to the 2000/01 census. Last year the www.istat.it site had 4,500 visitors a day, 250 thousand contacts, with a 30 million Kilobytes transfer every month. As well as accessing the data archives and on-line indicators it is also possible to access the National Statistical System.

Since 1970s Italy has evolved into a highly regionalised country from the policy and administrative point of view. It has 20 regions, 106 provinces, and more than 8086 municipalities. This decentralised approach has led to a strong regional dimension to the collection and maintenance of GI, with some regions in particular having developed strong GI infrastructures at a regional level – for example see the following regional key players: Emilia-Romagna , Liguria, Lombardia, and Toscana regions.

In the private sector some of the important players include Planetek Italia S.r.l, Eurimage, ESRI Italia, Intergraph, Bentley, Autodesk, and MapInfo. **Planetek Italia S.r.l.** (www.planetek.it) was founded in 1994. It is an SME focused on research and development of new applications for Earth Observation data, especially in the framework of programs financed by the European Community, by the European Space Agency (ESA) and by the Italian Space Agency (ASI). It has successfully penetrated the Italian GIS market place and won a prestigious contract from the Italian Ministry of the Environment to develop the www.atlanteitaliano.it public web site. **Eurimage** (www.eurimage.com) is the exclusive distributor for all international organisations (as well as all other non-Italian customers) in Europe and the Mediterranean basin of world-wide products from the DigitalGlobe very high resolution (0.6m resolution panchromatic) QuickBird mission. As the European Space Agency's cost-sharing partner in the Landsat programme, Eurimage also has exclusive global distribution rights for ESA Landsat 1-5 and 7 data. Furthermore it is a SPOT distributor and business partner of USGS for Landsat 7 world-wide data, as well as an official ESA commercial distributor with a world-wide distribution license for both ERS and ENVISAT data through the EMMA Consortium, in which Eurimage is the Master Distributor. Eurimage's shareholders are Telespazio (Italy), and Astrium (Germany/France/UK).

[46] The Cadastral Information System of "Agenzia del Territorio" - paper

[47] The Cadastral Information System of Agenzia del Territorio - ppt

Lithuania

Player	Type	Sectors	Products	Turnover	Staff
National Land Service (NLS)	Gov Dept	CG, LG, Def, Env, Tel	Digital Topographical Maps, Topographical DB Aerial photos 1:200k DEM		50 (GI - 15)
State Enterprise Centre of Registers	Gov Dept	CG,LG, Prop	Land Cadastre DB Admin Units Streets and addresses DB		
Ministry of Environment	Gov Dept	CG,LG, Env, Hea	Hydrography DB Environmental observations		
National Geological Survey	Gov Dept	CG, LG, Ret	Geological Databases, GIS GEOLIS Geoindicators		
National Forestry Institute	Gov Dept	CG, LG, Prop	GI of forest parcels Forest inventory DB		

As in many countries the GI policy in Lithuania is seen as part of a broader strategy to create an information-based society. This strategy is being driven by The Information Society Development Committee under the Government of the Republic of Lithuania, (www.ivpc.lt/) and The Committee of the Development of Information Society in Seimas (the parliament)[48]. The supply of GI products and services in Lithuania is very much led by the activities of the public sector, the key one being the **National Land Service of Lithuania (NLS)** (www.zum.lt/nz), the National Mapping Organisation. The NLS, part of the Ministry of Agriculture, was created in 2001 by the amalgamation of two previous bodies; the Department of Geodesy and Cartography (a State Department) and the Land Management and Law Department (part of the Ministry of Agriculture). Its role is defined by Government of Republic of Lithuania resolution No. 709 at 12.06.2001:

- to methodically lead the Land Reform and other state works of land uses, and to administer Land Reform funds for these purposes;
- to realize a State policy on geodesy, cartography and creation of georeference data bases;
- to methodically lead creation of Information Systems for development of land uses;
- to organise training for specialists of cadastral design, geodesy and cartography;
- to arrange concession of licenses for cadastral survey projects, geodesy, topography and cartography activities.

The NLS is responsible for the national Geodetic and Cartographic Control Information System (GCCIS) (www.zum.lt/nzt/gkpis/default.htm) which is a GIS holding geodetic control data including information about more than 10 thousands control points and 300 map sheets. It is intended to connect the GCCIS database to the internet in the near future to allow interactive queries on the database records and to view information graphically. The National Land Survey also coordinates the activities of two subordinate enterprises; The Institute of Aerial Geodesy and National Centre of Geoinformatic and Remote Sensing "GIS-Centras". The activities of the latter cover digital cartography and geoinformatics. For example it is responsible for the 1: 200k GDB200 topographic maps, the Lithuanian imagery map at scale 1:50k LTDBK50000 , and the 1:10k digital orthophotographic map of Lithuania (ORT10). Main users of GI products and services from GIS-Centras and the Institute of Aerial Geodesy include the Ministry of the Environment, Department of Informatics, Department of Telecommunications; Geological Survey of Lithuania; National Service of Geodesy and Cartography; State Land Survey Institute; Forest Inventory and Management Institute; State Frequency Service; The Armed Forces of Lithuania; Board of the Civil Aviation, and many more..
Internationally on behalf of NLS the GIS-Centras is involved with the creation and maintenance of the GIS data for Lithuanian sector of SABE (Seamless Administrative Boundaries of Europe) and EuroGlobalMap (1:1Million European topographic dataset).

[48] http://wwwlmu.jrc.it/ginie/dp_ws/Lithuania.ppt

The **State Enterprise Centre of Registers** (http://www.kada.lt) (former State Land Cadastre and Register) was founded in 1997 "to administer the real property system and to ensure state guarantee over the rights to real property"[49]. The Government of Lithuania has assigned to the Centre of Registers the following functions:

- To register real property of natural and legal persons, ownership and other real rights to immovable objects, restrictions on these rights, legal facts prescribed by laws;
- To provide official information about the data stored in the Register;
- To perform cadastral surveys of buildings;
- To form, administer, update the Real Property Cadastre and Register databank;
- To perform real property market research and property valuation;
- To register legal entities and provide data about them.

The Centre of Registers is involved in a number of international GI projects. It has strong links with the Swedish organisations Swedesurvey AB and Lantmäteriet, with bi-lateral funding coming from the Swedish International Development Agency (Sida). As part of its work to prepare for integration into the European Union Lithuania is being assisted by the Government of the Netherlands within the framework of Matra Pre-accession Programme funds and the "Real Property Information Services" project being executed by the Cadastre and Land Registry Agency - Kadaster International in co-operation with DHV Consultants. The Centre of Registers is also a partner in the "European Land Information Service" (EULIS) project.

The Lithuanian **Ministry of Environment** (www.am.lt) is the authority which forms the country's policy of environmental protection, forestry, utilization of natural resources, geology and hydrometeorology, territorial planning, construction, provision of residents with housing, utilities and housing. It also coordinates the implementation of that policy. In doing so it is of course a main user of GI data and in order to perform its role it has also created hydrography databases (rivers, lakes) and holds data on environmental observations.

The **National Geological Survey of Lithuania (NGS)** (www.lgt.lt) is responsible for creating and maintaining geological national databases and has created a computerised geological information system called GEOLIS. A large part of the stored geological information is of graphic type: maps, schemes, cross-sections and other drawings. The data base was recently supplemented with 482 new sheets of orthophotography and now holds orthophotography for the whole country. The LGT has recently been looking into the use of its data to help create a Lithuanian Water Resources Management System as part of the work towards compatibility with the requirements of the EU Water Framework directive. A system is being jointly developed with the Ministry of Environment, CarlBro (Denmark) and specialists from the LGT Geological Information Division.

With over 30% of the country covered by forested land[50] the **National Forestry Institute** (http://www.lvmi.lt/) clearly has a keen requirement for mapping. The National Forestry Institute, under the Ministry of Environment, keeps the forestry cadastre, and is developing a GI database of forest parcels. It holds a series of maps from 1:10k to 1:50k.

Other key users of GI related data are the **Department of Statistics**, as the official provider of socio-economic and statistical information, and the **Rural Business Development and Information Centre,** set up by the Ministry of Agriculture in 2001.

Private GI/GIS solution providers play important role as GIS technology and GI market experts interacting directly or via the Lithuanian Surveyors Association (a member of FIG) with the public sector organisations concerning GI data policy issues. The most active private GI suppliers in Lithuania are UAB "HNIT-Baltic Geoinfoservisas", AB "ALNA" and UAB "KORDAB".

[49] http://www.kada.lt/apie/struktura/index_en.php
[50] National Forestry Institute Statistics

Luxembourg

Player	Type	Sectors	Products	Turnover	Staff
Administration du Cadastre et de la Topographie (ACT)	Gov Dept	CG, LG, Uti,	Topographic maps Gazetteer /street names Orthophoto DEM	€2,7 Mill (budget 2003)	128
Ministère de l'Environnement	Gov Dept				
DATUR	Gov Dept				
Ponts et Chaussées					
Forestry administration	Gov Dept	CG,LG,	Phytolux Hunting parcels Public forests	€24 Mill (budget 2003)	130

The **Groupe de Travail Interministériel SIG (GTIM-SIG)** is the Luxembourg National GI Association. It was instigated by the government in 1992 as a working group with the aim of establishing and managing GIS at the national level. The GTIM SIG is made up of 12 representatives from the main government departments that deal with GI. Its mission is to define the needs of GI in the public sector, coordinate public efforts, propose a GI policy for the public sector, promote the use of existing public databases in the public sector and support the main GI data producer (Administration du cadastre et de la Topographie - ACT) to create GI products and services that serve the societal needs. One of its projects is to develop a public sector national database structure (BDN-SIT - *Banque de Données Nationale - Système d'Information du Territoire*) that allows all public departments to access and share GI data, and permits regular updating from the different departments.

The **Administration du cadastre et de la Topographie (ACT)** (www.etat.lu) is essentially the cadastre and land registration agency; a government department offering services in the area of land registration, cartography, geodesy and administration. It operates under the Luxembourg Ministry of Budget. The ACT undertakes all the work associated with land registration, cadastral surveys, geodesy, topography and the implementation of a national GIS. By combining all of these responsibilities it is clearly even more of a key player within its own country than the national mapping organisations of most other European countries. Digital GI produced by ACT includes:

- digitised cadastral plans - scanned and vectorised from the original cadastral plans. The cadastre of buildings exists at large scales: 1:500, 1:250 and 1:100 (the latter being hand drawn). The BD-L-TC is a vector database created at the scale 1:5 000 and derived from a photogrammetric survey. The database coves the complete extent of the country.
- national register of addresses and streets. CIE – Centre Informatique de l'Etat. The national register of localities and roads is continuously updated by the ACT.
- cartographic products - topographical mapping at 1:5k to 1:20k, orthophotography, and CDIST tool for Luxembourg, available on CD-ROM. The 1:20k maps are used to derive 1:50k, 1:100k, 1:200k and 1:250k maps[51].

Luxembourg is another European country where the government has launched an e-government programme in this case called "e-Lëtzebuerg". As a part of this, the ACT is developing an "e-cadastre" project. The aim is to disseminate official data, products and services on-line including cadastral and cartographic products. "eCadastre" has the following objectives:

- to inform the public about ACT products and services;
- to allow rapid and easy access to public information;
- automated retrieval and dissemination of data to users;
- to facilitate the exchanges of information between the internal ACT services and between the ACT and other administrations, according to the principles of the e-Lëtzebuerg administrative reform;
- to develop e-commerce for cadastral products and services.

The computerisation of the cadastre has also led to another project that aims to network the ACT, the Administration de l'Enregistrement et des Domaines, and the Notary within an integrated management system for real estate databases.

[51] ACT Products and Services

Other key players include the **Ministère de l'Environnement,** the **Ministère de l'Intérieur,** the **Direction de l'Aménagement du Territoire et de l'Urbanisme (DATUR), Ponts et Chaussées,** and the **Administration des Eaux et Forêts (Forestry Administration).** DATUR is responsible for general policy on regional planning, transborder planning, national road projects, natural reserves, and EC community programs (e.g. transborder INTERREG).

The GI market in Luxemburg is very much public sector oriented - which explains why the GTIM-SIG only has public sector representatives. There are no national software or hardware producers, and no universities or other research institutes in the GIS-domain. GI software vendors are mainly represented by two resellers of international GIS - ESRI and GEOMAP. Other GI players are manly foreign companies who work in the Luxemburg market from offices in their respective countries (France, Germany, and Belgium).

The 'Saar-Lor-Lux' region is an area centred on the cities of Luxembourg, Metz, Saarbrucken and Trier (where a treaty leading to a Europe free of border controls was signed at Schengen in 1985). It is home to some key EC Information Technology directorates, as well as the GIS branch of the Commission's statistical office. It was also the site of the EU funded INFO2000 CLEAR metadata project. The Saar-Lor-Lux area has long enjoyed fruitful public-private sector collaboration in serving its multi-ethnic population. This is certainly true of GI where the region traditionally acts as a testbed for trans-boundary European mapping and tourism-related data projects (e.g. the first Europe-wide vector mapping at 1:250,000 scale)[52].

[52] Geoconnexion Magazine

Malta

Player	Type	Sectors	Products	Turnover	Staff
Malta Environment & Planning Authority (MEPA)	Mapping Agency & Env' and Plan Agency		Map Server	€5.5 Mill (2002) €242.4k from revenue	450 (2003)
Malta Information Technology & Training Services Ltd (MITTS)	Gov owned PLC	CG			
Land & Public Registry	Gov Dept	Con,			
The Ministry for Resources and Infrastructure	Gov Dept				
Malta Resources Authority	Public Corporate Body				

The **Malta Environment & Planning Authority (MEPA)** (www.mepa.org.mt) is the Mapping Organisation for Malta, and also the Planning and Environmental Agencies. It is *the* key player in Malta for the supply of GI products and services. Its Land Survey Dept provides large scale mapping (1:1000) of the Maltese Islands to MEPA customers and is working on a consolidated map base by integrating the current 1:2500 and 1:1000 datasets. It also has national coverage of orthophotography at .25m resolution. MEPA earns around €242 annually from GI products and services[53] and has recently introduced a very successful on-line GIS from which users can obtain orthophotos, planning details, site plans, street maps etc. Internationally, MEPA has been involved in the UN CAMP project (coastal area management) and supplies data for the EuroGeographics SABE product.

Malta Information Technology and Training Services Ltd (MITTS) (www.mitts.net) operates as a 100% Government owned limited liability company and promotes the use of Information and Communication Technologies (ICT) in Government in order to develop the Maltese information society. With the mission "*To be a leading centre of excellence in the provision of cost effective and integrated information systems to Government using state of the art technologies, practices and methodologies in line with Government strategic directions*"[54] it has a key role to play in the provision of GI products and services by Government Departments to the citizen. MITTS Ltd recently launched a new web site aimed at providing MITTS Ltd clients, the public service, with an improved channel of communication to the organisation, and in the coming months MITTS Ltd will be developing the site as a web portal, providing resources on Information and Communication Technologies (ICT).

Land & Public Registry (http://www.mhja.gov.mt) is a government department governed by the Land Registration Act, Chapter 296 of the Laws of Malta, passed through Parliament in 1981 and brought into force in 1982. This law is of interest to anyone who may own property in Malta or intends to deal in property situated in the Maltese islands. Land & Public Registry services include the sale of land registry plans, search on property, registration of property, registration or variation of a charge, the caution, and certificate of title. All business in properties which are located in so called "registration areas" must be recorded in this Register. The Land Register is based on plans which indicate both the location of the property and the rights attached to it e.g. ground-rent or encumbrances.

The Ministry for Resources and Infrastructure (MRI) (www.mri.gov.mt) was established in 2002 and is mainly responsible for major infrastructural works and projects that are carried out throughout the Maltese Islands. The main operational organisation within the Ministry is the Works Division which works in close conjunction with the Building Industry Consultative Council (BICC), as the official link between the private sector and Government on matters related to the construction industry, and the Malta Resources Authority (MRA). **The Malta Resources Authority (MRA)** (www.mra.org.mt) is a public corporate body with regulatory responsibilities relating to water, energy and mineral resources in the Maltese Islands. It was set up by the Maltese Parliament through the Malta Resources Authority Act of 2000. The MRA has wide ranging responsibilities essentially involving regulation of water and energy utilities, industrial enterprises exploiting resources such as oil exploration, quarry operators and private abstractors of groundwater, retailers, operators and tradesmen in the regulated sectors.

[53] MEPA Annual Report 2002
[54] MITTS Mission Statement

Netherlands

Player	Type	Sectors	Products	Turnover	Staff
Kadaster	Self-Administering State Body since 1994	LG, CG, Con, Uti,Tel, Tra,Edu, Prop,Fin	GBKN cadastral registration A.C.N. RD kadaster-on-line	€ 176,4 Mill (2002)	2.373 (2002)
TeleAtlas	PLC	Con, LG, CG, Uti,Tel, Tra,Edu	Multinet Navshop	€78.3 (2002)	1850 (21 offices wordwide)
Alterra	Private	CG, LG, Env	Bonnekaarten GIAB, LGN, HGN soils, Aerial photo (2000,2003)	€50 Mill (2003)	650 (2003)
AND Products BV	Private	LG, CG, Con, Uti,Tel, Tra,Edu	AND Global Road Data Web Services GeoSource Clavis Suite	€35.0 Mill	350 (2003) Netherlands, UK, and India
Topografische Dienst Nederland (TDN)	Gov Dept (MoD)	LG, CG, Con, Uti,Tel, Tra,Edu	Top10vector Top50vector Top250vector Rasterbestanden	€10 Mill (budget 2003)	160 (2003)
LSV-GBKN	Public Private Partnership	CG, LG, Uti, Con	GBKN: Large scale base map	€ 3,1 Mill (see text)	4 (see text)
Rijkswaterstaat					

The National GI Association in the Netherlands is called **RAVI** (www.ravi.nl) which is the Dutch abbreviation of the Netherlands Council for Geographic Information. RAVI is the responsibility of the Minister for Housing, Spatial Planning and the Environment and was originally established as a collaborative undertaking of Governmental bodies concerned with GI but now includes the Dutch Association of municipalities, provinces, waterboards and utility companies. Formerly included in RAVI, and independently organised since 2001, is the Dutch Business Platform Geo-Information - **Bedrijvenplatfrom Geo-Informatie**, (www.bgi-NL.com). Members are private sector parties in the field of GI and its mission is to facilitate and improve the market in the GI sector.

Kadaster, or the Dutch Land Registry Office (www.kadaster.nl) collects information about registered properties in the Netherlands, records them in public registers and in cadastral maps and makes this information available to members of the public, companies and other interested parties in society[56]. Registered items include not only immoveable property, such as houses and apartments, but also moveable properties such as ships and aircraft. Registering, informing, and maintaining records have been the tasks of Kadaster since 1832 but since 1994 it has been a "Self-Administering State Body" meaning that Kadaster is a legal entity under public law performing its tasks as an independent organisation. Customers of Kadaster products are mainly the notaries (81% turnover), real estate agents (5%), municipalities (3%), financial institutions (3%), water boards (2%), and private individuals (2%). Over 5,000 business to business (B-B) users are connected to the Kadaster's on-line service and most data sales are performed via on-line distribution (93% in 2001). Kadaster also has a very active international division - **Kadaster International** which for many years has been involved with principally World Bank and EU funded projects. (NOTE: Kadaster & Topografische Dienst Nederland intend to merge and become one organisation in 2004)

Tele Atlas (www.teleatlas.com), with its HQ in The Netherlands, is recognised as a European and US markets "key player" in GI products and services. It is a PLC 32.06% owned by Bosch GmbH[57]. With over 16 years experience in the GI market (as Etak, Tele Atlas invented the first car navigation system in 1985) its core business is the provision of detailed geographic databases centred on traffic telematics, vehicle navigation, location based services (LBS) and GIS applications. Its €78.3 Million turnover in 2002 was split into €55.9 Million for navigation products and services, and €22.3 Million for LBS/GIS. Tele Atlas views itself "primarily as a facilitator that enables hundreds of business partners

[56] Kadaster Website
[57] Tele Atlas Annual Report 2002

to develop high quality applications for their own or commercial use"[58]. Although it reported 10% revenue growth in 2002 it was operating at an overall €19 Million loss. While it enjoyed an operating profit in Europe, mainly due to strong growth in car navigation product sales, it has invested heavily in the USA, creating "the most powerful database ever built"[59] which from Jan 2003 has been able to provide unique nationwide combined traffic information and mapping (via an alliance with Westwood One). In Feb 2003 it released the latest version of its Multinet map database[60]. This seamless digital European dataset extends from Spain or Italy in the south to Scandinavia including Finland in the north, or from the Czech Republic in the east to Ireland in the west. The Feb 2003 release includes, for example, the number of lanes at motorway intersections in several countries, and every house number for seven European countries: Belgium, Denmark, Great Britain, Luxemburg, Norway, Switzerland and The Netherlands. Although its core market has been in vehicle navigation it clearly sees LBS as a potential growth area with recent alliances signed with organisations such as MapInfo and Hutchinson 3G. Although its sales are principally B2B in conjunction with partners it does provide some on-line services such as sales of CDs on its Navshop website. Some of TeleAtlas's key partners are Siemens VDO, Daimler Chrysler, BMW, Blaupunkt, ESRI, Microsoft, Michelin and Ericsson.

Founded in 2000 as a result of a merger of three formerly independent institutes **ALTERRA** (www.alterra.nl) is the main Dutch research centre for rural areas with expertise in topics such as water, wildlife, forests, the environment, soils, landscape, climate and recreation. ALTERRA engages in strategic and applied research to support design processes, policy-making and management at the local, national and international level. It has a staff of 650 and an annual budget of €50 Million, mainly financed by the Dutch Ministry of Agriculture, Nature Management and Fisheries. Apart from its historical maps (Bonnekaarten - Topographical maps,1850 - 1949), it also produces current and historical land use data, a database of agricultural businesses, and has an on-line and call centre (KOM) for mapping services.

Founded in 1984, **AND** (http://www.and.com/) now has offices in the Netherlands, Germany, UK & US. With a turnover in excess of €34 Million, the company employs over 350 people and is listed on the Amsterdam Exchange. AND claims to be "the leading provider of location, routing, mapping and address management technologies and intelligence, which power enterprise applications worldwide"[61]. It aims to provide a one-stop-shopping concept for online & mobile services, supplying global travel content & context, POI's and address verification tools for e-commerce.

The National Mapping Organisation of the Netherlands is the **Topografische Dienst Nederland** (TDN) (www.tdn.nl/) which is part of the Ministry of Defence. It produces medium and small scale mapping (1:10k, 1:50k, and 1:250k databases and map series) for military and civil use. Internationally it is an active member of EuroGeographics and a participant in the EuroGlobalMap and EuroRegioMap projects. It also contributes its administrative boundary data to the pan-European SABE product. (NOTE: Kadaster & Topografische Dienst Nederland intend to merge and become one organisation in 2004)

With a 20% share of the public/private partnership foundation the Kadaster is a key player in the **Landelijk Samenwerkingsverband Grootschalige Basiskaart Nederland (LSV-GBKN)** which is responsible for the Large Scale Standard Map of The Netherlands (GBKN) (http://www.gbkn.nl/). The GBKN is a detailed topographic map of The Netherlands including interactive mapping data from 1:5k to 1:200k. The other partners involved include 10 regional public private sector foundations (including for example the major utilities and KPN Telecom) and 23 municipalities. The total turnover for all these organisations is about €20 Million, based upon annual reports, and about 100 employees are actively involved with the initiative within these GBKN organisations. The philosophy behind the project was the creation of a common map base for the whole country, with agreed content, multiple "owners" and fixed fees for participation. The GBKN is still being developed but is mainly used for planning and estate management applications with over 1800 "hits" per weekday.

Another publicly available national GI service in the Netherlands is called the New Map of The Netherlands http://www.nieuwekaart.nl/ . This is a nation-wide inventory of new plans and projects for housing, employment, infrastructure and nature created through the co-operation of the municipalities, provinces, national government departments and urban design bureaus. The map, which can be

[58] Tele Atlas Annual Report 2002
[59] Tele Atlas Press Release Oct 2002
[60] Tele Altas Press Release Feb 2003
[61] http://www.and.com/

consulted interactively, includes, for example, plans for residential, business and infrastructure developments - but also plans for urban restructuring, new recreational resorts and new nature reserves.

The **Rijkswaterstaat** (www.rijkswaterstaat.nl) is the executing organisation of the Netherlands Ministry of Transport, Public Works and Water Management. It is responsible for mobility policy in the Netherlands and for protection against floods or falling water tables. The ministry's main tasks can be described as dealing with traffic in its various forms, and water; traffic via roads, waterways, railways, and air, and water – in the rivers, lakes and the sea. The use of water is of course particularly important in The Netherlands - to prevent falling water tables, as well as protection against high water levels. Technical services concerning GI are supplied by the Adviesdienst Geoinformie en ICT (formerly (Meetkundige Dienst) including data capture and distribution of data including the highly detailed nationwide LIDAR elevation model geo-loket (www.minvenw.nl/rws/mdi/geoloket/index1)

Private sector GIS giants ESRI, Intergraph, Bentley and Mapinfo all have offices in the Netherlands. Other important private sector GI players include Nedgraphics, Isis Benelux, Grontmij Geogroep.

NedGraphics (www.cadgis.nedgraphics.nl) is part of the Blue Fox Enterprises N.V. group of companies (www.bluefox.nl) and is the market leader in the Dutch local government market for CAD/GIS solutions. It also supplies CAD/GIS solutions for the provincial and central government departments, including the Dutch Department of Transportation, waterways and public works. Solutions are mostly supplied on the basis of in-house developed software and to a small extent on the basis of third-party software. NedGraphics also supplies cartographic data for air navigation charts for the international aviation industry.

ISIS Benelux (www.isis.nl) is a GIS/internet applications company founded in 1990. It is a privately owned Dutch company and has evolved into one of the key players for GIS-products in the Netherlands GI market offering solutions and training based on Bentley, ESRI, Intergraph, MapInfo and Autodesk products. Its Omega Pro V8 and FlexiWeb products are aimed mainly at the local government market (used by 12 municipalities including Amsterdam and Rotterdam) but it also has a strong customer base in the telecoms and utilities sectors.

Another private sector key player in the Netherlands is engineering consultancy company **Grontmij Geogroep** (www.geogroep.nl). Its DgDIALOG software is a system for managing digital map data used by geodetic companies and geodetic-cartographic state offices. It encompasses functions for inputting surveyed data and importing/exporting data in text and CAD/GIS formats. Other main products are GEOWEB and MOVE3 software. The company have developed real-time kinematic GPS survey applications using Sokkia and GSM data links.

The Netherlands is also home of the **International Institute for Geo-Information Science and Earth Observation (ITC)** (http://www.itc.nl), established in 1950 under the name International Training Centre for Aerial Survey. It is an autonomous organisation operating under the aegis of the Ministry of Education, Culture and Science and the Minister for Development Cooperation of the Netherlands and closely linked to Twente University. It is the oldest and largest international higher education institute in the Netherlands. Recognised worldwide within the GI profession it has long been in the forefront of GI research and education.

Norway

Player	Type	Sectors	Products	Turnover	Staff
Statens Kartwerk	Public agency under Ministry of Environment	LG, CG, Con, Uti,Tel, Eme Tra,Edu, Def, Prop,Fin	Vector: N50, N1000 N2000, N5000 Raster: N50, N250, N1000 DEM Gazetter	€13.7 Mill revenue (budget approx €75.5 Mill)	
MapSolutions AS	PLC	Tra, Def, Eme, Con, Tra	ELVEG ELVEG route planner Nordic Map	€1.15 Mill (2002)	14 (2003)
Norway Mapping Group	PLC	International		>€88 Mill	>900 (2003)
NGU		LG, CG, Con, Uti, Env, Edu,	Mapsonline Geological databases	€16.5 Mill[62] (2002)	200 (2002)
The Norwegian Institute of Land Inventory (Norsk institutt for jord- og skogkartlegging, NIJOS)	Public Institute (Min of Agr)	LG, CG, Con, Uti, Tra,Edu, Env, Agr	National statistics on forest and cultural landscape resources Consulting Land-use and landscape information		130
Statens Vegvesen	National Road Administration	CG, LG, Con, Tra, Env			
Statistisk sentralbyrå (SSB) Statistics Norway	Gov Dept	CG, LG, Con, Tra, Env	Statistical Publications		900
Sysdeco AS	PLC	LG, CG, Con, Uti,Tel, Eme Tra,Edu, Def, Prop,Fin	QBE		150 (40 in Norway)
Blom AS	PLC	LG, CG, Con, Uti,Tel, Eme Tra,Edu, Def, Prop,Fin	CARTERRA	€16 Mill (2002)[63]	244

The National GI Association in Norway is the **GeoForum** (www.geoforum.no). It is the Norwegian umbrella organisation for GI with over 300 member organisations from both public and private sector and it is the Norwegian representative in EUROGI. Thanks to its broad geographical and professional representation, the Association serves as an important source of advice to the public sector and undertakes special studies on commission, e.g. evaluating municipal GI statistics. GeoForum represents Norway at EUROGI, ISPRS and ICA and, jointly with the Norwegian Association of Surveyors (NJKF), is the national representative member of FIG. The Association functions as the Secretariat of the GI-Nordic Region and also offers services relating to the provision of technical aid to developing countries[64].

As in many European countries today the Norwegian Government are developing policy for exploiting the benefits of the new "e-economy". It has created a national plan called eNorge 2005 which was published in May 2002 and which includes a strategy (Strategi for Elektronisk Innhold) to increase access to Public Sector Information (PSI) and exploit electronic content. Acces to public sector information and services via the Internet (http://www.noreg.no/) is part of the overall e-Government strategy. The service allows, for example, users to view each administrative area (e.g. commune or county) and to check the availability of PSI, find out contact information, and view interactive mapping. It is within this eGovernment strategy framework that the Norwegian national SDI has been created with core data sets to be provided via programmes called Geovekst/GeoNorge and Arealis. Geovekst/GeoNorge is a joint venture between Statens Kartverk (SK), the Norwegian National Mapping Organisation, the municipalities, publicly owned utility companies, public road administration, and agricultural authorities. (NB – The Norwegian NSDI is sometimes confusingly referred to as NGIS (www.statkart.no/ngis) which is actually a technological tool for data management and GI distribution used by Statens Kartverk). The **Association of Enterprises in Geomatics (GBL)** represents a recent grouping of private sector companies to work with the public sector and increase cooperation. Several companies are however working with the NMO via some form of collaboration agreement

[62] NGU Annual Report 2002
[63] Blom Annual Report 2002
[64] Geoconnexion magazine: Geoforum profile

A **GeoNorge** geodata portal (www.geoNorge.no) has been established and run jointly by GeoForum and SK. Institutions and individuals can apply to get and give information on geomatics. The gateway is a shortcut to information about official institutions and private companies and their GI products and services (GeoNorge lists 23 companies as members of the "nationwide interest organisation" including surveyors, map producers, GIS consultants or suppliers of equipment and software). The GeoNorge portal claims that the Norwegian institutions and companies within the field of geomatics are administrating more than 6 billion NOK each year[65] (1 NOK = approx €0.122)**. Arealis** is a programme co-ordinated by SK and aimed at co-ordinating collaboration amongst the key GI players in Norway to facilitate the flow of data and information. Arealis includes land cover data, environmental data, planning information, and other data. In simple terms Geovekst/GeoNorge addresses generic GI data elements while Arealis addresses the environmental side of the NSDI.

Amongst the public sector organisation involved with GI the most prominent is the National Mapping Organisation **Statens Kartverk. (SK)** (www.statkart.no). It's role[66] is to provide users nation wide with maps and GI relevant to all manner of planning and operational tasks as well as to ensure safe travel. Its main activities are:

- maintaining the geodetic and geophysical infrastructure;
- operating the national satellite positioning system;
- establishing and maintaining national digital data, map series and publishing databases;
- maintaining and issuing national analogue map series and publishing databases;
- maintaining national map and geodata standards, coordinate geodata activities in Norway and fulfil specific administrative functions;
- develop and supply digital and analogue products and services suiting user needs;
- co-operate with Norwegian private and public organisations to develop cartographic technologies and skills and support the export efforts of Norwegian mapmakers;
- maintaining the cadastre and co-ordinating the work of the land register;
- maintaining national nautical charts.

SK produces the following datasets:

- Vector data:
  - N50 kartdata (approx 1:50k)
  - N1000 kartdata (approx 1:100k)
  - N2000 kartdata
  - N5000 kartdata
- Raster data
  - N50 raster data (approx 1:50k)
  - N250 raster data (approx 1:250k)
  - N1000 raster data (approx 1:100k)
- Digital Elevation Model (DEM)
- Digital landscape model
- Gazetteer - national place name register (1:30k – 1:75k)

As with many other national mapping organisation SK is creating partnerships with private sector organisations in order to develop products and services based on its data and expertise. Unlike many of its NMO peers the responsibilities of SK also now extend, as mentioned above, to the cadastre and land register. In 2002 the Norwegian Parliament decided to transfer the land register from the courts to SK. As from 2003 the responsibility for the land register has passed from 87 local courts to a single registration office in SK HQ[67]. Technical maintenance of the land register and cadastre databases will be outsourced to a state owned company called **Norsk Eiendomsinformajon Ltd** which will facilitate integrated on-line services to users. Norsk Eiendomsinformajon is also currently operating an information service called InfoLand, on behalf of certain municipalities, which gives access to municipal information such as zoning regulations etc.

Situated in Trondheim, the **Direktoratet for naturforvaltning (DN)** (The Directorate for Nature Management) (http://english.dirnat.no/) is a national body that has the scientific responsibility for managing the Norwegian countryside. It is responsible to the Ministry of Environment on matters concerning nature management.

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[65] GeoNorge Portal

[66] Eurogeographics Members listing: Eurogeographics website

[67] Integrating the Cadastre and the Land Register in a Single Organisation in Norway, Helge Onsrund, Statens Kartverk

The **Norges Geologiske Undersøkelse (NGU)** (Geological Survey of Norway) (www.ngu.no). NGU is the national institution for knowledge on bedrock, mineral resources, surface deposits and groundwater. It is a Government Agency under the Ministry of Trade and Industry (NHD). NGU is a research-based agency and advises other Ministries concerning geoscientific matters. Its main tasks are to collect, process and distribute knowledge of the physical, chemical and mineralogical properties of the country's bedrock, surface deposits and groundwater. It provides a wide range of geological databases and published maps and users can obtain information about available data through an on-line products catalogue.

The **Norsk Institutt for Jord-Og Skogkartlegging, (NIJOS)** (Norwegian Institute of Land Inventory) (www.nijos.no) is an independent, public institute under the Norwegian Ministry of Agriculture. It is Norway's major supplier of data on soil, forest, outfield and landscape resources which is used for agriculture, forestry and other land-based enterprises, as well as for land-use and environmental management.

Statens Vegvesen (www.vegvesen.no/) is the Norwegian Public Roads Administration. In conjunction with Statens Kartverk it operates the online National Road Database (http://www.visveg.no/norguide/).

Statistisk Sentralbyrå (SSB) (http://www.ssb.no/) Statistics Norway has a staff of 900 and releases more than 800 statistics per year via its website including map based data, e.g. population on 1km x 1km grid, which can be ordered from Statistics Norway or directly downloaded from the Internet as PDF.

There are a number of key players in the private sector including (as well as the usual international GIS vendor key players) **MapSolutions, Blom, Sysdeco,** Asplan Viak AS, **Fjellanger Widerøe AS, Norkart AS**, and Norskog.

MapSolutions AS (http://www.mapsolutions.no/) recently (1st Jan 2003) changed name from Transport Telematikk. It claims to be the leading distributor of digital maps and road-data in the Norwegian market[68]. Its digital maps are the foundation for computerised transport planning, route optimisation and fleet control. Road data are distributed to customers as traditional databases, but also as xml-web-services through the "MapS Map Engine", which has been developed by MapSolutions (ESRI-software and Microsoft .Net). MapSolutions provides the Norwegian map database for Tele Atlas, and is the main distributor of Tele Atlas data in the Norwegian market. MapSolutions serves many different sectors, the principle ones being transport, security, emergency, defence forces, information services on the web (Yellow pages, Telenor etc), public services, and car navigation. Its key products ELVEG and ELVEG route planner are aimed at the transport planning, route optimisation and fleet control markets. MapSolutions has entered into partnership with several other GI key players, for example with Bosch and TeleAtlas for in car navigation products and with T-Kartor Sweden AB for the Map Hotel service in Norway.

Sysdeco Technolgy AS (http://www.sysdeco.no/sysdeco.asp) is a company developing GI applications for the international market. With an HQ in Oslo, the company has subsidiaries in England, Germany, Sweden, Italy and in Asia (Singapore and Malaysia). All together there are about 150 employees, with about 40 employed at the headquarters in Norway, 40 in UK and 40 associated with the Singapore office. Sysdeco has been a prime contractor for the supply of integrated digital mapping and GIS systems handling hundreds of gigabytes of spatial data to high profile national surveys and hydrographic institutes in Europe, India and South-East Asia for over 20 years.

Blom ASA (http://www.blom.no/) was founded in 1954 as a family-owned surveying company. It went public in 1988 and is now a group quoted on the Oslo Stock Exchange. The Blom Group activities include the collection, distribution, processing and presentation of GI, as well as commercial activity and related consultative services. Blom ASA is said to be "the largest company of its kind in Norway"[69] It intends to maintain 80% of its work internationally with target areas outside Norway being the EU market, Eastern Europe, Southeast Asia and the Middle East.

Fjellanger Widerøe AS **Fjellanger Widerøe Aviation AS** (http://www.fw.no/aviation/) is one of the world's oldest and leading companies in the aerial photography and remote sensing industry. The main base is located in modern facilities at Norway's national airport, Oslo Lufthavn Gardermoen. Apart form the flying services, FW Aviation is also delivering operational and maintenance services.

[68] Mapsolutions website

[69] Norway online.no

Norkart AS (http://www.norkart.no/) was established in 1961. It now has a staff of 60 and is among the leading companies in the field of photogrammetric mapping, the development and sales of GIS, consulting services, the production of thematic maps, aerial photography and land surveying. Norkart delivers GI services and products to major operators in the Norwegian GIS market. Among the customers and partners are both private companies and the great majority of Norwegian central and local government bodies.

Poland

Player	Type	Sectors	Products	Turnover	Staff
Head Office of Geodesy and Cartography (GUGiK)	Gov Dept	CG, Con, LG,Edu, Ret, Prop, Env, Uti			€50 (budget 2003)
The Polish Geological Institute (PGI)	Gov Dept	Env, Prop, CG,LG, Edu	HYDRO Bank GEIXS		
Chief Statistical Office (GUS)	Gov Dept	CG, LG, Con, Edu,Ret,Hea,Env			
Institute of Geography and Spatial Organisation - IGiPZ	Gov Dept	Con, CG, LG, Edu, Tra			
GEOBID® Ltd	PLC	CG, LG, Con, Edu,Ret,Hea,Env	OSRODEK BANK OSNOW EWMAPA POWTAX AKTUALTEL		
GEOSYSTEMS Polska, Ltd	PLC	CG, LG, Con, Edu,Ret,Hea,Env	ERDAS		
NEOKART GIS Ltd	PLC	CG, LG, Con, Edu,Ret,Hea,Env			
Tatuk GIS	PLC	CG, LG, Con, Edu,Ret,Hea,Env	Developer Kernel		

The National GI Association in Poland is called **GISPOL** (http://www.gispol.org.pl/) which is a non-profit organisation based on the voluntary work of its members. As in other countries its role is mainly in awareness raising, networking and education in order to achieve a co-ordinated GI infrastructure.

Since 1998 work has been going on to establish the concept of the Spatial Information System in Poland. The Surveyor General of Poland is the president of the Główny Urząd Geodezji i Kartografii **Head Office of Geodesy and Cartography (GUGiK)** (http://www.gugik.gov.pl/) which has numerous roles to play: establishing and maintaining geodetic and gravimetric networks, preparing official topographic maps, maintaining national resources of geodetic and cartographic data, and maintaining the cadastral register of land and buildings. Topographic data provided by GUGiK includes small scales - 1:500k (topography, hydrography, and transportation network), 1:750k (administrative divisions) and the 1:1Million EuroGlobalMap, which is currently being completed. At medium scales there is national mapping at 1:50k and 1:10k currently being digitised, and at larger scales there is cadastral mapping. Other international co-operation includes data contribution to the EuroGeographics SABE product. In 2001 GUGiK began the implementation of a system of geodetic permanent GPS stations to create an active geodetic network called ASG-PL. In 2002 GUGiK contracted work for 1:13000 scale aerial photography over an area of 10 000 km^2 to be used for the LPIS (Land Parcel Identification System) in support of the IACS (Integrated Administrative Control System) programme. The Polish cadastre is currently being improved via an "Integrated Cadastral System" that aims to develop electronic exchange of data between four existing or new databases; the Real Estate Cadastre, the New Land and Mortgage Register, the Fiscal Cadastre, and the Common System of Real Estate Valuation[70]. Online access to data has began, firstly via metadata as part of the MATRA project and also in the regional centres of geodetic and cartographic documentation.

In Poland there is a strong regional context to GI and GI metadata; all counties and provinces have geodetic and cartographic documentation centres that maintain basic GI; cadastral data, registers of utilities, and the basic maps of the country. This is co-ordinated by GUGiK in agreement with the **Chief Statistical Office (GUS)** (www.stat.gov.pl) and other government agencies.

The Polish Geological Institute (PGI) (www.pgi.waw.pl) was founded by the Polish Parliament in 1919 and its mission today is "to conduct geological research of the country aimed at national economical development and environmental protection". It is one of the biggest and oldest scientific institutes in Poland and employs 740 total staff. The main tasks of the Institute include research on the geological structure of Poland, geological and geo-environmental mapping, assessment of the country's mineral potential, and monitoring various aspects of the environment, including groundwater resources. Geological mapping has been generally focused on the construction of multisheet, serial maps, covering the whole territory of Poland or some specific regions. Maps from 1: 300k to 1: 10k cover geological, hydrological, geo-environmental, economic - geological, geophysical and geochemical themes. In terms of GI data the Polish Geological Institute has databases of mineral

[70] Integrating Electronic Platform (IPE) as a basic component of Cadastral System in Poland

resources and a HYDRO Bank. HYDRO Bank is a system set up in 1998 that creates a common platform for all hydrogeological databases existing in Polish Geological Institute. In partnership with EuroGeoSurveys, PGI has contributed to the GEIXS European Geological Data Catalogue.

The **Chief Statistical Office (GUS)** (www.stat.gov.pl) is an important GI player. As part of the Special Preparatory Programme (SPP) for Structural Funds in Poland (PHARE 1998) a feasibility study was prepared concerning GIS. Two important conclusions from this study were the need to link maps with other statistical data sources via GIS and that the final output of the GIS should be accessible for multiple users[71].

The Instytut Geograffii I Przestrzennego Zagospodarowania (**Institute of Geography and Spatial Organisation - IGiPZ**) (www.igipz.pan.pl/) has been involved with cartography since 1953. It merged with the Laboratory of Geographic Information Systems in 1994 and has since produced a 1:300k Atlas of Poland, a 1:500k administrative map of Poland (contracted by the Surveyor General Poland) and a road map of Poland.

The main GIS software in use in Poland is ESRI, Intergraph, **MapInfo**, Autocad, **Bentley Geographics**, and Polish GIS software, including EWMAPA and **GEO-INFO**.

In the private sector **GEOBID® Ltd** (http://www.geobid.com.pl/) is one of the key players. Set up in 1991, the company was founded by the computer programmers from the former Viovoda Geodetic and Cartographic Documentation Centre in Katowice. Its main activities are project management, programming, GI implementation and consultancy. It has developed a Polish GIS called EWMAPA® for Land Information and Administration Systems that is now used in 37 provinces in Poland. The firm has a production research and training centre in Chorzów and is organized into three divisions: projects and programming; implementation and marketing; research and production.

GEOSYSTEMS Polska, Ltd (www.geosystems.com.pl) is a remote sensing/photogrammetry and LIS/GIS consultancy and laboratory involved in various types of GI. Main areas of expertise include satellite image mapping, thematic mapping, rapid response mapping, DTMs, and visualisation. The company was set up in June 1995 in order to meet the challenges expressed in EC document "Towards a European Geographic Information Infrastructure - GI 2000 (18 January 1995)" and recognizing the opportunities for image based GI applications. The company acts as an authorised ERDAS distributor in Poland and supplier of satellite data from SPOT IMAGE, EURIMAGE, SPACEIMAGE and several Russian organisations. It has been involved in several international R&D projects such as the PHARE MERA project (extension of JRS-IRSA's activities in remote sensing of agriculture, forests and land degradation to central Europe), and land cover/use mapping of the Baltic Region.

Established in 1991 as a GIS consultancy **NEOKART GIS Ltd** (www.neokartgis.com.pl) also offers a range of GI services. These include GIS consultancy for resource and land survey applications, system design, digital mapping and training. The capability at NEOKART GIS is based largely on a network of UNIX and PC-based ARC/INFO systems and it has developed a strong expertise in cadastral data.

Tatuk GIS (http://www.tatukgis.com/) is another private sector developer specialising in GIS web server applications, image rectification and other GI final user applications. The lead product is the royalty-free GIS Developer Kernel toolkit.

[71] Backer Lars H, (Statistics Sweden), 2001. *GIS for CSO-Poland*; Expert Report within the Phare'1998: Special Preparatory Programme (SPP) for Structural Funds in Poland and Główny Urząd Statystyczny, 2001. Feasibility Study of Options for GIS Application In Regional Statistics In Poland.

Portugal

Player	Type	Sectors	Products	Turnover	Staff
Instituto Geográfico Português (IGP)	Public Administration Institute	CG, Uti, Con LG,Edu, Ret,	SNIG Geocid	€10 Mill	360 (2003)
Instituto Geográgico do Exército (IGeoE)	Public Administration Institute		Topo 25k Topo 50k DTM		
Municipia SA	PLC				54 (2003)
Estereofoto, SA	PLC			€6.1 Mill (2002)	
NOVAGEO, SA	PLC				

There are two key players in terms of GI data production in Portugal, the Instituto Geográfico Português and the Instituto Geográgico do Exército. Of these the former has a higher profile because it is also responsible for market regulation, the Cadastre and the national SDI.

Founded in 2002 the **Instituto Geográfico Português** (Portuguese Geographical Institute) **(IGP)** (www.igeo.pt) is the result of a reorganisation and modernising of Portugal's public administration and is a successor body to the National Centre of Geographical Information (CNIG) and the Portuguese Institute of Cartography and Cadastre[72]. This integrated approach allows IGP to deal across the board with national GI issues including 1:10k scale cartography, the national cadastre, and the National Spatial Data Infrastructure (NSDI) project. In the area of cartography its work is undertaken in partnership with municipalities, and it aims to provide national mapping coverage at 1:10k scale and urban coverage at 1:2k scale. With strong political support the national cadastre is now being developed within a new model that involves IGP, local government, financial offices and land registries.

The **Sistema Nacional de Informação Geográfica (SNIG)**, is Portugal's National Spatial Data Infrastructure or NSDI. It includes a web site (http://snig.igeo.pt/) that provides access to GI produced by national public agencies within environmental, agricultural, economic, scientific and cultural domains. The information included in SNIG is catalogued to allow an easy and fast access to the data. Through these catalogues the user can find which cartographic and alphanumeric data is available, and how to obtain it. **Geocid** (geocid-snig) is a public access geoportal offering free government-held data to every citizen and marks the third phase of development of the SNIG[73]. GEOCID's web interface was specially designed for use by the citizen, with a front-end intended to make browsing fun and navigation easy, with information structured according to themes and types of data (including weather, tourism, statistics, earthquakes). One of the most popular features of the GEOCID site has been the ortho-photography of Portugal's entire land mass. The colour infra-red coverage was flown in the Summer of 1995 under a joint initiative involving CNIG (the National Centre for Geographic Information and the agency in charge of implementing and operating Portugal's NSDI), CELPA (the Paper Mill Industry Association), and DGF (the General-Directorate of Forestry). The 5000 aerial photographs acquired during the survey were scanned by CNIG at high resolution and later ortho-rectified by IGeoE, the Portuguese Army Geographic Institute. Each image is about 300 MB in size, which means that full territorial coverage corresponds to 1.5 TeraBytes of data.

The **Instituto Geográgico do Exército (IGeoE)** (www.igeoe.pt) is the Army Institute for GI and is the Portuguese national institute responsible for the production of cartography. It publishes 1:25k and 1:50k maps and DTM data.

Municipia SA is a private company owned by a grouping of 30 municipalities and the only private company certificated by IGP for all cartographic activities. It is also involved in GI consultancy and implementation. It produces large scales digital cartography and is certified by IGP for topography and levelling, aerial triangulation, photogrammetric restitution, and orthorectification. Using aerial photography and satellite imagery Municipia also produces thematic databases.

ESTEREOFOTO - Levantamentos Aerocartográficos, Lda (http://www.estereofoto.pt) is a private company which claims to be "a market leader in Portugal for cartography, cadastre and valuation".

[72] Geo:connexion, Vol 2, Issue 7, http://www.geoconnexion.com/magazine/article.asp?ID=897

[73] Geoplace.com, 2002, http://www.geoplace.com/ge/2000/1000/1000cid.asp

With activities such as aerial photography, orthophoto production, digital cartography, GIS, remote sensing and cadastral mapping its main customer sectors are transport, utilities and agriculture.

NOVAGEO (http://www.novageo.pt/) is a leading consultancy and GIS software developer specializing in GIS implementation, thematic cartography, Web/Wireless GIS, and Geo-marketing.

The most prominent GIS software vendors in Portugal are **ESRI** (www.esri-portugal.pt), **Intergraph** (www.intergraph.com/portugal), and **Autodesk** (www.autodesk.pt).

Romania[74]

Player	Type	Sectors	Products	Turnover	Staff
National Office for Cadastre, Geodesy and Cartography (NMO)	Gov Dept				
Institute for Cartography, Photogrammetry, Geodesy and Cadastre (ICFGC),	Gov Dept				
Topography Military Department	Gov Dept				
Geo Strategies S.A.	Private company registered in Cambridge UK, with a subsidiary company in Sibiu, Romania.	Tel, Def, CG, Ems, Ret, Tra, Env, LG, Fin	CEE GIS Gis Plus & Navigable GIS Address CEE Imagery DTM CEE Boundaries & demographics interactive maps	>€600,000 (2002)	21
ESRI Romania	PLC	CG, LG, Uti, Tel, Ret	ESRI GIS ESRI IMS		
Intergraph Computer Services s.r.l	PLC	CG, LG, Uti, Tel, Ret	Intergraph		
ANIAP (National Association of the specialists in Informatique working in Public Administration):	PLC	CG			
Bucharest University, Faculty of Geology and Geophysics	Academic Institution				

Romania does not have a National GI Association as such and the picture of GI in Romania has for some time been a confusing one to the outsider. It has perhaps been made more difficult to follow by the frequent restructuring of Government departments; the latest restructuring process having taken place in June 2003. This latest change means that the situation is particularly confused at the time of writing this report, with possible changes meaning that for example, the National Office for Cadastre, Geodesy and Cartography may no longer be a Government department but may be a “Direction” in the Ministry for Internal Affairs, or an Agency. As a consequence the Institute for Cadastre, Geodesy and Cartography may become more independent and perhaps even become a private company.

The **National Office for Cadastre, Geodesy and Cartography (ONCGC)** (no website at present) is responsible for cadastre, land registration (in cooperation with Ministry of Justice - MoJ) and land management, the geodetic reference network, and national mapping. ONCGC was established in 1996. Both the ONCGC and the MoJ, have developed or are in the process of developing co-ordinated long term strategies for the implementation, maintenance and management of an integrated cadastre and real property rights registry system. Within the ONCGC (prior to Jun 2003) are the County Offices of Cadastre Geodesy and Cartography, which are organised as decentralised public services with a headquarters in the municipality of each county, and the **Institute of Geodesy, Photogrammetry, Cartography and Cadastre (IFGFC).** The IFGFC, part of the NOCGC up to the restructuring in Jun 2003, produces digital data including a digital topographic map at 1:500k (all of Romania), orthophotos (all of Romania), 1:2k mapping of Bucharest, a DTM (all of Romania), and isolated areas of large scale cadastre. There is also a nationwide 1:50k but not all of it is digitised.

The **Military Topographic Department** produce paper maps (1:50k – 1:1 Million) and a DTM for Romania. There are also some digital data at very small scales i.e. 1:500k and 1:1 Million. The Military Topographic Department also produce aerial navigation charts and air photos.

On the whole, the picture that emerges from Romania is one of a GI community polarized into the public and private sectors, with the state still exercising a great deal of (arguably restrictive) control through bureaucracy, while there appears to be little in the way of IPR protection for private data producers. The state institutions are perhaps still emerging from the political restraints of recent years and it seems that the GI market has a long way to go in terms of organisational co-operation. While

[74] Without a GI Association as such to provide formal input this report is indebted to Dr Angela Ionita (Deputy Scientific Director of Research Institute for Artificial Intelligence, Romanian Academy) and Daniela Florea (Geo Strategies Ltd) for information about GI players in Romania.

the National Mapping Organisation – the NOCGC has a long tradition of geodesy it appears that private sector efforts in this field have to date received an unenthusiastic response from their public sector counterparts.

There are some key players in the private sector. **Geo Strategies** (www.geo-strategies.com) pioneered mapping and GIS in the Romanian market in the early 1990s and is now a market leader in the SE Europe region, not just in Romania. Geo Strategies was established in 1993. During the following two years most of its activity was directed towards market development, culminating in a contract to produce 112 urban maps for Sibiu in September 1994. Since that time Geo Strategies has established a strong reputation in the international market as well as within Romania itself, exporting digital datasets covering 38 countries with over 280 national and international customers with over 700 data licences in use. Apart from creating digital data it offers services in data capture, training, consultancy, project management, data engineering, data processing, land surveying, applications development, and hardware/software supply.

In 1993 ESRI appointed Geosystems Romania (www.geosystems.ro) as its distributor in Romania until **ESRI Romania** (http://www.esriro.ro) was established in 1999. ESRI Romania and Geosystems Romania have the same management and closely cooperate to promote ESRI technologies in the Romanian market. ESRI Romania dominates the Romanian GIS software market with more than 200 user organisations and more than 1,500 ESRI software licenses. ESRI Romania provides all necessary services including training, technical support, and application development. ESRI Romania works closely with higher education organisations to promote the use of GIS in the educational process[75].

Other private sector players active in Romania include Norwegian company **Blom ASA** (www.blom.no), which has 103 project employees in Romania[76] working on data processing on behalf of the Institute for Cartography, Photogrammetry, Geodesy and Cadastre (ICFGC), **IGC EuroTopo**, which offers a range of geodesy, cartography, and remote sensing services and is involved in image processing working in Romania, partly as a subcontractor for IGN –France, and Intergraph reseller **Intergraph Computer Services SRL** (www.intergraph.com/international/#Romania).

The **Public Administration Information Systems Professionals Association (ANIAP)** (www.aniap.ro) was established on the 27th of October 2000 and currently counts 175 members from 77 public institutions (of which 34 county councils, 31 municipalities and 12 other local governments) and activates as an independent, non-political, non-profit and non-governmental professional association. With one of its goals “to accomplish a unitary information system in the public sector and a national network of public administration in accordance with national objectives and EU standards in order to allow public access to information” the organisation clearly has a “key player” role to ensure that GI is used effectively across the public sector.

In summary, the supply of GI products and services in Romania seems to be very patchy. There appears to be some “official” maps for Romania, although these are often out of date and only available on special request from the ONCGC. Although private sector players, such as Geo Strategies, are creating up to date digital maps for the country, these are considered by the public authorities to be not "official". Geo Strategies is a significant provider (via their international partners) however, to the Romanian Government. There are over 200 users in key government departments who use the data for strategic and operational purposes in land, air and water related applications. The lack of IPR protection and apparent reluctance by the state authorities to get involved in partnership initiatives seems to be creating a confused GI sector which is very slow to develop.

[75] ESRI Press Release, Nov 2002

[76] Blom 1st quarter 2003 statement

Slovak Republic

Player	Type	Sectors	Products	Turnover	Staff
Geodetic and Cartographic Institute Bratislava	Govt Dept	CG,LG,Edu, Agr,Cri, Tra, Env,Tel,Hea	SVM 50 CD RE SVM 50 – roads SVM 50 - water areas, canopy SVM 50 – rivers SGD CS RE SKPOS	€1.9 Mill (2002)	286 (2002)
Slovak Environmental Agency (SEA)	"Contributory organisation"	Env,CG,LG Edu	Civil and military maps, DEMs Protected areas, Admin districts, LANDCOVER Orthophotomaps, Thematic layers Environmental web map server	€309,500 (2002)	303 (2002)
Slovak Road Administration	Govt Dept (non-profit)	Tra, Prop, CG, LG, Edu	Road Data Bank (RDB) RDB Information Service, Traffic Engineering	Non-profit organisation	4,788 (2002)
Soil Science and Conservation Research Institute	Government institution	CG,LG, Env, Edu			114 (2002)
EUROSENSE s.r.o.	PLC (EUROSENSE HQ is in Belgium)	Def, CG,LG, Ret, Uti, Env, Tel	Central Georeferencing Database Land Id Orthophotomaps Orthocoverage for IACS LPIS DTM/DSM country coverage flood simulations	€1.2 Mill (2002)	27 (2003)
Geodis Slovakia s.r.o.	PLC	Ret, Tra, Tel, LG, CG, Agr	Vector map, Orthophotomap, Landform Profile	€1.6 Mill (2002)	16 (2002)
Hydromelioracie, s.p.	State Enterprise	Env, CG, LG			108
Aurex s.r.o.	PLC	CG, LG, Tra, Prop, Env	Planning	€600,000 (2002)	18 (2003)
GeoModel s.r.o.	PLC	Tel, Env, Uti, Edu	Land cover/land use data DTMs	€100,000 (2002)	3-5 (2002)
ErasData Pro	PLC	CG, LG, Ems,			17
ISAX s..r.o.	PLC	LG, CG, Prop, Tra	Spatial Planning	€83,500 (2002)	4

The **Geodesy, Cartography and Cadastre Authority of the Slovak Republic (GCCA**), www.geodesy.gov.sk) is a central body of the state administration for the geodesy, cartography and cadastre of the real estates. The GCCA has established and directly controls the Geodetic and Cartographic Institute Bratislava (GCI), the Cadastral Institute in Žilina, and the Research Institute of Geodesy and Cartography in Bratislava. The GCCA is also responsible for the national cadastre; the cadastral departments of regional authorities (8 in the Slovak Republic), and the cadastral departments of district authorities (79 in the Slovak Republic).

The **Geodetic and Cartographic Institute Bratislava (GCI)** (www.gku.sk) is a state budget organisation that is part of the Institute of Geodesy, Cartography and Cadastre of the Slovak Republic. The CGI was established on 1st January 1991 and its activities cover the whole of the Slovak Republic. It is responsible for the creation and maintenance of the geodetic network, automated information systems of geodesy, cartography and cadastre, national topographic mapping, GIS databases, documentation, and archives etc. As a supplier of GI CGI provides a range of products and services to its customers including analogue maps, geodetic data, raster and vector data, and data from the real estate register. According to Slovak law 211/2000 citizens are entitled to free access to certain types of information and this can be obtained via the CGI website.

The **Slovak Environmental Agency (SEA)** (www.sazp.sk) is a body operating within the Slovak Ministry of Environment and covering the whole of Slovakia. Its activities are focused on

environmental protection and development of environmental policy on the principles of sustainable development. As well as providing a range of topographic and thematic maps SEA have also introduced an interactive webmap for environmental monitoring (see http://www.sazp.sk/webmapy/).

The **Slovak Road Administration** (www.ssc.sk/) is a Government department established by the Ministry of Transport, Posts and Telecommunications.

The **Soil Science and Conservation Research Institute (SSCRI)** (www.vupu.sk) is a government funded institute that was established in 2000, having previously been known as the Soil Fertility Research Institute, and before that the Soil Science and Agrochemistry Research Institute. Its significance to the supply of GI in the Slovak Republic lies in a number of key datasets and its creation of the Slovak agricultural Land Parcel Identification System (LPIS). As well as a comprehensive library of hard copy soil maps and references electronic data includes soil maps of Slovakia, soil properties data, geochemical data, a soil monitoring data base, and ortho-photo and satellite imageries of Slovakian territory. Between 1994-1996 the SSCRI was the Slovak representative in the MARS-MERA project and is now the national focal point for remote sensing in agriculture.

The Bratislava branch of **EUROSENSE** (www.eurosense.com) is one of eight European branches of this prominent commercial remote sensing organisation. Its headquarters is in Belgium (see Belgium country section for more) and the Bratislava branch employs 27 of the 230 or so total staff employed by the company. Services are primarily aerial photography, photo interpretation, processing and interpretation of digital satellite images, production of photogrammetric and topographic maps, airborne laser scanning (LIDAR) for height measurements, GIS/LIS and AM/FM database development and consultancy, city and landscape planning, inventory of forests and natural resources, digital orthophotography, cartography, hydrography, environmental studies, and other remote sensing related activities.

Geodis Slovakia s.r.o. is a Czech remote sensing company. It provides services in the field of aerial photography, photo interpretation, and the production of photogrammetric and topographic maps.

Hydromelioracie (www.vuzh.sk/) is the Slovak Republic state enterprise which maintains a database of the main Slovak irrigation and drainage systems. Data is made available to users.

GeoModel s.r.o. (www.geomodel.sk) is a private company founded in 1998. The staff comprises three co-owners and several external workers. The company has built a significant position in the field of GIS and environmental science in Slovakia, mainly in digital terrain modelling and research-oriented expertise. The staff of the company has participated in various research and application projects in the field of the environmental mapping, analysis and modelling. Its experience has been developed partly in collaboration with other Slovak companies, research institutions and in international projects

Slovenia

Player	Type	Sectors	Products	Turnover	Staff
Geodetska uprava Republike Slovenije Surveying and Mapping Authority of the Republic of Slovenia	Government Dept	CG, LG, Uti, Prop, Env, Con, Ret, Def		€17.6 Mill (2002)	574 (2002)
IGEA d.o.o.	PLC	CG, LG, Uti, Prop, Env, Con, Ret, Def		€320,000 (2002)	25

The National Mapping Organisation in Slovenia is the **Surveying and Mapping Authority of the Republic of Slovenia (SMA)** (www.gov.si/gu/); part of the Ministry of the Environment and Spatial Planning. It is also responsible for the national cadastre. The main activities of the SMA are[77]:

- geodetic legislation;
- organisation and competences of geodetic service, financing and international cooperation;
- basic geodetic system and state boundary;
- land cadastre and register of buildings;
- topography and cartography;
- register of spatial units;
- keeping and issue of data, data catalogues.

Basic topographic maps are produced for the entire territory of Slovenia at 1:5k (2,543 sheets) and 1:10k (258 sheets) according to the landscape type (mainly urban/rural). Between 1993 and 1995 the SMA has digitised these sheets by scanning. Since then scanning has been performed during the updating of individual sheets. Other data products distributed by SMA are 1:25k (DTK25) and 1:50k (DTK 50) raster topographic data, orthophotos, the register of spatial units, and the register of cartographic names. SMA maintains the national cadastre which forms the official record of land parcels and the tax base. For each land parcel there is data on size, yield capacity, owner, and location. The whole territory of the Republic of Slovenia is covered by a total of 5,148,000 land parcels, forming 2,698 cadastral areas.

The **Anton Melik Geographical Institute** (http://www.zrc-sazu.si/gi/) was founded in 1948 by the Slovenian Academy of Sciences and Arts and is named after the Slovene geographer Dr Anton Melik (1890–1966), who was the founder and the first head of the Institute. The Institute has six organisation units and also houses a geographical museum, a geographical library, three geographic collections and a cartographic collection. The Institute is also headquarters of the Slovene Governmental Commission for the Standardisation of Geographical Names (Komisija za standardizacijo zemljepisnih imen Vlade Republike Slovenije). The Institute's main task has been to conduct geographical researches of Slovenia and its landscapes and to prepare basic geographical texts on Slovenia as a country and as a part of the World. The institute publishes three scientific publications.

In the private sector, **Igea** (www.igea.si) was established in 1989. The Company had an active role in the creation and the development of the GI market in Slovenia and lists its main activities as research and development, organisation and management, consulting and education, information system designing and business processes reengineering, data processing and software programming, data acquisition and adjustment, and database establishment. **GISDATA d.o.o.** (http://www.gisdata.si) is the local ESRI reseller, and **Geo-Strategies** (www.geo-strategies.com/home.htm) provide vector, raster and terrain model data covering Slovenia.

Although only a few GI players are listed above there are many other data providers and GI key players in Slovenia. More details can be found in the Slovenian National Spatial Data Catalogue (available in English) which at the time of writing contains details of 407 metadata items from 110 data providers classified into 43 thematic groups.

[77] According to SMA website: www.gov.si/gu/

Spain

Player	Type	Sectors	Products	Turnover	Staff
Instituto Geográfico Nacional (IGN)	Gov dept, part of Min of Public Works and Transportation	CG, LG, Uti, Prop, Env, Con, Fin	Vector/Raster data National Topographical Map National Atlas Astronomical Almanac	Budget, approx €30	561
Centro Nacional de Información Geográfica (CNIG)	Autonomous body of Min of Public Works & Transport linked to the IGN	CG, LG, Uti, Prop, Env, Fin, Con, Ret	Vector/Raster data National Topographical Map National Atlas Astronomical Almanac	€3 Mill Revenue	54
Dirección General del Catastro (General Directorate of Cadastre)	Gov Dept – part of Min of Finance	CG, LG, Uti, Prop, Env, Fin, Con, Ret	Aerial photographs Orthophotographs Paper-printed cartography (urban and rural) Digital cartography (urban and rural) Digital alphanumeric information (urban and rural)	€107 Mill (budget 2003)	2,880 (2003)
Institut Cartogràfic de Catalunya (ICC)	Public Enterprise of Regional Gov of Catalonia Dep of Public Works	CG, LG, Uti, Prop, Env, Con, Fin, Ret	Vector/Raster data Catalonial Topographic Map Orthophotographs		
Institut Cartogràfic de Andalucia	Public Enterprise of Regional Gov of Andalucia Dep of Public Works	CG, LG, Uti, Prop, Env, Con, Fin, Ret	Vector/Raster data Andalucia Topographic Map Orthophotographs		
Institut Cartogràfic de Valenciano	Public Enterprise of Regional Gov of Valenciano Dep of Presidency	CG, LG, Uti, Prop, Env, Con, Fin, Ret	Vector/Raster data Valenciano Topographic Map Orthophotographs		
TRACASA	Public enterprise of Reg. Gov. of Navarra	CG, LG, Uti, Prop, Env, Fin, Con, Ret	Vector/Raster data Navarra Topographical Map Ortophotographs		
GRAFCAN	Public enterprise of Reg. Gov. of Canary Islands	CG, LG, Uti, Prop, Env, Fin, Con, Ret	Vector/Raster data Canary Islands Topographical Map Ortophotographs		
ESRI España	PLC	CG, LG, Uti, Prop, Env, Con, Fin, Ret	ESRI GIS / IMS ERDAS		
Intergraph	PLC	CG, LG, Uti, Prop, Env, Con, Fin, Ret	GeoMedia		
Netmaps,SA	Private Company		Digital Maps	€195k	

The National GI Association of Spain is the **Asociación Española de Sistemas de Información Geográfica (AESIG)** (www.aesig.com) which was founded in 1989 to promote the introduction, use and development of GI technologies. With 145 individual, 32 universities/public sector organisations, and 57 corporate members it acts as a forum for debate and discussion between individuals, groups and organisations, users and providers of these technologies.

The National Mapping Organisation in Spain is the **Instituto Geográfico Nacional (IGN)** (The National Geographical Institute) (http://www.mfom.es/ign/) which operates under the Ministry of Public Works and Transportation. It was created in 1870, and according to the Royal Decree 89/1987 is entrusted with activities that cover cartography, geodesy, photogrammetry, remote sensing, research, GIS and national Seismic Network, Geophysics, and Astronomy.

The **Centro Nacional de Información Geográfica (CNIG)** (National Centre for GI) (www.cnig.es) is an autonomous body linked to the IGN with the aim of producing, developing and distributing geographic works and publications, including the GI products of IGN - in effect it commercialises the products of the IGN. Among these products are 1:1 Million (raster, vector), 1:500k (raster, vector),1:300k (raster, vector), 1:200k (raster, vector), The National Topographical Map (1:50k and 1:25k), 1:10k (although this is not national coverage), regional maps, the Spain National Atlas, the Astronomical Almanac, the Official Road Atlas, and books (including air photography, ortho-images, historical mapping, thematic maps, 3D maps, and tourist maps.

Another key player in the public sector is The **Dirección General del Catastro (General Directorate of Cadastre) (GDC)** (http://www.catastro.minhac.es) which is part of the Ministry of Finance. The cadastre is a fiscal one and all information is available to the public. It is linked to the national Property Register, which resides within the Department of Justice, and which is also open to the general public. The GDC is a key player in the supply of products and services and in the scale of its impact in terms of employment and budget. With a staff of over 2,880 and a budget of €107 Million (2003) it plays a crucial role in the Spanish land market with more than 2 million citizens visiting the offices of the cadastre each year. As well as the cadastral attribute data, GI products made available include urban and rural vector mapping (between 1:500 and 1:5000) and digital orthophotos (1:2000 – 1:5000). In recent years the GDC has pioneered a "virtual office of the cadastre" called Ensenad@. Co-financed by the EC and the GDC the Ensenad@ project is an automated territorial information service with access via the internet to cadastral services and territorial databases. Although it will initially be used for accessing and sharing information it will eventually be developed to incorporate services such as on-line sales of cadastral information and electronic payment of cadastral fees[78]. The GDC have also been particularly active internationally and were responsible in 2001, during the period of the Spanish EU presidency, for instigating the 1st European Cadastral Congress. This led to the formation of the Permanent Committee on Cadastre in the European Union.

There is an initiative currently underway in Spain, to create a national SDI,[79] which appears to mirror the INSPIRE thinking in that it is a national organisational structure that facilitates co-ordination of different national levels and interests as well as addressing the key issues of reference data, technical infrastructure, standards etc. The initiative is being led by the **Consejo Superior Geográphico** (National Geographical High Board), a co-ordinating body which includes representatives from every Government Ministry and every cartographical institution of the 17 Regional Governments in Spain. While the creation of a national SDI is still at the early stages there are good regional examples in Spain of SDIs – in particular the Catalan IDEC project ("Projecte per a la creació de la Infrastructura de Dades Espacials de Catalunya"). This two year project began in Jan 2002 with an overall aim of changing the culture of public administrations in terms of the way they handle and share spatial information. The project intends to firstly compile metadata catalogues on existing GI data and products, and then to create an internet portal where the elements can be published and managed. IDEC will offer a forum for those involved with spatial information to meet, and intends to conclude by creating a permanent institution that can be a sustainable SDI entity.

The **Institut Cartogràfic de Catalunya (ICC)** (Cartographic Institute of Catalonia) (www.icc.es) holds within its website a list of all regional public bodies that are producers of official cartography in Spain (and some international data providers).

[78] Spanish Cadastral Information System. Current status and IT renovation strategy, Carmen Conejo

[79] IDEE: The state of play of setting up the national SDI of Spain, Sebastian Mas Mayoral, 9th ECGI&GIS Workshop, La Coruna, Spain, Jun 2003

Some of the key private sector GI players in Spain include Intergraph, ESRI, MapInfo, Autodesk, Bentley, Smallworld and SAS. **Netmaps SA** (http://www.netmaps.es) was created at the end of 1997, by a group of geographers with a publishing background. It claims now to have "developed one of the largest cartography digital bases in the world"[80] and to be "one of the most important companies in the European market"[81]. Their maps cover mainly Europe and America, from cities at 1:10k scale to countries at 1:1Million scale. Netmap's coverage of Spain is "the largest coverage available"[82]. **ACEFHAT** (http://www.acefhat.com) is a company which was created in 1990 to coordinate and manage the service work carried out on public thoroughfares in the city of Barcelona, Spain's principal seaport. ACEFHAT used Intergraph GeoMedia to create its 'E-GIOS' web-based public works management system. The system helps the company to manage over 20,000 city streetwork projects per annum for utilities such as Aguas de Barcelona (water), Gas Natural (gas), Telefonica (telecoms), and Fecsa-Enher (electricity). The system allows real-time online data communications, and manages the GI data provided by the utilities in various formats. E-GIOS also allows improved co-ordination between service companies by allowing them to query the a common web portal for details of intended public works and submit planning applications for works that might be undertaken simultaneously. The applications can be vetted online by Barcelona city authorities, and citizens can also log-on to parts of the system. **ANEBA Geoinformática, SL** (www.aneba.com) is a Spanish company founded in Barcelona in 1986 and which in 1990 released its CARTOMAP® product for field data capture and land-surveying. Also within the private sector, **Dices.net** (http://dices.net/enter.htm) is, essentially, a web portal for advertising, but advertising what it calls "geo-publicity". It offers a channel to a very discreet market segment i.e. people in the GI market.

[80] Netmaps Website
[81] Netmaps Website
[82] Netmaps Website

Sweden

Player	Type	Sectors	Products	Turnover	Staff
Local Authorities (in co-operation with the Swedish Association of Local Authorities)	Local Gov	LG/Con		About €200M	About 3000 in 290 municipalities
Lantmäteriet	Gov Agency	CG, LG, Uti, Prop, Env, Con, Fin	GSD Road Map CORINE Imagenet Geoimager Mapmate	€161M (2002)	2074 (2002)
Geological Survey of Sweden	Gov Agency	CG, LG, Env	Georegister Geochemical	€27M (2002)	290 (2002)
Swedish Maritime Administration	Gov Agency	CG, LG, Tra,Con	Nautical Charts Mapmate	€155M (2002)	1250 (2002)
Teleadress	PLC	CG,LG, Ret,Fin	Teleadress Komplement Teleadress DM/TM Teleadress Intervall Teleadress Online Teleadress Katalog Teleadress Kartdata Teleadress Marknadsund.		
Trimble	PLC				
Swedish Meteorological and Hydrological Institute	Gov Agency	CG, LG, Env	Baltex Climate Data	€50M (2002)	550 (2002)
Swedish National Road Administration	Gov Agency	CG, LG, Tra, Con	Road Map Accident data	€1900M (2002)	6500

ULI (Utvecklingsrådet för Landskapsinformation)[83], the Swedish Development Council for Land Information is the National GI Association for Sweden. It is a non-profit association of Swedish organisations working "for more efficient use of geographic information". With a turnover of around €220,000 its work is mainly financed by membership fees and by a Government grant and revenues from conferences and from sale of publications.

According to ULI, the "key players" in Sweden are the **Local Authorities** (municipalities) in co-operation with the **Swedish Association of Local Authorities** (www.svekom.se). This is an association of Sweden's 290 primary local authorities. They have large powers of self-determination and are responsible for local issues in the immediate environment concerning citizens, such as primary and secondary schools, pre-school activity, care of the elderly, roads, water and sewerage issues, and energy issues. The municipalities also grant various types of permit such as building permission and licenses to serve alcohol, and are active in issues that affect business development, tourism, and culture in the local district. In Sweden, compared with many other European countries, the municipalities have a relatively large input into the supply of GI with perhaps one third of them, especially the larger ones, handling all cadastre production. They also produce data, mainly in the form of base maps at 1:2000 and 1:5000. They also use orthophotos as background information for their maps. The municipalities sell data to the National Land Survey (NLS), other authorities, the utilities, and private companies. They also have agreements with NLS to exchange data (on-line through the Internet). A growing trend is to create regional geo-centres of 15-30 municipalities which act as local "hubs" to serve that area. Normally, it is the regional offices for the Association for Local Authorities that administer these centres and the largest municipality of the group that actually holds the data (e.g. www.geodatacenter.se). Services for the citizen, aimed at increasing democracy, are also a feature of the Local Authorities with a growing list of Internet services such as presentation of plans, and a limited amount of geo-analysis.

Lantmäteriet, or the Swedish **National Land Survey (NLS)** (www.lantmateriet.se), sees its task as being "to contribute to an efficient and sustainable use of Sweden's real estate, land, and water". In

[83] ULI - Swedish Development Council for Land Information, SE-801 82 Gävle,
Phone: +46 (0)26 61 10 50•Fax: +46 (0)26 61 32 77 E-mail: uli@uli.se • Homepage: www.uli.se

the fields of GI, land information, cadastral services and GI techniques NLS is in the situation (as are many other National Mapping Organisations) of having both a national public responsibility and occupying a significant share of the GI sector – they are a key player. The total staff is approximately 2,000 working in 95 offices throughout the country. The headquarters is situated in Gävle. The annual turnover is approximately €161 million euro of which 70% is generated through charging fees on real property formation, the use of information from databases and on consultancy services. The Swedish Government tasks NLS with the production and maintenance of geographic information and land information for which NLS receives a grant of almost €44million. The activities of NLS can be divided into cadastre, land & geographic information, "Metria" (see below), and overseas consultancy:

- The main *cadastre* activities are carried out within 21 Cadastral Authorities, one in each county. At the headquarters there are units for development, marketing and management. The cadastre division has a total staff of approximately 850 of whom 800 are working at the Cadastral Authorities and 50 at the central level. In 38 of the municipalities there are also Cadastral Authorities within the local administration.
- The *Land and Geographic Information* division is responsible for the generation, management, development and distribution of geographic and real property information. Real property information comprises information from the Real Property Register, including the digital cadastral index map, the Land Register and the central registers for buildings, apartments, addresses, mortgage certificates and real property prices. Geographic information comprises basic geographic data such as co-ordinates, terrain elevation data, aerial photographs, vegetation cover data and place names. The Division is also responsible for standardisation questions and for R&D in the fields of geodesy, cartography and geographic information systems. The Division's main clients are credit institutions and banks, public administration, municipalities, estate agents and property management companies. The Division has a total staff of approximately 220, all of whom work at the central level.
- The *Metria* division carries out repayment services in the land survey sector and also produces basic landscape information for the Land and Geographic Information division. Other services and products supplied by Metria include consultancy services in surveying and mapping and geographic information techniques. Through Kartcentrum Metria is responsible for the publication of the national map series and other map products, as well as a comprehensive cartographic work on a contract basis. Metria's clients are to be found in both the private sector, such as forestry and telecommunications companies, and in the public sector. Metria has a total staff of approximately 760 and some 40 local offices.
- *Swedesurvey*[84] is a company which markets, coordinates and provides services in land administration and surveying throughout the world, often in the form of institutional cooperation. Swedesurvey has a staff of 30 and an annual turnover of around €11Million. The agency works very closely with NLS and uses primarily their staff for work overseas.

The situation regarding the management of the cadastre is at first sight confusing. In 1996-97, the government decided that any municipality could manage cadastral services for its own area but all the information had to be sent to NLS (Lantmäteriet) i.e. all cadastre information and the cadastre register is maintained by Lantmäteriet. In this way, either the municipality or the state-owned Lantmäteriet (NLS) may deal with properties, parcels and the cadastre, but Lantmäteriet maintains the official register. The cadastre information can then be bought by brokers, banks, and other users. Even the municipalities have to buy "their own" information. It is mainly the larger municipalities that have their own cadastre departments. Before 1996, NLS handled the rural areas in larger municipalities and the urban areas were handled by the municipality itself.

The **Geological Survey of Sweden (SGU)** (www.sgu.se) is a central government authority under the auspices of the Ministry of Industry, Employment and Communications. It deals with issues relating to the country's geological character and the management of its mineral resources. SGU currently employs a staff of 290, most of whom work at the head office in Uppsala; the rest work at the local offices in Gothenburg, Lund, Stockholm, and Malå. SGU holds geologic information on printed maps and descriptions, in databases and reports. Its Kartplan (in Swedish and a catalogue about geographic data from NLS, SGU, SMA, and SMHI) shows which geological information is available and there is also a printed catalogue for other SGU publications. Of the €27 Million annual turnover generated by the SGU almost €400,000 is derived from the sale/licensing of GI data products.

The **Swedish Maritime Administration (SMA)** (www.sjofartsverket.se) is a public enterprise within the transport sector. With 95% of Swedish foreign trade being seaborne the importance of the SMA is

[84] www.swedesurvey.se

clear. Although the figures above indicate a relatively large turnover and staff numbers, the Swedish Maritime Administration's primary tasks concern its responsibility for providing infrastructural services in the form of safe and accessible fairways to meet the needs of shipping, and so income from the supply of GI to the Swedish market is likely to be a fraction of these figures. The publication of nautical charts is part of the SMA activities although it is difficult to quantify the impact on the GI market. SMA is currently engaged upon a programme of digitizing all hardcopy nautical charts. The target is to convert all charts, with 80% available as ENC (electronic navigation chart) by the end of 2003. SMA have recently begun production of a new product – The living nautical chart which is a consumer orientated product targeted at sport and leisure users. Income from this is reported to be almost €200,00 in 2002.

Teleadress (www.teleadress.se) is a leading information aggregator, processor and provider of contact information regarding companies and private individuals in Sweden. It has a database of over 4.5 million records containing the name, address, phone number, sex and age of all Swedish inhabitants over 16 years living in households with fixed line phone subscriptions. Teleadress also keeps data about all legal entities in Sweden – in total 825,000 companies, organisations and authorities. It holds details of the name, address, phone number, turnover, number of employees and type of industry. Teleadress has over 95 categories of Points of Interest – these are geo-referenced places of interest for visitors to use, such as all pharmacies, bakeries and banks. As well as the geographical positions for each address in Sweden Teleadress has two types of maps, at detailed level for all Swedish communities and at overview level of the rest of the country. Their main customer is Eniro (www.eniro.se) which is the producer of the Swedish Yellow pages (www.gulasidorna.se).

In July 2000, **Trimble Navigation** (www.trimble.com/) acquired the Spectra Precision business, formerly owned by ThermoElectron Corp. Spectra Precision, which provides positioning solutions for construction, surveying and agriculture, was acquired for about US$214 million (about $365 million) in cash and about $136 million in seller debt. Spectra Precision was itself the result of a series of mergers and acquisitions in the European market, mainly led by Geotronics, which is famous for its Geodimeter product, the forerunner of today's total station. It also acquired the surveying instrument arm of Zeiss Optics. Trimble employs over 300 staff at their Danderyd site (formerly Spectra Precision and before that Geotronics and AGA).

SMHI, the **Swedish Meteorological and Hydrological Institute**, (www.smhi.se) operates under the auspices of the Swedish Ministry of the Environment and uses its meteorological, hydrological and oceanographic expertise to promote efficiency, safety and a better environment in various areas of society. Vast quantities of data are gathered around the clock from land-based weather stations, balloons, ships, buoys, aircraft, weather radar, satellites and lightning localisation systems. SMHI's products are designed to meet the needs of customers in various sectors but are used mainly in the Central, Local Government and Environmental sectors. Its main products are general weather forecasts, customised forecasts, analyses, surveys, statistics, expert opinions and reports, climate studies and research.

The **SNRA (Swedish National Road Administration)** (www.vv.se) is the national authority assigned the overall responsibility for the entire road transport system. The SNRA is also responsible for drawing up and applying road transport regulations. In addition, the SNRA is responsible for the planning, construction, operation and maintenance of the state roads. The SNRA is responsible for building the state-owned roads, which represents 20% (100 000 km) of all roads in Sweden. The other ones are built and maintained by municipalities (50 000 km) or are private ones (>350 000 km). Among the private ones the forest companies own >200,000 km. SNRA is responsible for building and maintaining the Swedish Road Database (www.vv.se/nvdb), in co-operation with municipalities, the National Land Survey and Forest Industry, through their organisation SkogForsk (www.skogforsk.se). The maintenance cost for this roads database is €3.5 million. Other GI based products supplied by SNRA are traffic information and traffic information services, such as www.trafiken.nu (real-time traffic information in Stockholm, Gothenburg, and Malmö). They also provide traffic information though radio broadcasting i.e. RDS-TMC (radio message system -traffic message channel).

Other key players in Sweden include local representatives of **TeleAtlas** and **Navtech,** particularly for data supply.

Switzerland

Player	Type	Sectors	Products	Turnover	Staff
Swisstopo - Federal Office of Topography	Government Dept.	CG, LG, Uti, Tra, Env, Ret, Tel	VECTOR25 / VECTOR200 SwissNames Ortho aerial photos SWISSIMAGE DHM25 (25m) / DTM-AV and DOM-AV GG25	€21.1 Mill (2002)	265 (2002)
Bundesamt für Statistik	Government Dept.	CG, LG, Uti, Tra, Env, Ret, Tel	STATWEB GEOSTAT		500 (Estimated average 2003)
ESRI Geoinformatik AG (HQ Redlands, USA)	PLC	CG, LG, Edu	ArcGIS		16 (2003)
Intergraph (Schweiz) AG (HQ Huntsville, USA)	PLC	CG, LG, Uti, Edu, Prop	GeoMedia GeosPro	€3.6 Mill	20
C-plan AG	PLC	Uti, LG, CG	TOPOBASE	€9.1 Mill	62 (29 in Germany)
GEOCOM Informatik AG	PLC	CG, LG, Uti, Edu, Prop	GEONIS ArcGIS ArcSDE with Oracle	€7.8 Mill (2002)	40 (2002)
Endoxon AG	PLC	CG, LG, Uti, Tra, Env, Ret, Tel	DOM10 Flytastic teleatlas, navtech geopost, active consumer ASP Geodata Server Endoxon mobidick.ch MapInfo ESRI ER MApper		50
NIS AG	PLC	Uti, LG, CG	Stromfachschale		
Swissphoto	PLC	CG, LG, Uti, Tel, Prop	Aerial photos 3D city models LIDAR , DEMs Land Surveys Engineering Surveys	€13.0 Mill (2002)	140 (2003)
Leica Geosystems		Prop, CG, LG, Def, Edu, Tra, Uti, Tel, Ret		€415 Mill	2370 (worldwide)
ITV Geomatik AG	PLC	CG, LG, Uti, Tra, Env, Prop	Consultancy Project management		6

The Swiss National GI Association is **Schweizerische Organisation für Geo-Information (SOGI)** (http://www.sogi.ch/) founded in 1994. It is an umbrella organisation for both public and private institutions concerned with the promotion and handling of geo-information. SOGI have identified the following organisations as being "key players" in Switzerland:

Swisstopo (www.swisstopo.ch*)* is the National Mapping Organisation in Switzerland, also known as *Bundesamt für Landestopographie,* the Federal Office for Topography. This is a government agency and is responsible for geodetic reference networks, geodetic and cadastral surveying, topographic mapping and spatial data for GIS in Switzerland. It is responsible for establishing the national geodetic and levelling networks, permanent GPS stations and positioning services, for producing aerial photographs, national maps at scales of 1:25k and smaller, interactive map applications, as well as digital cartographic and topographic databases. The Federal Directorate of Cadastral Surveying was integrated with Swisstopo in 1999, and overall tasks now include standards, co-ordination and overall control of cadastral surveying carried out by the Swiss Cantons. Furthermore, the Federal Office of Topography has been nominated to co-ordinate all GIS activities within the Swiss Federal Administration (www.cosig.ch). The Office also provides third parties with services in geodesy, engineering and high-precision measurements, aerial photography, photogrammetry, cartography and reproduction[85].

[85] EuroGeographics list of members

The Bundesamt für Statistik (www.bfs.admin.ch) or the Federal Office of Statistics, offers the possibility to order vector and raster data, images, and photos "on-line", although in reality this appears at present to be an on-line ordering service. The main GI service offered by the Swiss Federal Office of Statistics is called GEOSTAT. The system dates back to 1987 when it was introduced to replace the "informationraster" system of managing land use data. GEOSTAT attempts to promote a co-ordinated collection and compilation of spatial data throughout Switzerland at a standard scale of 1:25k or a basic unit of 1 Ha. In a principle echoed by INSPIRE "this should avoid as far as possible parallel and inefficient efforts for data collection and administration, both within and outside the federal administration"[86].

INTERGRAPH (Switzerland) AG (www.intergraph.com/ch) was formed in 1985 and is based in Zurich with a staff of 20. It has a customer list of over 700 covering a wide range of sectors, especially in central and local government, the utilities, education and construction sectors.

The **c-plan®** (www.c-plan.com) group of companies develops, markets and distributes both standard and bespoke solutions for GI in all sectors. With a staff of 62 (around half of these are in the German office) it claims to be one of the biggest GI solution providers in Central Europe. It was the first Swiss company to become a member of the OpenGIS Consortium committee and bases its applications and products around its TOPOBASE™ product which combines the ORACLE 9i Spatial Extension database with Autodesk software. c-plan Group is very much technology driven with 33% of its staff working in development, 41% in support and project processing, 15% in marketing/sales, and the remainder in administration. Its main partners are ORACLE, Autodesk (>500 municipalities in Germany, Austria, Switzerland use Autodesk products) and **Mensch & Maschine AG** which holds a 20% share of the c-plan® AG share capital. Mensch & Maschine AG is the principal German CAD supplier and fifth largest German software company (turnover >€143 Million in 2002). As one of the leading suppliers of CAD solutions in Europe, with offices in 12 countries, it provides a valuable distribution network for c-plan® TOPOBASE™ products.

GEOCOM Informatik AG (www.geocom.ch) was founded in 1995 and claims to be the leading GIS company in Switzerland[87]. An ESRI reseller, it was the ESRI 2001 Business Partner of the year. GEOCOM Informatik has developed, in an alliance with Leica-Geosystems AG, a hybrid network information system called GEONIS which consists of a core application and various modular components. GEONIS is built on the basic technology of ArcGIS but can integrate a number of ESRI modules depending on the application requirements e.g. data capturing based on ArcInfo/ArcEditor, an analysis module based on Arc View, and an internet module based on Arc IMS. The product is aimed mainly at the utility market, cadastral surveying, network information systems for communities, and services for engineering companies. Applications for gas, electricity, water, wastewater, and telecommunications are predefined.

Endoxon AG (www.endoxon.ch) is a company formed in 1988 under the earlier name of Symplan Map AG which established itself as "the leading Swiss supplier of geo data and geo marketing services"[88]. Already specializing in cartography and information technology Symplan Map implemented a number of highly successful internet solutions before merging with Endoxon AG in March 2001. Following the merger the business has developed a more international dimension. The company focuses on three main GI products/services:

- Data - topographic maps, aerial photos, road navigation data, satellite imagery, road maps, and detailed town and city plans;
- Analogue Maps (paper, DVD CD-ROM) - map products are based on satellite pictures, orthophotos, current town and city plans and specific customer information;
- Web based applications

Examples of customers include The Swiss Postal Service, Hallwag, McDonald's, Miele, SHELL, Swisscom Mobile (*Thematic Maps*); Credit Suisse, Die Post, Eurotax AG, Pirelli Tyre, Renault Suisse SA (*GIS implementation*); Cablecom, Swiss Online, Credit Suisse, Zürich Online, City of Luzern (*GIS Web Solutions and WAP Solutions).* The company website was unique amongst those visited as part of this survey of key GI players within Europe in having a webcam - showing a spectacular view over the city of Luzern! Within the mobile services sector Endoxon has developed Mobidick, which is a

[86] Swiss Statistics Services: GEOSTAT
[87] ESRI Website
[88] Endoxon Home Page, Company Information

mobile portal with a variety of services in the fields of MMS, SMS and WAP provided via all 3 Swiss mobile phone network operators.

NIS AG (www.nis.ch) is authorised distributor and business partner for GE Network Solutions and is a company formed through the partnership of seven regional energy supply companies. The companies joined together to form NIS AG with the principle of realising synergies and long term benefits for its joint owners, and other clients, by developing Network Information Systems. NIS AG has developed an electricity and cadastral application called Stromfachschale and also has specialist packages for telecom, water, gas, sewerage and grid gas network applications.

Swissphoto Group AG (http://www.swissphotogroup.ch) contains within its structure Swissphoto AG, Grünenfelder und Partner AG, BSF Luftbild GmbH, LandStudio Sp. z o.o. The history of Swissphoto AG goes back to the 1930 when it was founded as a subsidiary of Swissair, the national airline. In 1997 there was a management buyout and the company was split off from Swissair under the name of Swissphoto Vermessung AG. It worked closely with survey company Grünenfelder und Partner AG and the two companies joined together in 2000 to form the Swissphoto Group AG specializing in aerial photography, land surveying, and related products/services. In Oct 2000 the German company BSF Luftbild became a full member of the Swissphoto Group and in order to strengthen the presence in Eastern Europe, particularly on the fast growing Polish market, Swissphoto Group AG entered into a partnership with LandStudio Sp. z o.o.
The core business of the group is GI and it provides a number of products and services that reflect its aerial photography, photogrammetry and surveying roots. In 1995 Swissphoto embarked upon a project to cover the whole of Switzerland seamlessly by digital orthophoto. Since then Swissphoto has strongly broadened its specialisation in digital photogrammetry and derived products such as DEMs or digital data for GIS. Another example of the work of Swissphoto is laser scanning technology (LiDAR) for capturing terrain elevation data. The company is currently responsible for the largest LiDAR project in Switzerland to produce a countrywide DEM/DSM. Cartography is another core area for Swissphoto which produces many city and locality maps and base data for interactive CD-ROMs. Further product examples are 3D city models, used to create virtual reality models. Other products and services include aerial photography, engineering surveys, land surveying and charting. Another specialist division of Swissphoto deals with consultancy, both in land management - mainly abroad in transition and emerging countries – and in GI and engineering. Swissphoto engineers are involved with monitoring and maintaining dimensional control of the world's largest railway project – the 57Km St Gotthard Tunnel[89]. Customers mainly include municipalities, utilities, telecoms and government administrations, who in many cases have employed Swissphoto to implement GIS to utilize their data.

Leica Geosystems (http://www.leica-geosystems.com/) is a truly global "key player" in GI, describing itself as a "surveying and geomatics technology group". It is no exaggeration to call Leica Geosystems a pioneer of the surveying world; with a history going back 80 years embellished by numerous developments that have shaped the course taken by surveying, photogrammetry and GPS. Renowned names that many surveyors have grown up with, such as Kern Aarau and Wild Heerbrugg are among the companies which have become part of what is today Leica Geosystems. In June 2001, Leica Geosystems also added ERDAS and LH Systems, one of the market leaders in remote sensing, photogrammetry and GIS, to the group. It has its headquarters in Heerbrugg, Switzerland, and further research, development and production facilities in Unterentfelden, Switzerland, in America (Atlanta, Grand Rapids, San Diego, San Ramon) and in Asia (Singapore). With a turnover of 642 million Swiss Francs (approximately €415 Million) and an overall staff of 2,370, it has sales and service units in twenty countries and representatives in more than a hundred other countries.

ESRI Geoinformatik AG (www.esri-suisse.ch) is the official ESRI distributor for Switzerland serving 550 companies which collectively have nearly 2,000 licensed ESRI products in Switzerland. Customers include the federal administration, cantonal administrations, municipal authorities, private companies, schools and universities.

ITV Geomatik AG (www.itv.ch) is an independent Swiss consulting and IT company, which includes Swissphoto AG as one of the shareholder partners. It is involved with GIS consultancy and project management in Switzerland and other countries.

[89] Swissphoto: from aerial survey to geomatics, Surveying World, Vol8 2000

Turkey

Player	Type	Sectors	Products	Turnover	Staff
Ministry of Defence, General Commander of Mapping	Gov Dept				
Directorate General of Land Registry and Cadastre	Gov Dept				
General Directorate of Rural Services (GDRS)	Gov Dept				
Chamber of Surveying and Cadastre Engineers					
State Institute of Statistics (SIS)	Gov Dept				
ISLEM Geographic Information Systems Engineering and Education Ltd (ISLEM GIS)	PLC	Env, Def, Agr, LG	Geographic Database of Turkey ESRI GIS ERDAS Leica Landsat Quickbird	€1.45 Mill (2002)	100 (2002)
Graftek A.S.	Private Company	CG, LG, Prop	EGHAS Trimble MUTOH	€83k	17
BORAT DIGITAL MAPPING SYSTEMS	Private Company		GeoCAD, GeoGIS, GeoKENT, GeoMUHTAR GeoİMAR GeoPC		
Spaceturk	Private Company		Satellite imagery - IKONOS, SPOT		

EuroGeographics lists the **Ministry of Defence, General Commander of Mapping** (www.hgk.mil.tr) as the Turkish National Mapping Organisation (its website's opening sequence deserves mention – it is one of the most eye-catching/amusing of this report)

Cadastre and Land Registration activities in Turkey are the responsibility of the **Directorate General of Land Registry and Cadastre** (www.tkgm.gov.tr) which has a history going back 150 years. It comprises 13 departments supplying the main services and a regional structure which comprises 15 Regional Directorates, 1001 District Land Registry Directorships, and 313 Cadastral Directorships under the supervision of Regional Directorates.

The **General Directorate of Rural Services (GDRS)** (www.khgm.gov.tr) is a government department that brings together the work previously performed by TOPRAKSU (General Directorate of Soil and Irrigation Works), YSE (General Directorate of Rural Road, Potable Water and Electricity Affairs) and TOPRAK ISKAN (General Directorate for Land and Settlement). It provides "agricultural services and social infrastructure to rural areas in line with those original guiding principles of the Republic"[90] which are very much focused on the agricultural background of Turkish society. Traditionally, the national economy has been heavily dependent upon agriculture, and rural areas have been greatly in need of investments relating to sustainable agricultural production and to social infrastructure and education. Within the GDRS the Soil and Water Resources National Information Centre has a mission to meet Turkey's need for basic geospatial data, "ensuring access to and advancing the application of these data, and other related information about GDRS for users worldwide"[91]. The centre aims to produce basic cartographic and geographic spatial data of the country, acquire, process, archive, manage, and disseminate the related data of the Turkey, and improve the understanding and application of geospatial data and technology. The Soil and Water Resources National Information Centre is currently developing a National Soil and Water Information System which is intended to form the foundation for an eventual Turkish Land Information System. This project, of great significance for Turkey, commenced in 1999 with a pilot study for the Ankara province. The compilation of the first

[90] About GDRS
[91] Soil and Water Resources Centre

national soil map in digital format will be one of the first tasks for this project, as well as the establishment of a national infrastructure for distributing the information amongst the GDRS managers and scientists.

The Turkish **Chamber of Surveying and Cadastre Engineers** (TMMOB-Harita ve Kadastro Mühendisleri Odasi) (www.hkmo.org.tr) has about 9,000 members from the private as well as the public sector, half of them having a license. The Chamber has an HQ and ten regional branch offices.

The **State Institute of Statistics (SIS)** (www.die.gov.tr) is a technical and scientific institute which produces publications related to social, economic, and cultural subjects. The SIS has become a user of GIS for mapping, analysing and presenting statistical data. Data is grouped into: social statistics (population, demography, education, culture, sports, tourism), statistics of agriculture and industry, labour force, household income and expenditure, price statistics, national accounts, environmental statistics, and trade statistics. The SIS established a remote sensing division in 1992 and due to the importance of agriculture sector in the economy it has embarked upon a "Crop Yield Predictions by Remote Sensing Project". The significance of the SIS within Turkey as a key player is increasing as it is now beginning to provide users with data on-line. For more on GIS at the SIS and a general comment on GIS in Turkey see www.die.gov.tr/PROJECTS/GIS/

In the private sector **ISLEM Geographic Information Systems and Engineering LTD (ISLEM GIS)** (www.islem.com.tr) was established as a private engineering consulting company in 1991, developing out of the ISLEM Group of Companies which had been established since 1984. ISLEM GIS provides nationwide socio-economical and physical resource management services with Remote Sensing and GIS technologies. The main sectors served are environment, defence, forestry, agriculture, earth sciences, planning, water resource management, municipalities, AM/FM, and spatial statistics. It provides a range of GI products and services including consultancy, data (especially RS imagery), image processing, spatial analysis, data management, turnkey GIS implementation (especially ESRI and ERDAS products), and training.

Also in the private sector are **GRAFTEK Inc** and **BORAT Digital Mapping Systems.** Graftek Inc (www.graftek.com) is a leading supplier of mainly surveying, mining, and construction GI products and services, especially data acquisition and processing software and hardware products such as total stations and GPS receivers. With Government and the construction sector its main customers Graftek Inc has supplied equipment recently to the Turkish cadastre and Turkish coal. Its EGHAS surveying software has been used since 1988 in Turkey and worldwide.

United Kingdom

Player	Type	Sectors	Products	Turnover	Staff
Ordnance Survey	Gov Agency	CG,LG,Uti,Tel, Ret,Edu,Def,Env Fin,Tra	OS MasterMap™, Land-Line®, Superplan Data®, Superplan® plots, Siteplan Data™ Aerial Photos, Landplan® OS Street View™, 1:10k Raster, 1:25k Raster 1:50k Raster, 1:50k Gazetteer, 1:250k Raster, Strategi®, Meridian	€154 Mill (2002-03)	1746 (2002-03)
Ordnance Survey Northern Ireland	Gov Agency	CG, LG, Util, Tra, Env, Ret, Fin	COMPAS POINTER Large Scale Digital Data 50K Vector 10K Vector Soil DTM Boundaries Paper Maps	€3.6 (2001-02)	178 (2001-02)
Improvement & Development Agency for local government	Company limited by guarantee wholly owned by L Gov	LG, Prop, CG, Env, Con	NLPG NLIS NLUD NSG	€42.3 Mill (2001-02)	250
Landmark	Company	CG, LG, Env, Ret, Prop, Util	Envirocheck Sitecheck Promap Historical Maps	€29.7 (2002)	145 (2003)
Getmapping	PLC	Con/LG/CG	Millenium Map NEXTMap Britain (reseller)	€4.87m (2002)	60 (2002)
GeoInformation Group	Company	CG, LG, Env, Ret, Prop, Util	Cities Revealed Counties Revealed Countries Revealed		20 (2003)
Multi Media Mapping Ltd	PLC	CG, LG, Util, Tra, Env, Ret	multimap.com		
BTex Ltd	PLC	Conl, Tra, Ret,	streetmap.co.uk		
BKS Surveys Ltd	Wholly owned by Amalgamated Metal Corporation PLC	CG, LG, Env, Ret, Prop, Util			125 (2003)
Infoterra	PLC	CG, LG, Env, Ret, Prop, Util	TerraSAR Orthoview MAPS Global Seeps QuickBird		

The National GI Association for the United Kingdom is the **Association for Geographic Information (AGI)** (www.agi.org.uk). Its objective is "to maximise the use of GI for the benefit of the citizen, good governance and commerce". The AGI has a strong membership, supported by 21 of the UK GI "key players" acting as financial sponsors, and pursues its aims through lobbying, a web site, publications, and specialist meetings and seminars. These are all supported by an annual conference and trade exhibition. There are a number of special interest groups (including a European one) that provide services of specific relevance to users in various sectors as well as branches of the organisation in Scotland, Wales & Northern Ireland.

The UK is a complicated administrative unit made up of the three nations; England, Scotland and Wales, and the province of Northern Ireland. The responsibility for GI policy is currently shared between a number of key entities: the e-envoy (http://www.e-envoy.gov.uk), part of the Cabinet Office takes the lead regarding e-government policies, while Her Majesty's Stationary Office (HMSO) (http://www.hmso.gov.uk) is responsible for regulating the management of Crown copyright. The Office of the Deputy Prime Minister (ODPM) is mainly responsible for local government, regional development, and planning while the Scottish Executive and the National Assembly fulfil similar roles in Scotland and Wales respectively. The Chief Executive of Ordnance Survey is the official adviser to

the Government on GI although in a recent review the responsibility for this role was broadened out to include other parties.

Ordnance Survey (OS) (www.ordnancesurvey.gov.uk) is the National Mapping Organisation for Great Britain providing the underpinning reference framework and infrastructure for Great Britain. It is an internationally recognised market leader in its field, being the first National Mapping Organisation in the world to complete a programme of national large-scale electronic mapping in 1995, and since then remaining at the forefront of e-business innovation and use of new technology. Its product range is broad, from traditional walking maps and road maps to the large-scale maps and digital products that now account for the largest part of its business. Indeed electronic data now accounts for approximately 80% of OS's annual turnover. Unlike most of its international peers OS is a UK government agency, tasked with covering its operating costs through revenue from GI products and services. In April 1999 OS became a Trading Fund, giving it more financial and operational independence. Work that could not be justified on purely commercial grounds but which is still "in the national interest" is funded by the Government within a National Interest Mapping Services Agreement (NIMSA). Although its latest financial figures indicate that OS is operating at a loss (€3.1 Mill in 2002/03 on turnover of €154 Million) this follows two years of very high investment costs (€50.2 Million and €42.4 Million) in new technology and the creation of the first layers of its object based large scale OS MasterMap™ product. One other recent innovation worthy of mention is the pan-Government Agreement that allows over 500 government departments the ability to share and use OS data (in a similar way to which the 400+ GB Local Authorities are already able to do).

Ordnance Survey of Northern Ireland (OSNI) (http://www.osni.gov.uk) the National Mapping Organisation for the province, has very similar aims to those of OS (GB) i.e. to maintain a topographical archive to the required standards of currency and completeness, and to meet the needs of customers for GI from this archive. OSNI is in the process of development of a common national infrastructure (NIGIS) for sharing spatial information among a wide range of private-and public-sector organisations. The Northern Ireland Geographic Information System (NIGIS) is a multi-partner initiative to develop a common infrastructure to improve radically the accessibility and usefulness of GI held by government departments and public utilities. The common basis of the system is the OSNI topographic database to which all other spatial data are to be referenced. Government policy aimed at delivering more services electronically has recently been introduced so methods of access to OSNI data, and using OSNI data, may be extended. A metadata service is also available to highlight datasets that are 'fit for purpose'.

For historical reasons there is no cadastre in the UK as there is in the rest of Europe; all national large scale mapping being done by OS and its Northern Ireland counterpart OSNI. Combined with their range of products and services, their lead role in innovation, and their share of the GI market, the influence these organisations wield makes them very much "key players" in the UK, and to some extent beyond.

The Improvement and Development Agency (IDeA) (www.idea.gov.uk) is the successor to the Local Government Management Board and was established in April 1999 as a not for profit organisation wholly owned by local government. Its mission is "to support self-sustaining improvement from within local government"[92]. Its particular significance in the supply of GI products and services is the part it plays with the delivery of e-Government services and a series of national GI projects collectively known as the "N"s. These projects are managed by Information House, which has the trade name **Local Government Information House (LGIH)** (www.idea-infoage.gov.uk) and which is a wholly owned subsidiary of the IDeA. The "N" projects are:

- National Land and Property Gazetteer (NLPG) A British Standard, part of BS7666, the NLPG enables local authority data to be consistently referenced, enabling it to be identified, retrieved and integrated with other data;
- National Land Information Service (NLIS) The NLIS initiative is initially aimed at providing a service to the conveyancing community in order to speed up and simplify the process of buying or selling property. Searches can be carried out via the internet using the NLPG. Online access to large scale Ordnance Survey digital mapping is also provided, along with the ability to define the property boundary on the map, which can then be submitted with search requests where required. The conveyancer is able to retrieve ownership information from the HM Land Registry (HMLR), and local land charges information from all local authorities as well

[92] http://www.idea.gov.uk/aboutus/

as searching for other information such as mining information from the Coal Authority - all relating specifically to the property identified;

- National Land Use Database (NLUD) A project involving a partnership between four organisations; Office of the Deputy Prime Minister, English Partnerships, Improvement & Development Agency (representing the interests of local authorities) and Ordnance Survey NLUD aims to develop a definitive map of land use within the UK;
- Local Authorities Secure Electoral Register The Local Authorities Secure Electoral Register (LASER) project provides electoral registers that are joined-up, maintained and managed locally, which can then be accessible on a national level to authorised users. Any profit made from the sale of the register will be passed back to local authorities as recognition of the effort involved in collecting the information;
- National Street Gazetteer (NSG) Designed to be an unambiguous referencing system with which to identify any length of *street* in Great Britain, and conforming to BS7666, the National Street Gazetteer is made available through a partnership between Ordnance Survey and Local Authorities.

Property Intelligence PLC (part of the U.S. **CoStar Group**[93]) (www.focusnet.co.uk) & **Intelligent Addressing Ltd** (www.nlpg.org.uk/wwwia) are integral "key players" for GI within the Local Authorities. Property Intelligence PLC is a specialist provider of property information and data management services while its subsidiary, Intelligent Addressing Ltd, is managing the creation of the NLPG on behalf of LGIH and is helping individual Local Authorities match their data to the NLPG and create Local Land & Property Gazetteers. Property Intelligence is also responsible for the "FOCUS" online services which are a source of reference for the commercial property sector.

Getmapping Plc (www2.getmapping.com/) supplies national coverage of aerial photography and terrain information. The company rose to national prominence when the Queen became an investor, taking a 1.5% stake before it was launched in 2000. After floating at the top of the dotcom market, the shares touched a high of 237.5p but at the time of writing this report they were trading at 10.25p on the London Stock Exchange[94]. Getmapping specialises in "all aspects of 2D and 3D aerial photography from creation to application. For business, education, and the home"[95] Its mission statement is "to create and maintain up to date map accurate aerial photography of the whole country and make it available to existing and new markets at affordable prices." Established in June 2001 the company previously traded under the names of Getmapping.com plc, Millennium Mapping Company Plc and before that Blenford Ltd. Although it reported sales of €4.87million in 2002 it also suffered overall pre-tax losses of €4.03million[96]. Its main product is The Millennium Map™. This is the name given to what is eventually intended to be a complete and seamless high definition aerial photograph of the United Kingdom at a nominal scale of 1:10,000. Coverage is now complete for all England and Wales, with 27 cities flown at high resolution (10cm). Although Northern Ireland is not due to be flown Getmapping have been awarded a contract by Ordnance Survey to fly most of Scotland at 25cm resolution. Sales of the Millenium Map have been boosted by internet sales which have risen by over 70% in 2002. On 18th June 2003 the legal dispute with Ordnance Survey was resolved with Getmapping paying an out of court settlement and becoming an Ordnance Survey partner in the creation of the OS MasterMap imagery layer.

Multi Media Mapping Limited (www.multimap.com) operates multimap.com which it claims to be Europe's most popular mapping web site – "Multimap is Europe's leading provider of mapping and location-based services. Our company delivers more online maps, point-to-point driving directions and geo-spatial ("where's my nearest?") searches to businesses and consumers than any other supplier in Europe". Key features include street-level maps of the United Kingdom, Europe, and the US; road maps of the world; door-to-door travel directions; aerial photographs; and local information. Multimap also provides a range of complementary services through its partners. These include entertainment, hotel, holiday-cottage, restaurant and train-ticket booking services, SMS weather alerts and the ability to buy both historic and aerial photograph prints. Since its launch in 1996, multimap.com has become the number one online directory in the UK[97], and one of the 10 most-visited sites in the UK overall. In 2003 the public web site regularly delivers more than 80 million page views and received more than 5.5 million unique users per month. Traffic continues to grow on average by 10% per month[98].

[93] CoStar Press Release Jan 2003
[94] http://www.moneyextra.com/stocks/LSE/GMP
[95] http://www1.getmapping.com/home.asp
[96] http://www1.getmapping.com/media/pdfs/GetmappingComplete.pdf
[97] *Top UK Directories*, Jupiter MMXI, January 2001
[98] http://www.multimap.com/static/about1.htm

Multimap.com has also won the World Communications Award for "Best Internet Service 2002" and the Web User (UK) Award for the "Most Innovative Use of the Web 2003". Multimap.com provides mapping services to more than 650 business web sites across many industries and countries. It offers a range of location-based services to businesses: mapping, proximity searching, routing, aerial images, local information, and weather - from simple maps to advanced site locators. Their services are available in most countries, and work in most languages. All services are available on WAP, PDA, kiosk and iTV platforms, and as web services (XML)[99] In May 2000 Multi Media Mapping Limited was granted a patent covering internet mapping technology. The European patent EP0845124B, entitled "Computer System for Identifying Local Resources and Method Therefor," relates to Multimap.com's technology for displaying both an image of a map and information data relating to at least one place of interest on the map to an end user.

BTex Ltd uses Bartholomew and Ordnance Survey map data to provide streetmap.co.uk, the web site which in November 2002 was voted 4th best UK web site by Practical Internet magazine[100] in their poll of 100 top sites. The magazine says: 'This site is so useful that even the ads are relevant to the area you are searching for. For example, if you were looking for a road in Leeds, it would come up with a list of cheap hotels or properties for sale in the locality.'

BKS (www.bks.co.uk/), traditionally an aerial survey company, is now a world player in the supply of GI products and services. Based in the town of Coleraine, in Northern Ireland, the company has expanded and developed into "UK's largest independent digital mapping company offering that one-stop solution"[101]. BKS has successfully completed projects in over 40 countries on 4 continents and continues to operate world-wide today.

Owned by the Daily Mail and General Trust, **Landmark Information Group** (www.landmarkinfo.co.uk) claims to be "the UK's leading supplier of digital mapping, property and environmental risk information"[102]. In the early 1990's Landmark Information Group, in partnership with Ordnance Survey, embarked upon an ambitious programme of scanning the entire OS archive of historic mapping; the collection of paper historical maps at both 1:10,560/1:10,000 scale and County Series 1:2,500 scales as well as 1:1,250 and 1:500 town plans were systematically scanned, involving over half a million paper records. Historical maps can now be supplied by Landmark, centred on any site or property, and combined with a range of environmental data. Areas can be reproduced on CD-ROM, with the GB national grid used to provide a common link between the old and current mapping. This database and others, including data from The Environment Agency, The Scottish Environment Protection Agency, British Geological Survey, English Nature, and the Centre for Ecology & Hydrology combine to give Landmark, and its partner companies a wealth of large scale current and historic digital maps and digital environmental data.

The **GeoInformation Group** (www.crworld.co.uk) is one of Europe's leading providers of high-resolution aerial photography and satellite imagery products and services. These include Cities Revealed, Counties Revealed, Countries Revealed, along with a range of value added data such as 3D building data, land use and historical images. It owns a large, mainly city focused archive, of 25cm or greater resolution, ortho-rectified imagery of cities and counties across the UK, Continental Europe, Asia and Africa.

Launched in January 2001, by the integration of 'Earth Observation Services' department of Astrium GmbH, Germany and the National Remote Sensing Centre Ltd. (NRSC) UK, **Infoterra** (www.infoterra-global.com) is now a 100% owned subsidiary of EADS Astrium, Europe's leading space company. With over 20 years experience in commercial Earth Observation Infoterra aims to become a world leader in the provision of next generation GI products and services. Located over three sites in the UK and Germany, Infoterra has a 160-strong team of highly skilled staff with experts in a range of fields from oil and gas exploration to cartography and telecommunications. In the UK Infoterra operates the UK-PAF (United Kingdom Processing and Archiving Facility), one of four European Space Agency off-line facilities for processing, archiving and distributing data from the European ERS satellite system. Infoterra is investing heavily in innovative research, development and product generation with a number of projects and products. It is currently driving the requirements of a new generation of radar satellites, TerraSAR, which would enable total-information solutions worldwide. Infoterra has the advantage of being independent of any particular source of data; distributes output from all major

[99] Multimap is the pre-loaded mapping application on Palm PDAs (UK), and is the resident map service of BT Multiphone and Consignia's *Your Guide* kiosks.
[100] http://www.paragon.co.uk/pressrelease20.html
[101] BKS website
[102] Landmark Information Website

Earth-observation satellite systems; maintains archive of colour aerial photography of the UK which can be provided as a digital orthophoto product called Orthoview. A series of GI products are intended to provide 'off-the-shelf' solutions for key applications. These products include MAPS, a 'Map Accurate Photographic Survey' of the UK using 1:10000 colour aerial photography; Global Seeps, a product for the oil exploration industry, providing seepage and related information for early basin evaluation and Hot Property, an airborne thermal survey product for the detection of relative heat-loss from the urban environment. In addition, Geostore.com offers easy access to thousands of Infoterra's mapping products via an on line geo-information product catalogue. Infoterra has recently become a distributor for QuickBird data from Digital Globe. QuickBird 2 was launched in 2001 and currently provides the most detailed satellite imagery with up to 0.6 metre spatial resolution for black and white images and 2.4m resolution for visible and near infrared multi-spectral data.

United States based **Intermap Technologies Inc** (www.intermaptechnologies.com) is in the business of "creating and licensing accurate digital descriptions of the surface of the earth"[103]. It is building an inventory of Digital Elevation Model (DEMs) and Orthorectified Radar Image (ORRIs) map products to populate Intermap's GLOBAL Terrain DEM database. Using Intermap proprietary software, and ISO 9001 processes, Intermap has become "the world's leading commercial supplier of DEMs, ORRIs and other map products derived from Interferometric Synthetic Aperture Radar (IFSAR) technology"[104]. Intermap is in the process of capturing complete national IFSAR coverage of the United States, Japan, and countries in Western Europe. Within GB this has been brought to market via the NEXTMap product which is claimed to be the most current, accurate and affordable digital elevation model and image data of England, Wales and Scotland.

As elsewhere in this report, for example in France and Germany, the GI market is very well developed and there are a multitude of important players. Other key GI players in the United Kingdom include the AA, Autodesk, A-Z, Bartholomews, Bentley, Cadcorp, Defence Geographic & Imagery Intelligence Agency, eSPATIAL, ESRI, GEPS Smallworld, HMLR, Hopewiser, Infotech, Intergraph, Land Registers of Northern Ireland, LaserScan, Lovell Johns, MapInfo, Navtech, NJUG, ODPM**,** ONS, Richards Gray Services Ltd, RICS, RoS, The Environment Agency, The Hydrographic Office, Simmons, Sitescope, Survey Supplies, TeleAtlas, and TENET. Some of these organisations are described in brief elsewhere in this report under the country in which their HQ is based or under the pan-European and Global players section.

[103] Intermap President's message - Intermap Website
[104] Intermap President's message - Intermap Website

Pan-European[105] and global players

The bulk of this report has taken the form of a country by country review, with key players listed country by country. If we are to list the most important organisations that influence the supply of GI products and services within a country and across Europe as a whole however, some of the players will be pan-European in nature, and some will be global players, some with HQs outside Europe. The following section looks at a number of these players - and the Europe-wide market for GI. The GI market will be segmented and described according to software, hardware, services, data and policy.

One of the key industry sources for GI market intelligence is Daratech Inc. Daratech is a market research and technology assessment firm that has specialised in CAD/CAM, CAE, EDM/PDM, CIM, plant design/plant management automation, GIS and computer graphics since 1979. Daratech has also covered the GI and GIS market in particular since 1989 with an annual subscription based study entitled GIS Markets and Opportunities. Daratech published a timely press release[106] about the current GI market during the course of this key players study. The data relates to GIS "core-business" which again emphasises the importance of understanding the definition of the market. Unfortunately however, most of the data is global rather than dealing with Europe specifically (many global GI players aggregate Europe, Middle East and Africa as a market), but several trends and issues can be discerned and are very relevant. For example, the market for GIS appears to be growing. According to Daratech's forecast total global GIS core-business revenue for 2003 will grow 8% to €1.6 billion in 2003, compared to a 2.4% growth (to €1.46 billion in core-business revenues) in 2002. Core-business revenue includes software, hardware, services and data products.

Software

According to Daratech, software comprised more than two-thirds (67%) of the GIS pie in 2002, with revenues from GIS software vendors reaching €1.0 billion. Leading the market in software revenues were Environmental Systems Research Institute Inc (ESRI) and Intergraph Corporation. Together, the two companies accounted for nearly half of the industry's total software revenues. This trend appears to correlate with the GINIE key players survey findings although the latter are by no means the result of any rigorous quantitative assessment. Other software leaders in 2002 from the Daratech report included Autodesk, Inc, GE Network Solutions, Leica Geosystems GIS and Mapping Division, MapInfo Corporation, IBM Corporation's GIS Business Unit, and SICAD Geomatics GmbH & Co (mentioned in country sections of the key players report). To keep these data in perspective one must bear in mind the comments made in the assumptions section of this report regarding the definition of the GI market.

During the course of the GINIE key players survey ESRI were able to provide very helpful information concerning the GI market in Europe[107]. Approximately 25% of ESRI worldwide software revenue comes from Europe (ESRI software revenue mentioned in the Daratech report for 2001 is $340m, which represented about 36% of the total GIS industry). This amount is "net" to ESRI however, so the actual end-user spending would be substantially higher. The European distributors also have an income from services, training and application work. ESRI business partners are very active in Europe and will add substantially to the total GI revenue. ESRI estimates that the total (ESRI) end-user spending in Europe (Western and Eastern) was around €160 Million in 2002. In terms of employment ESRI distributors are responsible for employing around 1000 people in Europe (with another 2,000 in the USA). Although there are only eight ESRI distributors listed in the Trade Directory annexed to this report there are in fact distributors in *all* European countries. They are each locally registered and owned companies i.e. ESRI-UK, ESRI-Sweden, ESRI-Italia, etc. are local companies.

Apart from ESRI the other key player in the software sector that seemed to be mentioned most frequently in the GINIE survey were Autodesk, Bentley, Intergraph, MapInfo, and Smallworld (GE Network Solutions). Autodesk claims to be the world's market leader in CAD, and with Autodesk Map and the Internet GIS Autodesk MapGuide the company claims to have over 2 million users worldwide.

The Daratech report index provides a good list of global "key player" software vendors, although not all of these will have a strong European presence:

[105] The GINIE project has already produced a Survey of National GI Associations in Europe and will publish a report in Sep 2003 which will describe pan European GI bodies.

[106] Daratech Aug 2003 For information contact Sue Churchill, Daratech, Inc. *sue@daratech.com*, *www.daratech.com*.

[107] Information courtesy of Frank Holsmuller, ESRI-Europe and N Nick Chapallaz, ESRI UK

APIC SA
Autodesk
Auto-Trol Technology (Canada) Ltd
Byers Engineering Company
C.H. Guernsey & Co
Cadcorp
ECS (Exploration Computer Services)
Enghouse Systems Limited
ERDAS, LLC d/b/a Leica Geosystems GIS
ESRI (Environmental Systems Research Institute)
GenaWare, Inc
GE Network Solutions
GeoConcept SA
GIRO Inc
Hansen Information Technologies
IBM
Intergraph Corporation
Laser-Scan
Logica Plc
MapInfo Corporation
Mincom, Inc. (USA)
Ness Technologies
PCI Geomatics
Safe Software Inc
SICAD Geomatics GmbH & Co
Syncline, Inc
Techbase International, Ltd
Tekla Corporation
Tele Atlas, Inc
Terra-Mar Resource Information Services, Inc

The following list indicates (global) web-based mapping software vendors:

Apic (http://www.apic-sa.com)
Autodesk (http://www.autodesk.com)
Bentley Systems (http://www.bentley.com)
Byers Engineering Co (http://www.byers.com)
Cadcorp (http://www.cadcorp.co.uk)
CubeWerx (http://www.cubewerx.com)
Earth Resource Mapping (http://www.ermapper.com)
ESRI (http://www.esri.com)
Geodan (http://www.geodan.nl)
GeoMicro (http://www.geomicro.com)
Intergraph (http://www.intergraph.com)
LizardTech (http://www.lizardtech.com)
MapInfo (http://www.mapinfo.com)
MetaMAP (http://www.metamapgis.com)
MicroImages (http://www.microimages.com)
PCI Geomatics (http://www.pcigeomatics.com)
SICAD Geomatics (http://www.sicad.de)
SINTEF (http://www.sintef.no/)
Smallworld (www.gepower.com)
Soft Reality (http://www.softreality.com)
Star Informatic (http://www.star.be/)
Sysdeco GIS (http://www.gis.sysdeco.com/)
IONIC Software (http://www.ionicsoft.com)
Laser-Scan (http://www.lsl.co.uk)

Where does one draw the boundary of the GI software market though? As mentioned in the opening paragraphs of this report the edges of the definition of GI are getting more and more blurred. **Oracle** (http://otn.oracle.com/) is world market leader for databases. Its Oracle9i is nowadays considered to be a "spatial database". No-one in the GINIE survey mentioned Oracle as a key player but its software is becoming more and more common as an element in an "enterprise solution". As database technology develops it is incorporating more and more GI capability to keep up with developers demands – features such a topology management, raster data management, and faster spatial indexing are also helping to push the database software into more and more application areas.

Founded in 1997, and based in Dublin Ireland (but with offices in Washington DC, Chicago, San Diego, the UK and Australia) **eSpatial** (www.espatial.com), has developed a suite of products to integrate the spatial advantages of Oracle into the wider IT infrastructure. It claims to be a world leader in on-line spatial processing systems. eSpatial solutions are already in place with a number of key clients, including several national governments, and significant utility and transport companies including UK Railtrack and the Electricity Supply Board of Ireland. In addition to its obvious close relationship with Oracle, eSpatial has partners that include some of the largest system integrators in the world.

No-one in the survey mentioned **Safe Software Inc** (www.safe.com) either, although since its foundation 10 years ago it is has become the world's leading supplier of spatial data translation software. It provides software solutions that deliver seamless data format translation for organisations that need to access and manipulate GIS and CAD data in multiple data formats. In the medium to longer term there will inevitably be greater interoperability between GI applications in Europe from developments such as OGC, CEN/TEC287, EuroGeographics EuroSpec, and initiatives such as INSPIRE. In the shorter term however many organisations will rely on software such as Safe for data format translation. In our search for the boundaries of GI software we could even mention **Microsoft** – as the geographical element becomes more and more integrated into "standard" office software the GI definition becomes more blurred – it is possible to make simple maps from tabular data in Microsoft Excel for example. You can create simple chloropeth, chart and dot density maps using data organised by country, state or region – is that GI software? Microsoft is getting into the GI product market with software such as AutoRoute (Europe), Streets and Trips (USA), and Map Point - is Microsoft therefore a key player?

Another undoubted key GI player in Europe, and globally, is the **Open GIS Consortium (OGC)** (www.opengis.org). This organisation could also be included under the data, or perhaps even services sections also. OGC is a global organisation "dedicated to promoting consensus development and application of open commercial specifications worldwide". For the GI sector this means facilitating the creation of a set of standards that enable GI data to be shared more easily in an interoperable IT infrastructure. Its principles are therefore central to the long term development of a European SDI. To help accomplish its global mission, OGC has established a not for profit subsidiary, OGC (Europe) Limited (OGCE) to facilitate programs with European Commission Agencies and European members of the OGC. The OGC website lists a number of important activities in Europe that are helping to develop the concept of interoperability, for example:

- OGCE is working with the State Chancellery of Northrhine-Westfalia (NRW) to help develop a pilot project for information dissemination involving the state, a number of city municipalities and their private sector partners;
- OGCE has been instrumental in promoting standards convergence with ISO/TC 211, the de jure standards organisation addressing spatial standards (http://www.statkart.no/isotc211/);
- Since June 2001 OGCE has partnered with EUROGI (the European coordinator of national geo-information associations) and the European Joint Research Centre (JRC) at Ispra, Italy to establish a new framework (GINIE) to overcome barriers to information exploitation.

Hardware

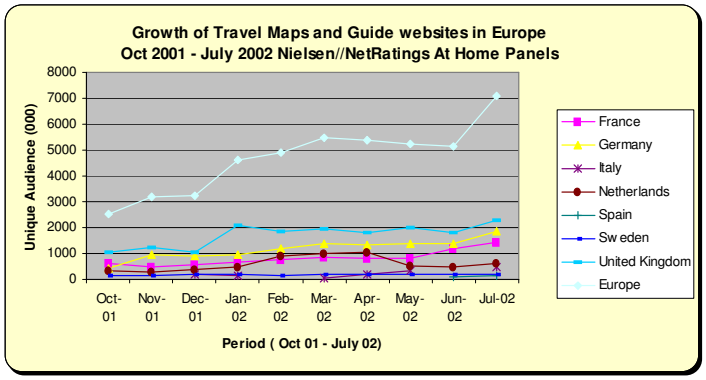
Hardware, a declining component of core-business revenues for many years, again accounted for just 5% of total core-business revenues in 2002, or $88 million according to Daratech[108]. Almost all of this came from Intergraph and IBM, both of which offer bundled hardware/software systems. Worldwide, PC shipments of 33.2 million were up 7.6% year-on-year in the second quarter of 2003 according to IDC's Worldwide Quarterly PC Tracker. This was ahead of projections for 4.1% growth due to the strong response to pricing initiatives in the U.S. and Europe, as well as the limited impact of SARS on demand in Asia. This is the fourth consecutive quarter of positive growth and represents the highest growth rate since the end of 2000. Key players according to worldwide PC sales in early 2003 are Dell (5.9 Million units shipped Q2 2003, 17.8% market), HP (5.3 Million, 16.2%), IBM (2.1 Million, 6.6%), Fujitsu Siemens (1.2 Million, 3.8%) and Toshiba (1.0 Million, 3.1%)[109].

Services

In the Daratech 2003 survey, services were said to be the second-largest component of GIS core-business revenues accounting for 24% of total GIS core-business revenues, or $393 Million - essentially flat from 2001. A feature of recent developments in GI applications has been the growth of on-line services. This is inevitably going to accelerate as more people are connected to the internet and as more services are developed into more markets – for example mobile telecoms.

Recent research[110] from Nielsen//NetRatings, a leading provider of market intelligence on consumer behaviour and trends on the Internet reveals that online map websites in Europe, such as multimap.com and streetmap.co.uk in the UK, mappy.com in France, map24.com in Germany and karthotellet.com in Sweden have experienced a growth of almost 300% in the last 12 months (these organisations are discussed in more detal in the relevant country sections of this report). This makes the online map sector one of the fastest growing Internet sectors in Europe. While 2.5 million users visited an online map site during October 2001, by July 2002 the figure had risen to 7.1 million, with the biggest increase experienced in the summer months of June and July. In France and the UK, a mapping service is the most visited of all online travel sites. Mappy.com in France has a unique audience of 947,000 and multimap.com in the UK has a leading position in the travel sector with a Unique Audience of 1,441,000 people.

[108] Daratech Aug 2003
[109] Source: IDC, July 16, 2003
[110] Nielsen Netratings Press Release, Sep 2002



The online map sites are particularly popular with surfers who use the Internet from their offices: the reach of each site is double for at-work surfers compared to at-home surfers, indicating that online map sites are being used by workers going to meetings or arranging to go out after work.

Nielsen//NetRatings Top Ten UK Travel Sites By Audience Growth, August 2002 at home panel

Rank	Domain	Unique Audience	Audience Reach (%)	Avg Time Spent
	All Travel	5,425, 000	33.3	0:07:35
1	multimap.com	1,441,000	8.8	0:06:59
2	lastminute.com	844,000	5.2	0:10:50
3	expedia.co.uk	751,000	4.6	0:07:24
4	streetmap.co.uk	684,000	4.2	0:07:21
5	easyjet.com	634,000	3.9	0:13:33
6	britishairways.com	519,000	3.2	0:15:47
7	travelselect.com	334,000	2.1	0:03:54
8	teletextholidays.co.uk	323,000	2.0	0:09:31
9	cheapflights.co.uk	242,000	1.5	0:02:57
10	thetrainline.com	355,000	2.2	0:16:43

Tom Ewing, European Analyst at Nielsen//NetRatings says “This is a great example of the Internet making a practical difference in people’s lives. It’s the kind of service that easily gets taken for granted but these sites actually have enormous potential. Whilst at present, the majority of these sites provide their information for free, there is a possibility to generate revenue from them in the future. Map sites could be combined with local information sites and with new Global Positioning System technology and really changing the way we go about organising and arranging our social and business lives. Currently there may be two or three local mapping sites in every market, but there is no key pan-European player as yet – if you’re looking for the ‘new Google’ this sector is an interesting place to start.” These impressive user statistics show why organisations such as Wanadoo (Mappy.com), Netsolut GmbH (Map24.com), and Multi Media Mapping Limited (www.multimap.com) are included in this report of key GI players in Europe and why the on-line services sector appears to be one of the most significant growth areas of the GI market.

Data

While national mapping data needs have been largely catered for by a variety of public and private sector players, pan-European data have been slow to emerge. Road navigation, routing, logistics etc applications that depend upon consistent and up to date road data have stimulated that particular vertical market. The National Mapping Organisations, via their pan-European body EuroGeographics (formerly MEGRIN and CERCO) have produced SABE European boundaries since 1997, and in more recent years have been developing pan-European small scale (1:1Million and 1:250k) data, and metadata services. A number of private sector datasets cover Europe at relatively small scales but initiatives such as EuroGeographics’ EuroSpec and the EC INSPIRE promise to bring about more consistent interoperable data in the coming years. Some of the key players in terms of data are listed in the following paragraphs.

With a permanent HQ based in Paris, **EuroGeographics** (www.eurogeographics.org/) is the Association of the European National Mapping Organisations, with 40 members from 38 countries. Its

mission is to represent the national mapping and cadastral agencies of Europe working for the European geographic information infrastructure. To fulfil its mission it has a permanent HQ staff of 5 who co-ordinate the activities of EuroGeographics members towards a vision "to achieve interoperability of European mapping (and other GI) data within 10 years". The organisation works on a distributed basis, with HQ staff ensuring overall co-ordination while operational activities are performed by its member organisations. EuroGeographics has produced or is in the process of creating the following pan-European geographic datasets:

- SABE – an administrative boundaries dataset on the scale 1: 100 000 and 1:1000 000;
- EuroGlobalMap – a 1:1 million topographic dataset that will be the European contribution to the Global Map project;
- EuroRegionalMap – a 1:250 000 scale topographic dataset.

EuroGlobalMap is intended to become the European contribution to the Global Map project. Global Map, to quote the project website, "is a group of global geographic data sets of known and verified quality, with consistent specifications which will be open to the public. Global Map is considered a common asset of mankind, and will be distributed worldwide at marginal cost. (Rule of International Steering Committee for Global Mapping: Article 3). The Global Mapping concept calls for every nation and all concerned organisations to work together to develop and provide easy and open access to global geographic information at a scale of 1:1,000,000"

Recognising the fundamental need for users to discover information about existing datasets in Europe EuroGeographics has for many years operated the GDDD Map Catalogue. As well as co-ordinating the production of pan-European data and providing a GI metadata service, EuroGeographics provides its members with advice on best practice within the areas of Legal & Commercial Issues / Pricing & Licensing, Quality Management, and Geodesy, via its Expert Groups which are comprised of specialists representing member organisations. Some of the other projects with which EuroGeographics are currently involved include EuroSpec, GISEE, and the R&D forum. Previous European GI projects with which EuroGeographics has been involved, either as leader or partner, include ETEMII (European Territorial Management Information Infrastructure), LaClef (Metadata Information Service), ESMI (Linking Metadata Providers), PETIT (1:250 000 Topographic Databases), and ABDS (Administrative Boundaries Data Service for Central and Eastern European Countries).
In recent times, reflecting changing technological capabilities, EuroGeographics has changed the emphasis of its work from the co-ordination of centralised pan-European databases (such as SABE, or PETIT) towards facilitating the creation of interoperable (distributed) European data. A major plank in this strategy is the EuroSpec work, which in many ways is a practical implementation of the principles being formulated under the INSPIRE initiative.

Although it is not a pan-European dataset the MapBSR data covers a large sub-region of Europe. The purpose of the **MapBSR** project (http://www.mapbsr.nls.fi/) is to provide basic map data sets for the Baltic Sea region in the nominal scale of 1:1Million. The elements included in the database are boundaries, hydrography, transport, settlements, geographical names, elevation and national parks. The MapBSR Project provides the first uniform, reliable map data sets for the Baltic Sea drainage area and the countries within its sphere of influence. The database forms a base map for GIS, in which any kind of data item can be located and represented, as long its coordinates are known. Different kinds of thematic information can therefore be added to the database, such as statistics on population density or data on water quality. The National Mapping Organisations of each of the participating countries have produced the map elements for the areas of their respective countries. These were then combined into one cartographic database by NLS Finland. National databases are prepared to ARC/INFO format as seamless coverages according the Feature, Quality and Data model for the project. Updating will be done at regular basis when the database is ready. The MapBSR project has received funding from the European Union's Interreg II C-program. To some extent the EuroGlobalMap has now taken this product forward. It is being produced also by NLS Finland on behalf of EuroGeographics and extends the 1:1 Million scales mapping across Europe as a whole.

GRID-Arendal (http://www.grida.no/) is an environmental data and information centre operating under the United Nations Environment programme and has produced a range of GIS datasets. Its Baltic Sea Region GIS, Maps and Statistical Database is a result of the Baltic Drainage Basin Project (BDBP). The BDBP was a multi-disciplinary research project under the EU 1991-1994 Environment Research Programme. In the past it has claimed to be "Europe's most popular on-line GIS database for an international trans-boundary region". The organisation claims 1,000 weekly visitors to their Baltic Sea Region GIS site, with 200-300 datasets downloaded in ArcInfo, Idrisi, and MapInfo formats. The dataset includes administrative data to county and in some cases municipality level. It is compiled from

source data at between 1:200k and 1:3million, coming from the ArcWorld (1:3million) CDROM, EpiMap (Internet public domain software and data for public health applications), and a variety of Baltic state agencies (not NMOs).

The private sector provides a growing number of pan-European data providers. **AND** (http://www.and.com/) was founded in 1984 and now has offices in the Netherlands, Germany, UK & US. With a turnover in excess of €34 Million, the company employs over 350 people and is listed on the Amsterdam Exchanges. AND claims to be "the leading provider of location, routing, mapping and address management technologies and intelligence, which power enterprise applications worldwide"[111]. It aims to provide one-stop-shopping concept for online & mobile services, supplying global travel content & context, POI's and address verification tools for e-commerce.

GfK Macon AG (http://www.globalmaps.com/) was founded in 1991 and is now able to offer an extensive archive of worldwide digital maps. In the beginning the company mainly developed postal and administrative maps for Germany, Austria and Switzerland to integrate with their GI software RegioGraph and District. High demand for European and non-European maps encouraged Macon to develop a range of worldwide digital maps. Increased demand for vector maps for countries, economical regions, continents, and also for the whole world has encouraged Macon to extend its range and in recent years some of its digital data have been bundled with Microsoft Office.

In the GIS software vendors sector both ESRI and MapInfo have built up a range of European GI data to support their software applications. For example **ESRI UK** provides a "DataStore" (www.data-store.co.uk) which aims to serve all areas of the international GIS market providing mapping, demographics and remote sensing data. The DataStore has established links with many independent providers of GIS data, for example Bartholomews, Philip's and Lovell Johns. As a result The DataStore holds international datasets from a wide range of different agencies for example, the Ordnance Survey (GB) and the Military Survey for Greece. The DataStore is continually building on its data portfolio, not only UK based but also Pan-European and International. "It is anticipated that a full US portfolio will be introduced over the next 18 months and that a comprehensive set of worldwide datasets will be available by the end of 2002". **MapInfo** (www.mapinfo.co.uk/products/data.cfm) provide a range of GI data products covering individual European countries and pan-European coverage. Much of this is based on partnerships with existing data providers – organisations such as Tele Atlas, Ordnance Survey GB, Bartholomew, and AND. Its 1:300k Cartique™ product for example is based on AND data and is a seamless European database "designed for graphic output, backdrop mapping, and route planning"[112].

The two key players in the European road navigation data sector are Navigation Technologies and Tele Atlas. **Navigation Technologies** (www.navtech.com) is a global GI player with corporate headquarters in Chicago, Illinois, USA. Additionally, there are over 140 field offices in 18 countries. Privately held, Navigation Technologies (often referred to as **NavTech**) was founded in 1985 and currently employs over 1,200 people. NavTech is a leading provider of digital map information and related software and services used in a wide range of navigation, mapping and geographic-related applications, including products and services that provide maps, driving directions, turn-by-turn route guidance, fleet management and tracking and geographic information systems. These products and services are provided to end-users on various platforms, including: self-contained hardware and software systems installed in vehicles; personal computing devices, including personal digital assistants and cell phones; server-based systems, including internet and wireless services; and paper media. According to their website NavTech has built a database,

> "unrivaled in precision by employing the industry's most extensive development and quality control program, executed by one of the largest team of geographers in the world. This detailed map data is captured by over 400 full time professional Navigation Technologies employees, who drive millions of miles / kilometres a year on the roads in North America, Europe and other select countries to provide accurate and ever-expanding detail to our NAVTECH® database."

The NavTech database is maintained on a continuous basis and released to customers/partners 4 times a year on CD/DVD. The product is a fully navigable street database at a nominal scale of 1:10,000 containing the full street network with navigation attribution such as one-ways, turn restrictions, gate restrictions, access restrictions, speed limits, traffic calming, tollbooths, under construction attributes, physical restrictions such as barriers, etc. The NT database also includes address ranges, postal codes, cartographic features and points of interest.

[111] http://www.and.com/

[112] http://www.mapinfo.co.uk/products/mapping.cfm

Tele Atlas[113] (www.teleatlas.com), with its HQ in The Netherlands, is recognised as a European and US markets "key player" in GI products and services. It is a PLC 32.06% owned by Bosch GmbH[114]. With over 16 years experience in the GI market (as Etak, Tele Atlas invented the first car navigation system in 1985) its core business is the provision of detailed geographic databases centred on traffic telematics, vehicle navigation, location based services (LBS) and GIS applications. Its €78.3 Million turnover in 2002 was split into €55.9 Million for navigation products and services and €22.3 Million for LBS/GIS. Tele Atlas views itself "primarily as a facilitator that enables hundreds of business partners to develop high quality applications for their own or commercial use"[115]. Although it reported 10% revenue growth in 2002 it was operating at an overall €19 Million loss. While it enjoyed an operating profit in Europe, mainly due to strong growth in car navigation product sales, it has invested heavily in the USA, creating "the most powerful database ever built"[116] which from Jan 2003 has been able to provide unique nationwide combined traffic information and mapping (via an alliance with Westwood One). In Feb 2003 it released the latest version of its Multinet map database[117]. This seamless digital European dataset extends from Spain or Italy in the south to Scandinavia including Finland in the north, or from the Czech Republic in the east to Ireland in the west. The Feb 2003 release includes, for example, the number of lanes at motorway intersections in several countries, and every house number for seven European countries: Belgium, Denmark, Great Britain, Luxemburg, Norway, Switzerland and The Netherlands. Although its core market has been in vehicle navigation it clearly sees LBS as a potential growth area with recent alliances signed with organisations such as MapInfo and Hutchinson 3G. Although its sales are principally B2B in conjunction with partners it does provide some on-line services such as sales of CDs on its Navshop website. Some of TeleAtlas's key partners are Siemens VDO, Daimler Chrysler, BMW, Blaupunkt, ESRI, Microsoft, Michelin and Ericsson.

Some of the key players already mentioned in the country by country section of this report could also be included as pan-European players. Organisations such as **Maporama** (www.maporama.com) (France) claims to be "the world's leading enterprise location-centric services Application Service Provider (ASP)." While **Webraska** (www.webraska.com) (France) claims to be "the worldwide provider of location-based services and telematics software solutions". Further afield **OMNI Resources** (www.omnimap.com) is a US company that claims to have "The world's largest online map catalog", while **East View Cartographic**, (also US) with offices in Russia and the Ukraine, is a major producer and distributor of international map data that claims to have "the world's largest collection, 150,000 plus sheets in all scales, of Russian produced topographic maps". It offers large and small scale mapping of Europe in national topographic maps and Russian Military Topographic mapping georeferenced to the customer's requirements.

Other organisations providing pan-European GI data products and services include Bartholomews, EUROSTAT, Geodan, Geo Strategies, Intermap, and Lovell Johns.

Policy

The criteria used to define the GI key players within Europe have been, as stated in the introduction, very subjective. The National GI Associations in each country have, in general, indicated who they believe to be the most influential in the supply of GI products and services in their country, and ranked these organisations. These key players have often been dominated by the main data suppliers, often the NMOs, land registries and cadastre agencies, and the major software suppliers and systems developers.

It could be argued however that we should take one step back from this position and look at some of the key players who are driving the GI *policy* within each country and within Europe as a whole[118] - on the basis that it is this which arguably has the main influence over the supply of GI products and services. Within each country the **national government** will decide how its public sector Mapping and Cadastre agencies will gather and disseminate GI data i.e. the IPR, pricing and licensing framework within which these organisations will work. This is driven by political issues, largely dependent on each Government's view of the relative roles of the public and private sectors and how the public sector should be financed. Broadly speaking, it results in a wide range of cost recovery models across

[113] This paragraph is repeated from the section covering the key players of The Netherlands
[114] Tele Atlas Annual Report 2002
[115] Tele Atlas Annual Report 2002
[116] Tele Atlas Press Release Oct 2002
[117] Tele Altas Press Release Feb 2003
[118] See also GINIE Report on GI policies in Europe: http://wwwlmu.jrc.it/ginie/doc/DP_TechRpt_Publish.pdf

Europe, and it would appear that no two countries operate exactly the same model. This then, to begin with is a key influence on the supply of GI products and services. Secondly, within each country, there may or may not be a **national GI policy body**. In Spain and Finland for example, such bodies have recently become established in order to drive national policy and to ensure that developments across the various layers of administration and within the GI market are done in a co-ordinated way. The INSPIRE recommendations also favour such an approach, with each country having a single national authority to act as contact point with the EC and to co-ordinate national GI activities such as data specifications, metadata, standards etc[119]. Industry interest bodies exist already of course in most European countries in the form of the **National GI Associations** but although these are of course influential, they do not have the responsibility of deciding national GI policy.

Moving now to the pan-European level, **The European Commission** is in a position of great influence of course. As the "Government" of Europe they are a key player in promoting legislation and stimulating the development of GI to support EC policy through research funding. There are a number of key players within the EC itself. **COGI** (www.ec-gis.org/cogi) is the interservice committee for geographical information within the Commission. It was created on the initiative of Eurostat and Information Society DG (INFSO). The creation of this group was seen to satisfy the need for a strategic approach and for a better co-ordination and visibility of Commission actions related to GI and GIS. Within the EC it is influential in co-ordinating a unified approach e.g. use of common reference system, metadata, and projection system, while externally it is able to provide input to the wider debate on the development of GI within Europe, particularly via the INSPIRE initiative. As a pan-European data user **EUROSTAT** (europa.eu.int/comm/eurostat) provides an influence on the direction of pan-European data e.g. via its requirements for the EuroGeographics SABE product. The **Joint Research Centre** (www.jrc.cec.eu.int/) is a key player within the EC by the research it conducts and promotes, by the very active role it plays in the development of the European SDI e.g. INSPIRE, GI workshops, and GINIE, and in the use of GI in support of EC policy e.g. MARS crop monitoring to support the CAP. The JRC is the European Union's scientific and technical research laboratory and an integral part of the EC. It is a Directorate General, providing the scientific advice and technical know-how to support EU policies. It is also at the forefront of developing the interoperability of GI data that is necessary for the implementation of the ESDI as envisaged by INSPIRE. Also within the EC there are a number of initiatives being developed by the various Directorate Generals in support of EC policy. Examples of these include the work of DG Environment to stimulate access and sharing of data via INSPIRE, or the work of DG Information Society which is putting a budget of €100 Million into the 5 year eContent programme (2001-05) of research that includes a number of GI based projects, or the €17.5 Billion funded DG Research Framework Programme 6 (2003-08), which again will include GI related projects. The EC is very influential in determining GI development via its legislative impact – through the creation of EU **regulations and directives**. Current examples of these include the proposed Directive on the re-use and commercial exploitation of public sector information (EP-PE_TC1-COD(2002)0123) and the Water Framework Directive. Sometimes the influence is more subtle; in July 2003 the European Commission announced a recommendation to set up guidelines aimed at establishing systems that will provide automatic transfer of location information to emergency centres for both fixed and mobile callers when people phone for emergency services using the pan-European emergency number 112. The share of emergency calls emanating from mobile networks is estimated to be 50% today in the EU and still rising. Although statistics vary widely, conservative estimates indicate that EU-wide, each year over 1 million emergency callers are unable to indicate their location, whilst in several million emergencies valuable time is lost because wrong or inaccurate location information is provided. Moreover, the widespread use of mobile phones also leads to a very high occurrence of multiple calls referring to the same incident. This represents another example of the growth in importance of LBS and the underlying need for the accurate data to support it. Some services are not so critical of data quality but others, such as emergency services, are dependent on accuracy both in a positional sense and perhaps more importantly in terms of being up-to-date. The use of location information in emergency call situations is just one of many examples where the EC is developing policy that involves GI. The Water Framework and PSI Directives have already been mentioned, but we could also include initiatives such as the Galileo positioning constellation, where the European GI sector needs to move swiftly to provide the infrastructure to support the policy.

There are a number of pan-European organisations that have an important role to play in GI and can be considered to be key players. **EuroGeographics** (www.eurogeographics.org/), for example, has already been mentioned under the data section above. It is also a key player in terms of policy however by the role it plays in co-ordinating the activities of the European NMOs and cadastral agencies, in the advisory role it plays to the GI community, and in the lobbying role it has with the EU.

[119] Recommendation 7.1.1 Impementing Structures and Funding Final Position Paper Mar 2003.

A central plank in the EuroGeographics vision to achieve interoperability of European mapping (and other GI) data within 10 years is the EuroSpec project. How this project and INSPIRE are able to develop in parallel will have a major influence on the development of the European SDI. Also at a pan-European level is **EUROGI** (www.eurogi.org). EUROGI is the European Umbrella Organisation for Geographic Information, and was set up in November 1993, as a result of a study commissioned by DG Information Society (formerly DG XIII) of the European Commission to develop a unified European approach to the use of geographic technologies. Its mission is "to maximise the effective use of geographic information for the benefit of the citizen, good governance and commerce in Europe and to represent the views of the geographic information community. EUROGI achieves this by promoting, stimulating, encouraging and supporting the development and use of geographic information and technology". It acts as a key player in Europe by raising awareness of GI and co-ordinating the European activities of National GI Associations.

Other organisations in the GI sector performing a similar pan-European role include the Permanent Committee on Cadastre in the European Union, Euro-Geo Surveys, EuroSDR, WPLA, EARSC, AGILE, and CLGE. Other key players which have a wider geographical scope but which are important in Europe include FIG and ISPRS.

One of the conclusions of the "First Congress on Cadastre in the European Union" held in May 2002 under the auspices of the Programme of Activities of the Spanish Presidency of the EU, was to propose the creation and start-up of the **Permanent Committee on Cadastre in the European Union (PCC)** (www.eurocadastre.org). Its mission is "to create an adequate space in which to promote the full awareness of the activities developed by the European Union and the Member States related with Cadastre and, by means of this information, to develop strategies and propose common initiatives with the aim of achieving greater co-ordination among the different European cadastral systems and their users." In order to achieve its objectives the PCC intends to follow two main objectives. Firstly to constitute a network of information on cadastre to facilitate the exchange of information, expertise and best practices among the members of the Permanent Committee on Cadastre, and secondly to represent a link between cadastral institutions and the key GI related organs of the European Union, and other entities requiring cadastral information to carry out their activities.

Euro-Geo Surveys (www.eurogeosurveys.org) has 22 European members and has a mission to provide a "virtual" European geological survey with a virtual data centre, centre of excellence, and geoscience education network. Much of its work is carried out via expert workgroups and its main tasks in 2003 are mainly concerned with policy areas such as sustainable use of resources, land use and planning, energy studies, soil and groundwater etc. As with the other pan-European key players a principal function is to act as a conduit between the EC and its members – in terms of representing an industry viewpoint and in alerting its members to future developments.

European Spatial Data Research (**EuroSDR**) (www.eurosdr.org) is the name adopted by the former OEEPE. It has 18 member countries, each having two members, one from the data provider – NMO or Cadastre Agency, and one from academia. Its focus is on research, with the main topic areas being data capture, management, integration, and presentation. There is a strong link with EuroGeographics and the two organisations attempt to create synergy between their two sets of activities.

The United Nations Economic Commission for Europe (ECE) was the first international organisation which defined and addressed the issue of land administration in Europe in a comprehensive manner. The Meeting of Officials on Land Administration (MOLA), which preceded WPLA, was set up as an ad-hoc group of experts under the auspices of the ECE Committee on Human Settlements in February 1996. These activities were implemented in response to a high demand from the ECE member states. In 1999, the Economic Commission for Europe granted a standing status to MOLA and transferred it into the **Working Party on Land Administration (WPLA)**. The main focus of its work stems from its twice yearly workshops.

The European Association of Remote Sensing Companies (EARSC) (www.cs.telespazio.it/earsc) is a non-profit-making organisation which is devoted to promoting the European Remote Sensing industry. It is open to any European private company and has members from most European countries.

The Association of Geographic Information Laboratories for Europe (AGILE) (www.agile-online.org) was established in early 1998 to promote academic teaching and research on GIS at the European level and to ensure the continuation of the networking activities that have emerged as a

result of the EGIS Conferences and the European Science Foundation GISDATA Scientific Programmes.

The pan-European organisation known as **CLGE** (www.clge.org) has its name in two of the many European languages English and French, namely, “European Council of Geodetic Surveyors" and "Comité de Liaison des Géomètres Européens"**.** This has arisen because the business of the council is conducted in English, and the language of the European Courts of Justice is French. The accepted abbreviation in all languages is CLGE. It was established at the Fédération Internationale des Géomètres (FIG) Congress in WIESBADEN in 1972 by the then 9 member States of the EEC to consider the implementation of the Treaty of Rome in relation to the profession of geodetic surveying. CLGE represents 22,000 (in 1997) Geodetic Surveyors in 17 States, which includes all 15 Member States of the European Union, and Norway and Switzerland.

The “**Fédération Internationale des Géomètres**” or **International Federation of Surveyors (FIG)** (www.ddl.org/figtree) was founded in 1878 in Paris. It is a federation of national associations and is the only international body that represents all surveying disciplines. It is a UN-recognised non-government organisation (NGO) and its aim is to ensure that the disciplines of surveying and all who practise them meet the needs of the markets and communities that they serve. It realises its aim by promoting the practice of the profession and encouraging the development of professional standards. FIG’s activities are governed by a plan of work which is regularly reviewed against a longer-term strategic plan. The current plan of work focuses on the surveyor’s response to social, economic, technological and environmental change and the particular needs of countries in economic transition. More than 100 countries are represented in FIG by member associations; corporate; and academic members. Its technical work is led by ten commissions:

Commission 1 – Professional Practice
Commission 2 – Professional Education
Commission 3 – Spatial Information Management
Commission 4 – Hydrography
Commission 5 – Positioning and Measurement
Commission 6 – Engineering Surveys
Commission 7 – Cadastre and Land Management
Commission 8 – Spatial Planning and Development
Commission 9 – Valuation and the Management of Real Estate
Commission 10 – Construction Economics and Management

The **International Society for Photogrammetry and Remote Sensing (ISPRS)** (www.isprs.org) is a non-governmental organisation devoted to the development of international cooperation for the advancement of photogrammetry and remote sensing and their applications. The Society operates without any discrimination on grounds of race, religion, nationality, or political philosophy. The official languages are English, French and German. The Society's scientific interests include photogrammetry, remote sensing, spatial information systems and related disciplines, as well as applications in cartography, geodesy, surveying, natural, Earth and engineering sciences, and environmental monitoring and protection.

The **IEEE Geoscience and Remote Sensing Society** (http://www.ieee.org/grss) seeks to advance geoscience and remote sensing science and technology through scientific, technical and educational activities. The Society strives to promote a high level of technical excellence among its members by exchange of information through conferences, meetings, workshops, publications, and through its committees to provide for the needs of its members.

Conclusions

The purpose of this GINIE report has been to gather information on the key GI players in Europe to gain an improved understanding of the GI capacity within each country. A secondary aim was to establish some kind of ranking of these key players in order to establish their relative position in their country and within Europe. As well as providing a listing of the key players, and data about each one, it was hoped that an analysis would be possible to indicate both the breadth of the GI market i.e. the number of sectors, and the depth of penetration within these sectors i.e. the volume of turnover.

The first of these objectives has been achieved, with a country by country listing of the key players, in most cases ranked in order of perceived importance by the National GI Association of the country concerned. As has been highlighted a number of times in this report the listing is not definitive – it is subjective and will inevitably be the subject of debate. It is hoped that the information will provide a valuable resource for members of the GI community and for the decision makers using it in order to help to develop the European GI strategy.

The secondary objectives concerning the breadth and depth of the GI market have been more difficult. Trying to estimate the size and growth of the European data market, for example, is not easy. The findings from the PETIT project, which looked at creating a 1:250k scale pan-European topographic database were partly based upon the GIBASE study[120] and the findings from a number of private sector organisations (Dataquest, Frost & Sullivan, International Data Corporation). The figures are quite out of date now, being based upon the situation in 1996-98, but they indicated a total European GI data market size estimated at the time to be €550 Million with an estimated 50%, i.e. €275 Million, being supplied via National Mapping Organisations. Looking at the figures gathered during this key players study may give us some indication of the size of the market in 2002 but the figures for turnover from National Mapping Organisations, for example, can be difficult to interpret – all have different financing models with some being 100% state funded and others being 100% cost recovery. An estimate has to be made of the income received for GI data products. A further complication is that some receive revenue from cadastre and land registration activities so that their overall income doesn't just reflect data sales (it could be argued that these are GI related services). Taking into account as many of these variables as possible the overall data income from NMOs in 2002 was approximately €390 Million - but there is probably quite a large margin of error in this figure. If we assume that the figures from 1996-98 were approximately correct, it suggests an overall (and plausible) 42% increase in the NMO market over 5-7 years, which would equate to a European GI data market of approximately €780 Million. Totalling the turnover figures for the European key players listed in this report produces a figure approaching €2.5 Billion – including all types of GI products and services (how much of the total European GI market do the 250 or so organisations featured in this report represent however…70%-80%-90%?). This figure is also based on assumptions regarding the split of revenue, in some organisations, from non GI related income (for example EADS). In its review of the GIS market Daratech estimate total worldwide sales of GIS software and related hardware and services now tops €6.5 Billion annually (NB the distinction here between this figure and the one given earlier for GI "core-business"). The key players survey figure of approximately €2.5 Billion correlates with such a figure if we assume that it accounts for most of the market and that the European share of the global figure is around 35%-40%

Other reports suggest a European *content sector* that has a market size of €433 Billion, employing some 4 million Europeans and a value of *public sector information* in the European Union estimated at around €68 Billion[121]. Other informal estimates suggest the integrated spatial services market, which includes 'map services' in many forms and ways is probably in the neighbourhood of €27-35 Billion and growing at about 6% per annum[122].

The results of these estimates need to be treated with caution; they clearly emphasise the importance of establishing a clear definition of what constitutes "GI". The figures from this key players survey seem to be plausible based on the previous GI-Base figures, and the overall market size stated by Daratech, but the general conclusion that must be drawn is that it would be dangerous to put too much weight on these findings and that any serious estimation of the size of the market would need a

[120] The EC launched a study (GI-BASE) in 1996 to attempt to better define the data component for the GI market place, specifically in Europe. The contractors defined the European market for digital geographic information " ***... as the annual value of sales, to end-users, of digital geographic information that is separable and distinct from any system in which it is used***" http://www.ec-gis.org/copygi2000/product/gimarket.html

[121] http://www.sourceuk.net/indexf.html?02656

[122] http://egip.jrc.it/200303/0884.html

separate study to analyse all the possible evidence and to create rigid criteria for definitions of the market.

In terms of GI market sectors the Daratech 2003 report suggests that, "Utilities grew 8% and contributed 51% of total regulated-sector GIS revenues in 2002, while telecommunications companies accounted for 30%. By comparison, transportation accounted for 10%, and education for 8%. Revenues from the public sector - the two major segments being state and local governments, and federal governments—grew by 5% and now account for 30% of total revenue. While federal governments were among the early adopters of GIS technology, recent trends toward devolving more responsibilities to states and localities have spurred those entities to become important consumers of GIS. In 2002, state and local government markets accounted for 67% of total public-sector GIS revenue, while federal governments contributed 33%. The private sector remained flat at 24% of core business. Of the major industry segments within the private sector, earth resources represents the largest opportunity for GIS business, accounting for 43% of total private-sector GIS revenue in 2002. Also notable is the AEC segment, which accounted for 16% of sector revenue. Other significant segments within the private sector include marketing and sales, and cartography"[123]

According to ESRI, whose distributors are active in over 30 vertical markets in Europe, the primary markets are the national, regional and local government sectors which provide about 50% of revenue, utilities are the second largest sector, with education, military, transport, private businesses as runners up. While Location Based Services have been hailed as a significant breakthrough for the wider expansion of GI services there is conflicting evidence over how much impact it will have in financial terms[124]. Increasingly the growth of the GI market is taking place within organisations, and by web users, using GI technology and data without recognising it as the traditional compartmentalised GIS of recent decades. As described in the section above relating to ORACLE or Microsoft, the use of spatial functions and GI data is becoming difficult to separate from "mainstream" IT. Internet and Intranet expansion is having a big impact on the ability of users to access and share GI data.

In summary, who *are* the key players in Europe, how big is the market and what are the main sectors[125]?

At a European level the key players are the EC, some of the pan-European bodies such as EuroGeographics and EUROGI, and some private sector players such as Tele Atlas and NavTech. The list should also include some of the global players such as ESRI, Dell, HP, IBM, Intergraph, Microsoft, OGC, and Oracle.

At a national level the key players will always include the National GI Associations, the National Mapping Organisations, the Cadastre Agencies, and possibly the land registration offices. It may include key government departments, such as statistical offices. There is clearly a trend across Europe for the development of "e-public services" and the growth of such services can have a large impact on the GI sector if the significance of geography in these services is recognised during their implementation. The EC's IDA Programme[126] is set to become the IDAbc (Interoperable Delivery of pan-European eGovernment Services to Public Administrations, Businesses and Citizens) Programme, following a proposal adopted by the European Commission on 9 July. The list should perhaps include national GI policy defining and co-ordinating bodies, but these do not appear to be widespread. In many countries there are very strong regional or municipality influences and while the plethora of SMEs might not have a great impact individually their collective contribution is significant.

The size of the GI market indicated by the survey is in the region of €2.5 Billion, although, as has been stated several times, this is based on assumptions, and is likely to be subject to a large margin of error.

The main user markets are still central and local government, utilities, education, transport and retail – although these again are broad general categories. Although the level of importance one attaches to organisations such as Wanadoo, Netsolut GmbH, and Multi Media Mapping Limited is difficult to assess it is clear from the volume of use that these on-line service providers generate that they represent one of the most significant growth areas of the GI market. A noticeable trend amongst many

[123] Daratech Aug 2003 For information contact Sue Churchill, Daratech, Inc. *sue@daratech.com*, *www.daratech.com*.
[124] http://www.directionsmag.com/article.php?article_id=311
[125] The view here is that of the author - based upon impressions gained over the course of this survey – it is not based on any definitive scientific, technical, or financial criteria.
[126] http://europa.eu.int/ISPO/ida/jsps/index.jsp?fuseAction=home

key players is the degree to which they form partnership amongst themselves to exploit GI opportunities – partnerships for example between key players that are data producers, software providers, and service providers.

Another main point that comes out of the survey is the increasing penetration of GI into applications which don't rely on a traditional GIS implementation, and the increasing integration of spatial components within mainstream everyday IT.

Lastly, the survey represents a snapshot in time – Summer 2003, in what is clearly a fast changing market.

Annex 1 – Glossary

ABGI	Advisory Board for Geographic Information
AGILE	Association of Geographic Information Laboratories for Europe
AM/FM	Automated Mapping / Facilities Management (Systems)
ASP	Application Service Provider
CAD	Computer Aided Design
CAE	Computer Aided Engineering / Common Applications Environment
CAMP	Coastal Management Project (UN)
CAP	Common Agricultural Policy
CERCO	Comité Européen des Responsables de la Cartographie Officielle
CGI	Common Gateway Interface
CLGE	Comité de Liaison des Géomètres Européens
COGI	Interservice Committee for Geographical Information (EC)
CORINE	Coordination of information on the environment
DEM	Digital Elevation Model
DG	Directorate General
DHTML	Dynamic Hypertext Markup Language
DTM	Digital Terrain Model
EARSC	European Association of Remote Sensing Companies
EC	European Commission
ECE	Economic Commission for Europe (UN)
ECW	Enhanced Compressed Wavelet
EMMA	Environmental Measurement Modelling and Assessment
ENVISAT	ENVIronment SATellite
ERS	European Remote Sensing Satellite
ESA	European Space Agency
ESRI	Environmental Systems Research Institute
EU	European Union
EU CAP	European Union Common Agricultural Policy
EUROGI	European Umbrella Organisation for Geographic Information
EUROSDR	European Spatial Data Research
EUSI	European Space Imaging
FAO	Food And Agriculture organisation (UN)
FIG	Fédération Internationale des Géomètres
GCCIS	Geodetic and Cartographic Information System
GDP	Gross Domestic Product
GI	Geographic Information
GINIE	Geographic Information Network in Europe
GIS	Geographic Information System
GISEE	GIS Technology and Market in South East Europe
GISIG	Geographical Information Systems International Group
GITA	Geospatial Information & Technology Association
GLONASS	Global Orbiting Navigation Satellite System
GML	Geography Markup Language
GPS	Global Positioning System
GSDI	Global Spatial Data Infrastructure
GSM	Global System for Mobile Communications
HTML	Hypertext Markup Language
IACS	Integrated Administration and Control System
ICA	International Cartographic Association
ICT	Information and Communication Technologies
IGN	Institut Géographique National
IMTA	International Map Trade Association
INSPIRE	Infrastructure for Spatial Information in Europe
INTERREG	EC initiative to stimulate interregional cooperation in the EU
IRS	Indian Remote Sensing
IRS-LISS	Indian Remote Sensing Linear Imaging Self-Scanning
ISDN	Integrated Services Digital Network
ISO	International Standards Organisation
ISO TC 211	International Standards Organisation Technical Committee 211
ISP	Internet Service Provider
ISPRS	International Society for Photogrammetry and Remote Sensing

IST	Information Society Technologies
IT	Information Technology
iTV	interactive TV
JSP	Java Server Pages
LBS	Location Based Service(s)
LIDAR	LIght Detection And Ranging
LIS	Land Information System
LLR	Lunar Laser Ranging
LPIS	Land Parcel Identification System
MEGRIN	Multipurpose European Ground Related Information Network
MOLA	Meeting of Officials on Land Administration
NMO	National Mapping Organisation
OEEPE	European Organisation for Experimental Photogrammetric Research
OGC	Open GIS Consortium
PDA	Personal Digital Assistant
PDM	Product Data Management
PETIT	Pathfinder Towards the European Topographic Information Template
PHARE	Poland Hungary Aid for Reconstruction of Economy
PLC	Public Limited Company
PLM	Product Lifecycle Management
PSI	Public Sector Information
PSTN	Public Switched Telephone Network
RESURS	Russian low-flying remote sensing satellites
RGE	Référentiel Géographique à grande Echelle
RNIS	Reseau Numerique a Integration de Services
RS	Remote Sensing
RTK	Real Time Kinematics
SABE	Seamless Administrative Boundaries of Europe
SDI	Spatial Data Infrastructure
SLR	Satellite Laser Ranging
SME	Small to Medium sized Enterprise
SRTM	Shuttle Radar Topography Mission
UN	United Nations
UNDP	United Nations Development Programme
URL	Uniform Resource Locator
VB	Visual Basic
VLBI	Very Long Baseline Interferometry
W3C	World Wide Web Consortium
WAP	Wireless Application Protocol
WFD	Water Framework Directive
WPLA	Working Party on Land Administration (UN)
XML	Extensible Markup Language
XSDL	XML Schema Definition Language

Annex 2 – Directory 1: Organisations - alphabetical listing

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Administration du Cadastre et de la Topographie (ACT) - Luxembourg

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email	info@am.lt
www	www.am.lt

Ministry of National Defense, General Command of Mapping - Turkey

Milli Savunma Bakanligi, Harita Genel Komutanligi, TR-06100 Cebeci – Ankara, Turkey

Tel	+90 312 595 2230
Fax	+90 312 320 1495
email	oalp@hgk.mil.tr
www	www.hgk.mil.tr

MoD Mapping Co – Hungary

22 P.O.B 85, H-1276 Budapest, Hungary

Tel	+(36 1) 212-0807
Fax	+(36 1) 212-4223
email	laszlo.buga@mhtehi.gov.hu
www	www.topomap.hu

Multimap.com

150 Holborn, London, EC1N 2NS, UK

Tel	+44 20 7430 5454
Fax	+44 20 7681 2094
email	info@multimap.com
www	http://www.multimap.com

Municipia SA

Taguspark Ed. Ciencia II No11, 3^{d} B 2740-120 Porto Salvo, Portugal

Tel	+351 214 228 200
Fax	+351 214 228 205
email	info@municipia/pt
www	www.municipia.pt

National Forestry Institute - Lithuania

Pramones pr. 11a, LT-3031, Kaunas, Lithuania
Tel +370 37 490222 +370 37 490211
Fax +370 37 490233
email sek@mp.is.lt alfredas@lvmi.lt
www www.lvmi.lt

National Geological Survey - Lithuania

Konarskio g. 35, LT-2600, Vilnius, Lithuania
Tel +370-5-2332889
Fax +370-5-2336156
email lgt@lgt.lt
www www.lgt.lt

National Land Service - Lithuania

Gedimino av. 19, LT-2025, Vilnius, Lithuania
Tel +370 5 2398 438
Fax +370 5 2398 437
email aldonas@zum.lt
www www.zum.lt/nzt

National Land Survey of Finland

Opastinsilta 12 C, P.O.Box 84, 00520 Helsinki, Finland
Tel +358 205 41 5564
Fax +358 205 41 5005
email heli.ursin@maanmittauslaitos.fi
www www.maanmittauslaitos.fi

NedGraphics CAD/GIS B.V.

Ir. D. S. Tuynmanweg 10, 4131 PN Vianen, The Netherlands
Tel +31 347 32 96 00
Fax +31 347 32 96 66
email cadgis.info@nedgraphics.nl
www http://cadgis.nedgraphics.nl

NEMOFORUM

Pod sidlistem 9, CZ – 182 11 Praha 8, Czech Republic
Tel + 420- 284 041 595
Fax + 420- 284 041 428
email nemoforum@cuzk.cz
www www.cuzk.cz/nemoforum

NEOKART GIS Sp. z o.o

ul.Batorego 20, 02-591 WARSZAWA
Tel +48 22 825 98 36
Fax +48 22 825 57 05
email neokartg@gis.com.pl
www www.neokartgis.com.pl

Netmaps SA

Paseo Central 22-37-39 (edif. netmaps), 08228 les Fonts-Barcelona, Spain
Tel +34 93 786 33 44
Fax +34 93 786 35 69
email info@netmaps.es
www http://www.netmaps.es

NETSOLUT GmbH

Düsseldorfer Str. 40a, 65760 Eschborn/Frankfurt am Main, Germany
Tel +49 (6196) 777 56 - 0
Fax +49 (6196) 777 56 -17
email info@netsolut.com
www http://www.netsolut.de

NIRAS

Sortemosevej 2 DK-3450 Allerød, Denmark

Tel	+45 4810 4200
Fax	+45 4810 4300
email	niras@niras.dk
www	http://www.niras.dk

NIS AG

Postfach, 6002 Luzern, Switzerland

Tel	+41 41 249 67 67
Fax	+41 41 249 67 68
email	info@nis.ch
www	www.nis.ch/

Norges geologiske undersøkelse (NGU) (Geological Survey of Norway)

7491 Trondheim, Besøksadresse: Leiv Eirikssons vei 39, Trondheim, Norway

Tel	+47 73 90 40 00
Fax	+47 73 92 16 20
email	ngu@ngu.no
www	www.ngu.no

Norkart Ltd

PO Box 145, Lokketangen 20A, 1300 Sandvika, Norway

Tel	+47-6-755-1400
Fax	+47-6-755-1401
email	norkart@norkart.no
www	http://www.norkart.no/

NORSKOG

Lilleakerveien 31 Postboks 123, Lilleaker0216 Oslo

Tel	+47 22 51 89 00
Fax	+47 22 51 89 10
email	firmapost@norskog.no
www	http://www.norskog.no/

Norwegian Institute of Land Inventory

PO Box 115, N - 1431 AAS, Norway

Tel	+47 64 94 97 00
Fax	+47 64 94 97 86
email	nijos@nijos.no
www	www.nijos.no

Novageo SA

Taguspark Nucleo Central 237, 2780-784 Novageo, Portugal

Tel	+351 21 421 3262
Fax	+351 21 421 2889
email	info@novageo.com
www	www.novageo.pt/

Oficiul National de Cadastru, Geodezie si Cartografie - Romania

202 A, Splaiul Independentei, 1st Floor, Sector 6, Bucharest, Romania

Tel	+40 21 222 2900
Fax	+40 21 222 5224
email	oncgc@itcnet.ro
www	

OMNI Resources

1004 South Mebane Street, P.O. Box 2096, Burlington, NC 27216-2096, USA

Tel	1 336-227-8300
Fax	1 336-227-3748
email	custserv@omnimap.com
www	www.omnimap.com

Open GIS Consortium (Europe) Ltd

Tel	+1 301 320 5760
Fax	+1 301 320 0693
email	lhecht@opengis.org
www	http://www.opengis.org

Ordnance Survey (OS)

Romsey Road, Maybush, Southampton, SO16 4GU, UK

Tel	08456 05 05 05 (general enq' from UK) 44 23 8079 2912 (outside UK)
Fax	023 8079 2615
email	customerservices@ordsvy.co.uk
www	ordnancesurvey.co.uk

Ordnance Survey Ireland (OSi) - Oifig na Suirbheireachta Ordnais

Phoenix Park, Dublin 8, Ireland

Tel	+353 1 8025 333
Fax	+353 1 820 4156
email	bfarrell@osi.ie
www	www.irlgov.ie/osi

Ordnance Survey Northern Ireland (OSNI)

Colby House, Stranmillis Court Malone Lower, BT9 5BJ, Belfast, Northern Ireland

Tel	+44 (0)28 90 255755
Fax	+44 (0)28 90 255700
email	russell.connelly@drdni.gov.uk
www	www.osni.gov.uk

Paradigm Technology Limited

Paradigm House, Dundrum Office Park, Dundrum, Dublin 14, Ireland

Tel	+353 2960155
Fax	+353 2960080
email	info@paradigm.ie
www	http://www.paradigm.ie/index.htm

piLINE Software Development Ltd

Montevideo u. 6., H-1037 Budapest, Hungary

Tel	+36 1 436 7676
Fax	+36 1 436 7699
email	akta@piline.hu
www	www.piline.hu

Planetek

Via Massaua, 12 70123 Bari, Italy

Tel	+39 080 5343750
Fax	+39 080 5340280
email	info@planetek.it
www	www.planetek.it

Polish Geological Institute (PGI)

ul. Rakowiecka 4, 00-975 Warsaw, Poland

Tel	+48 22 849 53 51
Fax	+48 22 849 50 96
email	lmar@pgi.waw.pl
www	www.pgi.waw.pl

Ponts et Chaussées - Luxembourg

38, bvd de la Foire, L-1528 Luxembourg

Tel	+352 45 05 91
Fax	+352 45 32 98
email	dig@pch.etat.lu
www	http://www.pch.etat.lu/

Property Intelligence Plc

15 John Adam Street, WC2N 6LD, LONDON

Tel	+44 (0) 20 7839 7684
Fax	+44 (0) 20 7839 1060
email	sales@focusnet.co.uk
www	www.focusnet.co.uk

Rala: Icelandic Agricultural Research Unit

Keldnaholt, Vesturlandsvegi, 112 Reykjavík, Iceland

Tel	+354- 5771010
Fax	+354- 5771020
email	rala@rala.is
www	www.rala.is

Regio Ltd

Riia 24, 51010 Tartu, Estonia

Tel	+372 7 387 300
Fax	+372 7 387 301
email	regio@regio.ee
www	www.regio.ee

Registers of Scotland

Erskine House, 68 Queen Street, Edinburgh, EH2 4NF, United Kingdom

Tel	+44 (0)1 31 200 3940
Fax	+44 (0)1 31 200 3932
email	customer.services@ros.gov.uk
www	http://www.ros.gov.uk/

Reykjavíkurborg

Ráðhús Reykjavíkur, Tjarnargötu 11, 101 Reykjavík, Iceland

Tel	+345 563 2000
Fax	+345 562 1799
email	vefstjori@rhus.rvk.is
www	www.rvk.is

Samsyn ehf

Haaleitisbraut 58-60, IS-108 Reykavik, Iceland

Tel	+354 553 9500
Fax	+354 553 9503
email	info@samsyn.is
www	www.samsyn.is

Scankort AS

Selsmosevej 2, DK-2630 Taastrup, Denmark

Tel	+45 4399 7722
Fax	+45 4352 2032
email	sk@scankort.dk
www	http://www.scankort.dk

SCOT

Parc Technologique du Canal, 12 Rue Hermès, 31526 Ramonville, France
Tel +33 561 - 39 46 00
Fax +33 561 - 39 46 10
email
www www.scot-sa.com

Slovak Environmental Agency

Tajovského 28, Banská Bystrica, 97590, Slovak Republic
Tel +421 (0)48 4713739
Fax +421 (0)48 4132160
email machkova@sazp.sk
www www.sazp.sk

Slovak Geodetic and Cartographic Institute

Chlumeckeho 4, 827 45 Bratislava, Slovak Republic
Tel +421 (0)2 43427491
Fax +421 (0)2 43427511
email majovska@gku.sk
www www.gku.sk

Slovak Road Administration

Mileticova 19, 82619 Bratislava, Slovak Republic
Tel +421 (0)2 55567975
Fax +421 (0)2 55567976
email jan.sedivy@ssc.sk
www www.ssc.sk/

Slovak Soil Science and Conservation Research Institute (SSCRI)

Gagarinova 10, 827 13, Bratislava, Slovak Republic
Tel +421 (0)2 48 206901
Fax +421 (0)2 43 295487
email bielek@vupu.sk
www www.vupu.sk

Spaceturk

Haymana Yolu 12, Golbasi, Ankara, Turkey
Tel +90 (312) 612 2370
Fax +90 (312) 612 2390
email dtaktak@spaceturk.com.tr
www http://www.spaceturk.com

Spot Image

5 rue des Satellites, BP 4359, F-31030 Toulouse Cedex, Toulouse, France
Tel +33 5 62 19 40 02
Fax +33 5 62 19 40 11
email philippe.munier@spotimage.fr
www www.spotimage.fr

STAR INFORMATIC FRANCE

Le Thelemos, 12, Quai du Commerce, 69009 Lyon, France
Tel +33 4 361 47 41
Fax +33 4 72 53 04 61
email tdt@star.be
www http://www.star.be/

STAR INFORMATIC S.A.

Avenue du Pré Aily, 24 4031 Angleur, Liège, Belgium
Tel +32 4 361 47 75
Fax +32 4 367 17 11
email info@star.be
www www.star.be/index.asp

State Enterprise Centre of Registers - Lithuania

Kudirkos g.18, LT-2600, LT-2600,Vilnius, Lithuania

Tel	+370 5 2688 202
Fax	+270 5 2688 311
email	info@kada.lt
www	www.kada.lt

State Institute of Statistics - Turkey

Tel	
Fax	
email	
www	www.die.gov.tr

Statens Kartverk

Service Box 15, N-3504 Hønefoss, Norway

Tel	+47 32 11 81 37
Fax	+47 32 11 81 01
email	kari.strande@statkart.no
www	http://www.statkart.no

Statens Vegvesen

Grenseveien 92 0033 Oslo, Norway / Postboks 8142 Dep, 0033 Oslo, Norway

Tel	+47 22 07 35 00
Fax	+47 22 07 37 68
email	firmapost@vegvesen.no
www	http://www.vegvesen.no/

Swedish Association of Local Authorities

S-118 82 STOCKHOLM (visiting address: Hornsgatan 20)

Tel	+46 8 452 71 00
Fax	+46 8 641 15 35
email	sk@svekom.se
www	http://www.svekom.se/

Swedish Maritime Administration

S-601 78, Norrköping, Sweden

Tel	+46 –11 19 10 00
Fax	
email	ake.magnusson@sjofartsverket.se
www	http://www.sjofartsverket.se/navigering/htm/frameset.htm

Swedish Meteorological and Hydrological Office

SMHI (head office), SE-601 76, Norrköping, Sweden

Tel	+46 11 495 80 00
Fax	+46 11 495 80 01
email	Registrator@smhi.se
www	www.smhi.se

Swedish National Road Administration (Vägverket)

Vägverket, Röda vägen 1, 781 87 Borlänge, Sweden

Tel	+46 243 75354
Fax	
email	caroline.ottoson@vv.se
www	www.vv.se

Swiss Federal Statistical Office

Espace de l'Europe 10, 2010 Neuchâtel, Switzerland

Tel	+41 (0)32 713 66 91
Fax	+41 (0)32 713 65 60
email	rainer.humbel@bfs.admin.ch
www	www.statistics.admin.ch/

Swissphoto Group AG

Dorfstrasse 53, Postfach CH-8105, Regensdorf-Watt, Switzerland

Tel	+41-1-871 22 22
Fax	+41-1-871 22 00
email	info@swissphoto.ch
www	www.swissphoto.ch/

Sysdeco Technology AS

Trondheimsveien 184, P.O.Box. 6614 – Rodeløkka, 0502 Oslo, Norway

Tel	+47 22 09 65 00
Fax	+47 22 09 65 01
email	support@sysdeco.no
www	http://www.sysdeco.no/sysdeco.asp

TatukGIS Sp. z o.o

Plac Kaszubski 8/105, Gdynia 81-350, Poland

Tel	+48 58 620 9262
Fax	+48 1 530 463 8101
email	info@tatukgis.com
www	www.tatukgis.com

Tele Atlas NV

Reitscheweg 7F, NL-5232 BX 's-Hertogenbosch, The Netherlands

Tel	+31 73 640 21 21
Fax	+31 73 640 21 22
email	info@teleatlas.com
www	www.teleatlas.com

Teleadress

Box 8185,SE 10420 Stockholm, Sweden (visiting address: Fleminggatan 37,SE 11226, Stockholm)

Tel	+ 46 8 692 75 00
Fax	+ 46 8 69275 90
email	info@teleadress.se
www	www.teleadress.se,

Terra Map Server GmbH

Stockholmer Allee 24, 44269 Dortmund, Germany

Tel	+49 231 477 39 60
Fax	+49 231 477 39 89
email	info@terramapserver.com
www	http://www.terramapserver.com

The GeoInformation Group

Telford House, Fulbourn, Cambridge, CB1 5HB, United Kingdom

Tel	+44 (0) 1223 880077
Fax	+44 (0) 1223 880097
email	info@crworld.co.uk
www	http://www.crworld.co.uk/index.htm

T-MAPY spol. s r.o.

Nezvalova 850, CZ - 500 03 Hradec Kralove, Czech Republic

Tel	+420-49-5513335
Fax	+420-49-5513371
email	marketing@tmapy.cz
www	www.tmapy.cz

Topografische Dienst Nederland (TDN)

Bendienplein 5, Postbus 115, 7800 AC Emmen, The Netherlands
Tel +31 (0) 591696200
Fax +31 (0) 591696296
email info@tdn.nl
www http://www.tdn.nl

Trimble

Rinkebyvägen 17 Box 64, S-182 11 Danderyd, SWEDEN
Tel +46 8 622 1000
Fax +46 8 753 2464
email
www http://www.trimble.com/

Trinity College Dublin

GIS Laboratory, Department of Geography, Museum Building, Trinity College, Dublin 2. Ireland
Tel +353 1 608 2359
Fax +353 1 671 3397
email dennistm@tcd.ie
www http://www.tcd.ie/Geography/GIS/index.html

VARINEX Informatics, Inc

Kőszeg u. 4, 1141 Budapest, Hungary
Tel +36 1 273-3400
Fax +36 1 273-3411
email voloncs@varinex.hu
www www.varinex.hu

Vlaamse Landmaatschappij OC GIS-Vlaanderen

O.C. GIS-Vlaanderen, Gulden Vlieslaan 72, 1060 Brussels, Belgium
Tel +32 (0) 2 543 69 08
Fax +32 (0) 2 543 73 95
email geovlaanderen@vlm.be
www web.gisvlaanderen.be

Webraska

22, rue Guynemer - B.P. 107, 78600 Maisons-Laffitte, France
Tel +33 (0)1 39 12 88 00
Fax +33 (0)1 39 12 88 88
email info@webraska.com
www http://www.webraska.com/

WPLA (UN Economic Commission for Europe Working Party on Land Administration)

Mr. Bengt Kjellson **(Chaiman),** Director of Planning, Lantmateriet (National Land Survey)
SE-801 82 Gavle, Sweden
Tel
Fax
email
www www.unece.org/env/hs/wpla/

Z/I IMAGING HELLAS S.A.

Mediterranean Region Center, 24 Fokidos Str, Athens 11526, Greece
Tel +30 1 747257 0
Fax +30 1 747257 9
email
www www.intergraph.com/international/#Greece

Annex 3 – Directory 2: Data Providers

	topgraphic data	property/cadastre/land reg'	road/transport/navigation	land use/cover	hydro/marine/river	environmental	geological/soil	address/post code/gazetteer	aerial photos / satellite imagery	terrain	population/lifestyle/demographics	other
Administration des Eaux et Forêts - Luxembourg				■		■		■	■	■		■
Administration du Cadastre et de la Topographie (ACT) - Luxembourg	■	■										
Administration du cadastre, de l'enregistrement et des domaines	■	■		■				■				■
Alterra	■		■			■			■			
AUREX, s.r.o			■	■		■					■	■
BORAT DIGITAL MAPPING SYSTEMS	■											
Cyprus Department of Geological Survey				■	■	■	■		■			
Cyprus Department of Lands and Surveys	■	■	■		■		■	■	■	■		■
Cyprus Electricity Authority												■
Cyprus Telecommunication Authority												■
Cyprus Statistical Service				■				■			■	
E.O.Map Ltd	■		■		■			■				
EADS-S&DE-ISR-geomatics									■	■		
ErasData-Pro	■		■		■			■	■	■	■	■
ESRI France	■		■					■	■	■	■	■
Estonian Land Board	■	■		■			■		■			
Estonian Map Centre	■								■	■		
EUROSENSE - Slovak Regional Office	■	■	■	■	■	■			■	■		
Federal Office of Topography	■		■	■	■			■	■	■		■
Finnish Environment Institute (SYKE)				■	■	■			■			■
FlexiTon Kft									■	■		
FM-Kartta									■			
Genimap Corporation	■	■	■			■						■
Geodetic and Cartographic Institute Bratislava (GCI)	■	■	■	■	■			■		■		■
Geodetska uprava Republike Slovenije	■	■		■				■	■	■		
Geodis Slovakia Ltd	■		■	■	■	■			■	■		■
Geological Survey of Finland							■					
Geological Survey of Sweden					■		■					■
GeoModel s.r.o.				■						■		
Graftek A.S.					■							
graphIT Ltd			■					■			■	■
Hydromelioracie s.p.					■							■
Improvement & Development Agency for local government (I&DeA)		■	■	■				■			■	
Institut Géographique National – Belgique	■		■	■	■				■	■		■
Institut Géographique National (IGN-France)	■	■	■	■	■			■	■	■		■
Institute of Geodesy, Cartography and Remote Sensing (FÖMI)	■	■		■				■	■			■
ISAX sro		■	■		■				■		■	

	topgraphic data	property/cadastre/land reg'	road/transport/navigation	land use/cover	hydro/marine/river	environmental	geological/soil	address/post code/gazetteer	aerial photos / sa/satellite	terrain	population/lifestyle/demographics	other
Kadaster	■	■						■				■
Lantmäteriet (NLS)	■	■	■	■	■			■	■	■		■
LSV-GBKN	■											
Malta Environment & Planning Authority (MEPA)	■		■	■	■	■	■		■	■	■	■
Military Topographic Directorate (Romania)	■		■	■	■		■		■	■	■	
Ministry of Environment - Lithuania					■	■						
MoD Mapping Co – Hungary	■		■		■				■	■		
National Forestry Institute - Lithuania				■								
National Geological Survey - Lithuania							■					
National Land Service - Lithuania	■								■	■		
National Land Survey of Finland	■	■	■	■					■	■		
Ordnance Survey	■		■		■			■	■	■		■
Regio Ltd	■		■					■	■		■	■
Slovak Environmental Agency	■			■		■			■	■	■	
Slovak Road Administration	■		■									
Spot Image									■			
State Enterprise Centre of Registers - Lithuania		■						■				
Swedish Maritime Administration			■		■							■
Swedish Meteorological and Hydrological Office					■	■						■
Swedish National Road Administration (Vägverket)			■									■
Swiss Federal Statistical Office				■		■	■	■		■	■	■
VARINEX Informatics, Inc	■		■					■		■	■	

Annex 4 – Directory 3: On-line Service Providers

	maps/images	public services for the citizen	environmental	travel/trafic	cadastre/land registration	lifestyle/geodemographics	other
Alterra	■		■				
Belgian Administration du cadastre, de l'enregistrement et des domaines					■		
BORAT DIGITAL MAPPING SYSTEMS		■					
Cyprus Department of Lands and Surveys		■					
Cyprus Telecommunication Authority		■					
Cyprus Statistical Service		■					
ESRI France	■						
Estonian Land Board	■	■	■		■		
Estonian Map Centre	■	■					
EUROSENSE - Slovak Regional Office	■				■		
Federal Office of Topography							■
Finnish Environment Institute (SYKE)			■				
FM-Kartta							■
Genimap Corporation	■			■			
Geodetic and Cartographic Institute Bratislava (GCI)		■			■		■
Geodetska uprava Republike Slovenije	■	■					
Geodis Slovakia Ltd	■	■					
Geological Survey of Finland	■	■	■				
graphIT Ltd		■					
Hydromelioracie s.p.							■
Improvement & Development Agency for local government (I&DeA)		■			■	■	■
Institut Géographique National – Belgique	■						■
Institut Géographique National (IGN-France)							■
Institute of Geodesy, Cartography and Remote Sensing (FÖMI)	■	■			■		■
Intergraph (Schweiz) AG	■	■	■	■	■		
Kadaster					■		
Lantmäteriet (NLS)	■	■			■		■
LSV-GBKN (Landelijk Samenwerkingsverband Grootschalige Basiskaart Nederland)	■						
Malta Environment & Planning Authority (MEPA)	■	■	■	■		■	■
MoD Mapping Co – Hungary	■						■
National Land Survey of Finland	■				■		
NIS AG	■						
Ordnance Survey	■						
Regio Ltd	■	■		■			
Slovak Environmental Agency	■	■	■				
Slovak Road Administration	■	■		■			
Spot Image	■						
Swedish Maritime Administration							■
Swedish National Road Administration (Vägverket)	■						
Swiss Federal Statistical Office	■	■					■
VARINEX Informatics, Inc						■	

Annex 5 – Directory 4: Software Providers

	gis/cad	survey/gps	cartography/design	remote sensing	database	other
Alföld-GIS Information Ltd	■			■	■	■
Alterra						■
AUREX, s.r.o	■					
BORAT DIGITAL MAPPING SYSTEMS	■					
Claritas	■		■		■	
c-plan AG	■	■			■	
EADS-S&DE-ISR-geomatics	■		■	■		
ESRI France	■	■	■	■	■	■
ESRI Hungary Ltd	■	■	■	■	■	■
Estonian Map Centre	■			■		■
Federal Office of Topography		■	■			
FlexiTon Kft	■					
Genimap Corporation						■
GEOCOM Informatik AG	■	■	■		■	
GeoConcept SA	■				■	■
Geodis Slovakia Ltd		■				
GeoModel s.r.o.	■					
Graftek A.S.	■	■	■		■	
graphIT Ltd	■	■	■	■	■	■
HungaroCAD Information Ltd	■	■	■		■	■
Institut Géographique National – Belgique						■
Institute of Geodesy, Cartography and Remote Sensing (FÖMI)	■					
Intergraph (Schweiz) AG	■	■	■	■	■	■
ISAX sro	■					
ISLEM Geographic Information Systems Engineering and Education Ltd (ISLEM GIS)	■	■	■	■	■	■
NIS AG	■				■	
Regio Ltd	■					
Slovak Road Administration	■	■			■	
VARINEX Informatics, Inc	■	■	■	■		■

Annex 6 – Directory 5: Hardware Providers

	computers/peripherals	photogrammetry	telecomms/data comms	survey/gps	other
Alföld-GIS Information Ltd	■			■	
BORAT DIGITAL MAPPING SYSTEMS	■				
CadMap Ltd	■				
Cyprus Department of Information Technology Services	■				
Cyprus Telecommunication Authority			■		
ErasData-Pro	■			■	
ESRI Hungary Ltd	■			■	
FlexiTon Kft	■				
GEOCOM Informatik AG	■				
Geodis Slovakia Ltd		■		■	
Graftek A.S.	■		■	■	
graphIT Ltd	■	■			
HungaroCAD Information Ltd	■			■	■
Intergraph (Schweiz) AG		■			
ISAX sro	■				
ISLEM Geographic Information Systems Engineering and Education Ltd (ISLEM GIS)	■	■	■	■	■
VARINEX Informatics, Inc	■				

Annex 7 – Directory 6: Other Service Providers

	training/recruitment	consultancy/project management	data capture/services	printing/reproduction	web-map authoring	survey/gps	audit/quality	procurement	systems implementation	publications	other
Administration du cadastre, de l'enregistrement et des domaines						■				■	
Alföld-GIS Information Ltd	■	■	■	■	■	■		■	■	■	
AUREX, s.r.o		■		■						■	
BORAT DIGITAL MAPPING SYSTEMS	■	■	■	■	■		■		■	■	■
CadMap Ltd	■	■	■	■					■		
c-plan AG	■	■								■	
Cyprus Department of Information Technology Services		■							■		
Cyprus Department of Lands and Surveys	■		■	■		■					
Cyprus Statistical Service										■	
EADS-S&DE-ISR-geomatics	■	■							■		
E.O.Map Ltd	■	■	■	■		■			■		
ErasData-Pro	■	■	■			■			■		
ESRI France	■	■	■		■		■		■	■	■
ESRI Hungary Ltd	■	■	■		■			■	■	■	
Estonian Land Board			■	■							
Estonian Map Centre			■	■							
EUROSENSE - Slovak Regional Office		■		■		■					
Federal Office of Topography		■				■					■
Finnish Environment Institute (SYKE)		■									
FlexiTon Kft	■	■	■						■		
FM-Kartta			■			■					
Genimap Corporation		■	■	■	■						
GEOCOM Informatik AG	■	■	■		■				■		
Geodetic and Cartographic Institute Bratislava (GCI)			■	■	■	■				■	■
Geodetska uprava Republike Slovenije						■				■	
Geodis Slovakia Ltd	■	■	■	■							
Graftek A.S.	■					■			■		
graphIT Ltd	■	■	■		■		■		■	■	
HungaroCAD Information Ltd	■	■	■	■	■	■		■	■	■	
Hydromelioracie s.p.		■	■	■	■						
Improvement & Development Agency for local government (I&DeA)	■	■	■				■	■			■
Institut Géographique National – Belgique		■	■	■		■	■				■
Institut Géographique National (IGN-France)											
Intergraph (Schweiz) AG	■	■	■	■	■				■		
ISAX sro	■		■	■							
ISLEM Geographic Information Systems Engineering and Education Ltd (ISLEM GIS)	■	■									
Kadaster		■									
Malta Environment & Planning Authority (MEPA)	■		■	■	■	■	■	■	■	■	
Military Topographic Directorate (Romania)			■	■		■					

	training/recruitment	consultancy/project management	data capture/services	printing/reproduction	web-map authoring	survey/gps	audit/quality	procurement	systems implementation	publications	other
NIS AG	■	■	■	■	■		■	■	■		
Regio Ltd	■	■	■	■	■				■		
Slovak Environmental Agency	■	■	■	■	■	■		■		■	
Spot Image	■	■	■	■							
Swiss Federal Statistical Office		■					■				
VARINEX Informatics, Inc	■	■	■	■	■				■	■	

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