Final Report

on the work carried out for
Contract Code GI-POLICY 10338:

Study on Policy Issues Relating to Geographic Information in Europe

within the framework of
the IMPACT program of the
EUROPEAN COMMUNITY

Harald Meixner
Andrew U. Frank

June 1997

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Study on Policy Issues Relating to Geographic Information in Europe

Final Report - February 1997

EXECUTIVE SUMMARY

Introduction

This study identifies and clarifies "issues relating to data policy which are specific to geographic information" and gives recommendations to increase awareness and for the resolution of some of the issues. It is mostly based and reports on a large number of contacts with knowledgeable individuals influencing the development of the GI market and on structured interviews with a number of key decision-makers.

Geographic information is information, which "can be related to a location (defined in terms of point, area or volume) on the Earth, particularly information on natural phenomena, cultural and human resources" [GIS Dictionary 1991]. The commission has identified the following list of issues to be studied for a general European information policy:

- Privacy,
- Copyright and Protection of Databases,
- Data Quality,
- Liability,
- Security of Data,
- Data Access Policy,
- Minimum EU-wide Geographic Information Base Data,
- Public Domain Data.

Performance of the Study

The study reviewed systematically the issues in a broad context using desk research. It then gathered information to get an appraisal of the situation in Europe with respect to GI. The issues for a GI policy were systematically identified. In a series of interviews with key decision-makers their assessment of the issues was explored in open ended discussions. They were specifically asked to rank the issues. These opinion leaders were also asked to identify major barriers to the GI business and to assess some proposed fields of policy action.

The team is led by Andrew U. Frank and advised by a steering committee consisting of Peter Burrough, Massimo Craglia, Ian Masser and David Rhind. The contract is administrated by Dr. Harald Meixner.

Major Findings

Copyright and Protection of Databases

The protection for geographic data by the copyright rules in most European countries is limited, due to lack of originality. The new EU directive on legal protection of databases is assumed to apply for geographic information. Its translation into national laws and its application by the courts will show if this protection is appropriate and sufficient.

Data Quality

Standardised methods to describe and measure data quality are crucial to develop a market in geographic information. Buyers of data must assess the fitness of datasets offered for their application.

Data quality is one of the primary methods for data providers to differentiate the products they deduce from their data and justify higher prices for higher quality data.

Data Access Policy

Availability of data is one of the most important limitations in the EU geographic information market (and the major difference to the situation in the USA). Data are collected, but access to the data is difficult:

Lack of mandate: Many of the data collectors, in particular the local authorities, have no mandate to make the data available to others (independent of pricing). Public accounting rules are often a disincentive to efforts to sell data. Only the NMA of UK, Netherlands and France have a mandate for

'cost recovery'. There is no organisation with a mandate to collect geographic data at the European level.

Bureaucratic procedures in different countries vary and it is often difficult to gain information of what is available. The exact details of licences for use of geographic information vary and make it difficult to assemble and sell pan-European datasets (also due to differences in national copyright rules).

Emerging issues

The other issues are considered less important today, probably due to the current immaturity of the GI market, but it is pointed out that they will increase in importance for the GI business over the next years. Specific for geographic data are:

Privacy

One of the particular issues of the GIS technology is that it enables data integration to an extent previously not possible, which opens up new business opportunities but also dangers, such as invasion of privacy. Postal addresses provide a widely used key to data about individuals. Spatial processing of these data may circumvent privacy protection rules. Methods to protect privacy better and hinder analytical use of the data less, should be developed. Certain information about the location of some features, e.g. bird breeding places, should be kept secret, even if they are not associated with persons.

Minimum EU-Wide Geographic Information Base Data

The respondents were divided on the question if a business case for a minimum EU-wide geographic information base can be made. Several key decision-makers pointed out that the EU is the major user of pan-European data and harmonised approach by the EU could advance the GI market greatly.

Standardisation, in Particular Spatial Reference Systems

There is a European need for easy-to-follow procedures to integrate national data into an European framework. This applies not only to the co-ordinate based geodetic reference systems (exists in form of the little known EUREF datum), but also to non-coordinate based systems (e.g., postcode, statistical enumeration areas, political subdivisions).

Barriers to the Development of the GI markets

The key decision-makers considered the lack of awareness clearly as the most important major barrier to the development of the GI markets. The lack of awareness is mostly among the politicians and key decision-makers at the European, national, regional and local level.

Two observations are noteworthy:

- Technical issues are not considered as major obstacle, and
- The Southern European leaders point to the lack of a critical mass of geographic data and users.

Ranking of Priorities for the Commission

The assessment of three potentially important issues for action by the commission resulted in broad variation in the answers from the key decision-makers. Developing a European Access Policy for GI was ranked highest, but was considered very difficult, due to the many cultural, legal, social and economic barriers. The development of a European-wide Reference Framework ranked second. The lack of internal co-ordination within the EU, as the major consumer of pan-European geographic information was criticised by the key decision-makers. They assume the market could be developed to satisfy the needs of the commission, if co-ordinated. The issue of Metadata standards and services was perceived as of lesser importance, partly because many already work on this front.

Summary

In general **the situation regarding geographic data in Europe varies enormously.** The differences between the countries, within countries and among application areas are very large. There is a noticeable difference between Northern and Central/Southern European countries.

The list of topics assembled by DG XIII covers the issues well. As a general observation, most of the rules for information policy in general apply also to geographic information. Additionally, access and use of GI by the public, standardisation and reference systems and promotion for GI must be considered.

The key decision-makers ranked **Copyright, Data Quality and Access to Geographic Data** highest. Leaders from Northern Europe stressed copyright more, whereas the respondents from Southern and Central Europe ranked Data Access Policy highest.

Recommendations

- The most important efforts must increase awareness for GI among politicians and administrative leaders at the EU-, national, regional and local level. Convincing benefits and concrete solutions of the perceived problems must be found and widely publicised. Focused GI awareness days at the national levels and preferably carried out in the national languages should concentrate on the legal, administrative and economic aspects; technical problems seem not to be an impediment.
- The development of an Access Policy is one of the most important tasks that the EC should undertake, as only the Commission has the opportunity to stimulate and coordinate national policies. Given the significant variations that exist at present, there is a need for the EC to stimulate the debate at the national levels and develop comparative profiles of the existing conditions in the 15 EU member countries similar to the EUROGI study on copyright. Further, efforts to publicise and promote 'best business practice' to demonstrate how the administrative and legal impediments for a GI market can be overcome would contribute to a more immediate improvement of data access.
- The co-ordination of the EU internal use of geographic data is urgently needed and will likely advance the GI market.
- The differences in the national copyright and IPR regimes were studied by EUROGI and policies must be developed to promote an uniform implementation of the Database Directive into the national legislation. The process under way with the Green Paper on Copyright should be continued and it must be verified that the particular features of GI are covered.
- Support the development of the GI market in the poorer regions through support for data sharing arrangements, improvement of data quality and modernising public administration to build a critical mass of geographic data and GI users.
- In the existing efforts to address the needs of a general European Information Policy, especially the issues of copyright and Intellectual Property Rights, the special requirements of Geographic Information should be considered.

INTRODUCTION

Objectives of the Study

The object of the 'Study on Policy issues relating to Geographic Information in Europe' is to "identify and clarify issues relating to data policy which are specific to geographic information. The study examines data policy to determine the special elements that specifically relate to geographic information. For each issue, a statement will be developed summarising the current situation in regard to geographic information" [Request for Proposal on GI Policy Study]. The study had also to collect and analyse the opinions of key decision-makers in the field.

Contents and Structure of the Final Report

The final report consists of

- an executive summary,
- a list of issues and
- their current status in the EU,
- a ranking of the issues, and
- detailed recommendations for improving awareness in general and
- how to resolve particular issues at the EU level.

The report starts in this section with the Terms of Reference and the method and background to the study. Section 3 discusses what is special about spatial information. Section 4 identifies the issues and section 5 assesses briefly the current situation in Europe and compares it with the USA. Section 6 describes the policy issues in detail. The following section ranks the issues based on interviews with key decision-makers and what these see as the major barriers to the GI business. The last section gives the proposed recommendations.

The separate Report of Interviews with Key Decision-Makers in Europe, detailing the findings from the interviews is Annex A. A report on the performance of the study, with a list of the contacts made is found in Annex B.

Research Method

The study applied methods of desk research, questionnaires and interviews in its different phases. Interviews with key decision makers to elicit their views became the major part of the study. The results of the study are an interpretation of the opinions collected from key persons in this field. The issues encountered and the opinions found are here represented, but do not necessarily coincide with the opinion of any of the members of the steering committee or the team.

Identify Issues

In the initial phase of analysing the issues, academic style desk research was conducted. It appeared necessary to identity the special character of GI to allow the concentration on points where GI policy must differ from information policy in general. It should review the issues initially identified by the Commission to check if other important issues had to be added. A systematic, analytical review of GI uses and users and producers considered their interests and possible conflicts as source of issues which could require policy actions.

Status of the Issues

Desk research and a questionnaire were used to make an assessment of the current situation. Information was collected from knowledgeable sources in most EU countries.

Interviews with Key Decision-Makers

The study called for a collection of the opinions of the key decision-makers. A representative group of individuals were established by the steering committee. It was attempted to achieve regional balance within the EU, but also to collect the opinions of the different types of organisations implied in the GI field. Besides some representatives of NMAs from different parts of the EU, EU-wide organisations related to GI and active within the EU were contacted to get an assessment of their position, national

organisations responsible for co-ordinating GI matters, and companies active in the national or European GI market. It was not intended to create a statistically valid sample - other studies by DG XIII were tasked do such - but to gain a valid overview of the current thinking of the key individuals who influence the field, which is possible only by a careful selection of the individuals contacted. Care was taken to achieve an equitable balance between EU countries, producers and consumers, public and private sector etc.

In December 1996, 20 interviews with senior representatives of key organisations responsible for the collection, supply or use of geographic information were conducted by Peter Burrough, Massimo Craglia, Ian Masser and David Rhind. An additional 5 decision-makers were interviewed by Andrew Frank. These interviews followed a structured set of open ended questions. Interviewees were sent the questionnaires a couple of weeks before the interviews so that they had a proper time to reflect on the issues being explored.

The detailed results of these interviews are reported in Annex A. This report draws heavily on this material, especially for the ranking and the recommendations.

Background to Study

In August 1995, the European Commission's DGXIII invited tenders for three studies within the framework of its GI2000 initiative: GI-BASE, GI-META, and GI-POLICY.

- GI-BASE is concerned with an assessment of the current market for geographic information in Europe, and has to survey existing data sources and services.
- GI-META is concerned with the feasibility of providing European geographic information metadata services by reviewing existing local, national and international metadata services.
- The aim of the GI-POLICY study is to examine issues relating to data policies to determine if there are special elements which relate to geographic information.

Definition of 'Geographic Information' used here

Geographic information is information, which "can be related to a location (defined in terms of point, area or volume) on the Earth, particularly information on natural phenomena, cultural and human resources. The position data can be a specific set of spatial co-ordinates, or it can cover less precise locations or areas, such as addresses, postal codes or administrative boundaries, regions or even whole countries" [GI2000 1995].

Geographic information provides an answer to a human question. It is as various as there are ways to understand the world and the things in it. Geographic information can describe the objects of the physical reality, it can describe man-made objects, administrative and legal units, aspects of human culture, economics etc. It describes relevant aspects of these objects in space, their position, their form and attributes describing the objects. Most geographic information also includes a time dimension.

Geographic Information in the Information Age

"Information is becoming a major world commodity in its own right. It is a major contribution to increase competitiveness, make economies grow, create new jobs and improve the quality of life" [Request for Proposal on GIPolicy Study]. The transition from the industrial to the information age, which became possible with the development of technical means to process data separated from the physical support used to represent the information, has profound effects on our social situation.

Geographic information is just one kind of information, describing spatial situations in the world: where is what ? Geographic information has been distributed mostly in the form of descriptive texts and beautiful hand drawn maps. Today it has become possible to collect geographic information systematically, to manage and process it rapidly and to show results in varying form to suit a wide range of user needs. Information technology, especially the Internet, creates business opportunities. There is actually an emerging, rapidly growing business in geographic information and the structures currently in place to deal with geographic information appear insufficient, on the legal, economic and organisational level.

Need for Policy

A need for a European geographic information-policy follows from the Treaty of Maastricht:

- in particular the mandate for a European integrated market: Market opportunities must be available to every entrepreneur on fair competitive terms [GI2000 1995].
- the efforts to promote the political, economic, social development in European transborder regions, e.g. Pyrenean region.

In general, specific policies may be needed for each goal, but some policies may advance several points.

WHAT IS SPECIAL ABOUT GEOGRAPHIC INFORMATION?

Many of the issues for a GI policy are the same as in other areas of information policy. This study has to concentrate on aspects which are specific to GI. It is therefore necessary to analyse first those properties that make GI special [Barr 1996].

Computerised spatial data/information have the same characteristics as many other data/information in electronic form. Thus:

- unlike most goods, they do not wear out,
- they can be copied at low or even near-zero cost,
- 'information theft' is rendered easier by the ease of copying and the possibility for disguising the source of the data,
- use by one person need not preclude use by another,
- their value to one person is often much greater than to another,
- the value of the data is much greater if collected consistently to high standards which are explicitly defined,
- the availability of metadata (data about data) is essential to support a broader use of the data and to guarantee data quality, and
- long term archiving in digital form remains a problem as compared to the storage of paper-based information.

For Geographic Information in particular, we can differentiate semantic, technical, operational, institutional and legal characteristics, in which it differs from information in general.

Semantic Differences

Human beings live in space, all human actions are performed in space. For nearly all human actions, geographic information is necessary in one form or another. There are a number of elementary observations about space and objects in space, which indicate that geographic information requires some special provisions:

- There is only one spatial reality and all geographic information refers to the same physical reality. The integration of observation with relation to space is important because activities in space influence each other. Space provides a concept of neighbourhood and of distance.
- The same objects are defined differently for different applications, which leads to confusions. Different activities use space differently and observe different properties and observe them differently.
- The physical reality can be observed (for most aspects) by anybody. Relatively objective measurements are often possible, but there is no final authoritative source (as there is in a database about law).
- Geographic information can be observed and collected at different levels of resolution (commonly known as 'map scales') and with different focus on content theme. There is no ultimate, finest resolution (as it is in a financial database). Fuzziness with the data is intrinsic and cannot be avoided.
- Much geographic information is readily available and needs only to be collected. But some geoscientific data (geological, etc.) are not visible at all and require very complicated and costly activities for collection.
- The presentation of geographic information follows very strict conventions.
- The world is constantly changing and to keep geographic data up-to-date is difficult and requires resources. The data required are describing – at least in principle – a single, universally existing reality and can be used for many applications.

Spatial data or information related to geographic units (or 'real world states' or 'objects') e.g. houses, fields, administrative areas or some representation of a geographical variable such as a set of contours describing air temperature or altitude above sea level.

- These units are often highly complex and usually are not fixed in size or other properties (e.g. not all communes are the same shape and size and may be disjoint e.g. France includes Corsica).

- There is an infinite number of ways of dividing space into such units or 'objects' (e.g. in Britain, the land surface is divided up into parliamentary constituencies, local government areas, postal areas and many others by different organisations and none of these match).
- Many analyses have to cope with very different types of objects, e.g. some spatial units are assumed to be homogeneous with abrupt changes at their periphery (e.g. soil areas) while others are functional (e.g. 'travel to work areas' are focused on a node but their boundaries are a statistical abstraction).

Technical Characteristics

Irrespective of the type of applications, there are two kinds of spatial data - *framework* data (represented normally by topography or cadastral information) and *related spatial data* (of all kinds), which are positioned in relation to the framework data. This descriptive data cannot be used spatially without the framework even though its involvement may be implicit, rather than explicit.

Perhaps the main attribute of the spatial object - its position in space - requires at least 2 dimensions (often 3, often additionally a reference to time) to describe it. Simple sorting on one description (c.f. on the funds available in bank accounts) will not give a reasonable representation of or access to a spatial data set. This has many implications both for the computer systems and for the way in which users understand the data/information.

Integrating data may involve use of quite different geographical reference systems (e.g. GPS co-ordinates, co-ordinates on some nationally-based projection, relationally-based schemes ('1.4 km down river from the bridge' or '1.2 m from the corner of this house') or 'nominal' references such as street names and house numbers or postal/zip codes)

Spatial data are inherently fuzzy. This occurs for three reasons:

- as indicated above, there is no universal metric (e.g. monetary units) to which the data/information may be related and from which it may be converted unambiguously into other metrics. For example, conversion of altitudes measured by GPS are often difficult to relate to those measured by more traditional means and relating postcoded information to information based on national co-ordinates systems is always an approximation process,
- some of the spatial units or objects are themselves fuzzy (e.g. a mountain range, the Alps have no firmly defined boundaries),
- it is possible to measure or record the data at many different levels of detail and even to generalise the data so as to caricature certain characteristics. A map compiled at, say, 1:1 million scale depicts a different world from one at 1:10,000 scale in terms of the features shown, where and how they are shown and the relationships between them; databases derived from different sources retain the characteristics of the source materials.

Maintenance of much spatial data is complex, involving up-dating and validation of the geometry, topology and attributes of the numerous objects/units. It is rarely automatable in its entirety and therefore requires considerable staff skills.

Some types of spatial error are insidious and difficult to detect, yet may be extremely serious for the end user. For example, a one millimetre gap between the end points of two roads as stored in a database may give rise to completely erroneous route instructions from a car guidance system.

Because of the technical characteristics of spatial data, the relationships established between different data sets are dependent on various factors such as scale, resolution and the positioning and size of areas defined by humans (e.g. electoral areas). Thus definitions of, say, poverty, levels of commuting and other policy-related variables are very sensitive to the way in which the data have been assembled and processed and any incompatibilities across the domain of interest (e.g. between nations across the European Union)

Spatial data are typically voluminous, especially when portrayed in multi-media form. Typically, many spatial queries involve searching - rather than simply playing back - these data, often for some combination of circumstances (e.g. 'find me the location of soils of a particular quality and type on which crops of a certain type are being grown and where a particular kind of management is practised').

Operational Characteristics of Spatial Data

Spatial data may be linked together, even if collected separately, using geography as the linkage key but the match is usually some approximation to reality. Such data linkage gives at least three advantages, almost for nothing:

- it permits filling in of missing data, thereby cutting the cost of data collection in some cases,
- it facilitates checking the quality of individual data sets through a check on their consistency,
- it provides added value - the number of permutations rises very rapidly as the number of input data sets rises and hence many more applications can be tackled when data sets are linked together than when they are held separately.

Our tools to describe the quality and characteristics of spatial data are as yet very incomplete and not widely used.

Often geographic information is only valuable to a user if it covers the whole area completely and uniformly. The value of spatial data to a user depends in many cases not only on the characteristics of the data or the tools available to analyse then, but often on the skills of the analyst. This arises because of the complex statistical and geometric properties of the data.

Many users are interested in change, rather than in a single state. This necessitates linkage of data through time as well as between different themes.

Institutional and Legal Characteristics

The great bulk of spatial data thus far collected have been collected by government bodies. There are first reasons of national security, but then also the very large collection cost to achieve a consistent and complete collection. The National Mapping Agencies of the European Union alone, for instance, expend over 1 billion ECU per annum.

For GI, the cost and the benefit often arise in different organisations. There is good - though mostly qualitative - evidence of significant external benefits from the provision of certain key (notably framework) spatial data sets. It is typically very difficult or impossible to collect these benefits.

Though the situation varies greatly across the world, this government domination has had certain consequences:

- most spatial data are collected to meet internal responsibilities and are therefore typically undocumented and not ‘productionised’,
- many government bodies have neither the mandate, resources or skills to market the data they hold,
- the consumers have tended to regard such government data as being available free or at low cost,
- most spatial data sets have been collected within a national (or local) context and hence meet national (or local) standards,
- some spatial information is regarded as a matter of state secrecy.

Spatial data provision and marketing is much more difficult to regulate than, say, electricity, water, gas or even Telecom. The reason for this is that the raw data may be manifested in many different forms by re-sampling, generalisation or data linkage such that the relationship to any common unit is very largely obscured (c.f. simple measures of energy like a Joule).

The uses of different types of spatial data are already growing rapidly, but potentially are virtually infinite; this should provide substantial growth in value-added markets but provides high commercial risk except for those focused on niche markets.

IDENTIFYING THE ISSUES

In the terms of reference for this contract eight topics for a European geographic information policy were listed:

- Privacy
- Copyright and Protection of Databases
- Data Quality
- Liability
- Security of Data
- Data Access Policy
- Minimum EU-wide Geographic Information Base Data
- Public Domain Data

DG XIII has undertaken several general studies to consider many of the issues listed above in the broader, non specifically geographical context. The materials from these studies have been reviewed and it was found, that **in most cases, geographic information is not different from other types of information and the general rules apply without change**. The study concentrates on these other cases, where the qualitative difference of geographic information requires a different approach and a different policy.

Method to Identify other Issues

In order to analyse the situation and to identify possible other issues as well as to understand the interactions between the issues, an analytical approach was followed. It broadly considers the use and users of geographic information and deduces from these the major groups involved. These are separated in producers and consumers of GI. The conflicts between their interests become then apparent and can be analysed. This approach focuses on the relevant issues related to the actual use of geographic information and it leads to regulations which are more within the spirit of 'business re-engineering' [Hammer and Champy 1994], the major business development strategy for the information age.

In a time of rapid change, there is a danger when considering only the existing geographic information business, which is emerging and changing rapidly. This will mar future business opportunities and a policy must consider all users, even the potential future ones. The approach here should achieve a more complete review of interests.

The Major Users and Their Uses of Geographic Information

The users and uses will be eventually similar, but today the opportunities in the European countries differ. Clearly different are the players involved. In a number of countries, the surveying profession plays a major role, in others it is completely absent. Depending on the professional education involved the approach to the issues is very different.

For the purpose of policy development, we differentiate user groups which have relatively uniform interests. This leads to a recognition of the conflicts which policies can help to resolve.

User	Uses	Conflicts between
Private	Navigation Real Estate, Housing and Relocation Leisure	privacy, access, price
Business	Marketing Distribution Utilities	intellectual property rights (IPR), protection, market price
Res Publica (politics, planning and science)	Agriculture Transportation Environment	access, low cost/low benefits
Administration	Urban Planning Land Management Administrative Uses	privacy, cost,
Defence	Navigation, Allocation, Planning	secrecy

Tab.1 shows the relations between the players and their major interests

Not all these users have the same visibility or the same potential to influence the market for geographic information. The large, mostly public national mapping agencies (NMAs), which produce and distribute geographic information, articulate their interests more clearly than the public at large, which needs access to geographic information for informed policy decision in a democracy.

Private

The largest and most numerous group of users of geographic information are private individuals. They need geographic information in most any activity they undertake. There are many uses, each of these uses of geographic information is minor and only a small benefit is achieved, but multiplied with the many uses and users, many business opportunities appear:

- navigating with a car and with public transport systems, including information where points of interests are (so called “Yellow Pages”),
- finding apartments, jobs and selling/buying real estate,
- planning vacations and other leisure activities.

Business

Enterprises need geographic information in many situations, e.g.

- to plan where their markets are,
- to reach their customer, or
- to organise the distribution of goods to their customers.

This need is similar for small and large enterprises and is also similar to the needs of public utilities, but also public administration, as they produce goods and services for the citizen. In both cases, one can separate the short term (operational) data needs from the long-term (strategic, planning) needs. The business use is very rapidly growing today, as witnessed by the growth of the annual European ‘Business Geography’ conventions.

The Public (res publica)

The public – organised as towns (communes), districts, provinces and states – makes decisions about space. Geographic information is necessary to allow a democratic decision process and for the citizenry to make informed decisions. This includes the need of access to geographic information for *scientific research* in environmental and in the social sciences.

The Administration

To carry out the laws and regulations, geographic information is required in many forms. The public administration at all levels is probably the largest collector and user of geographic information. Geographic information is most used for:

- administration of planning and building activities,
- taxation of land
- management of public services (water, telephone, electricity etc. – often performed by semi-public organisations).
- The administration collects or demands from the interested individuals the appropriate information as required for the administrative decisions.

Defence

National defence is perhaps the oldest systematic collector and user of geographic information. Today the defence interest is moving towards geographic information in electronic form and uses which are methodologically very similar to business uses (logistics, allocation of resources, management of space as a resource etc.).

The Major Producers Within the Geographic Information Business

The production and transformation of Geographic Information has become a very important business in its own right. The traditional geographic information business produces geographic information in the form of traditional maps. This is the domain of surveyors, civil engineers, photogrammetrists, cartographers and geographers and this business is oriented towards providing **services** or work under a public mandate (with the notable exception of printed paper maps, which were always seen as products).

The **new geographic information business** is quite different from the traditional one. It is oriented towards products and users. New uses of geographic information are identified and new businesses are created to sell this information to prospective users. The data are collected or data already collected are transformed to fulfil the requirements of these new uses. Channels for the distribution of the **product** are set up and the information packaged for the market.

This business is emerging today and only few examples are clearly visible, but it is growing ultimately much more and will surpass the geographic information business in the traditional sense. It has the potential to create many new jobs in a well paying industry if the legal and economic framework can be constructed.

The GI agencies are found in the public and private sector and the business is organised as a public service or as commercial activities. The public NMAs, but also regional and local authorities act increasingly following commercial patterns and often enter into competition with private business. In certain regards, the interests of private and public organisations are similar (e.g., protection of their business investments, including Intellectual Property Rights) but in others they differ.

Public and Private Geographic Information Agencies

Geographic information is necessary for many activities and that it is cost-effective to have national agencies with a mandate to collect geographic information. There are typically two agencies, namely a mapping agency, dealing with the spatial-geometric aspect and a national statistical bureau, which collects socio-economic and demographic data. European policies for the collection of socio-economic statistics exist, but not for map data.

The collection of a base set of data for each country by a single agency is justified by cost savings. It requires that the resulting monopoly is regulated. The cadastre to protect security of land ownership can be considered under this heading as well and it is sometimes integrated with a NMA, which produces topographic maps, and sometimes an independent organisation. The NMAs often have no specific mandate to distribute the data and the accounting methods do not encourage publication.

Private mapping companies exist throughout Europe and move rapidly from the paper-based production mode to electronic means and experiment with selling electronic products.

Data Collection by Administration and Business Enterprises not Primarily in the Geographic Information Business

Administration collects (often with the assistance of the interested parties) all the geographic information necessary for the execution of the laws. As many laws consider spatial circumstances, large amounts of geographic information are collected.

It is often cost effective for an administration to construct complete geographic information collections and to maintain them. Many larger towns and public utility companies maintain such datasets; in several countries well organised co-operation between NMA and towns exist (Austria, UK). The data are then available, potentially, for other users, but many agencies lack a mandate, to make the data available. Where these obstacles have been overcome, the data are used by third parties (e.g., the town of Vienna is regularly selling large scale data). Privacy protection must restrict the diffusion of such data, but fears of potential violations often restrict availability – and thus use – of geographic information unnecessarily.

Similarly, companies collect much socio-economic information with respect to geography in carrying out their business and with the assistance of the persons involved. Some companies arrive at complete coverage for their territory: public utilities, supermarket chains etc., although for limited themes. There are concerns that widespread diffusion of such data would violate privacy of the individual seriously.

The Interests to Defend

The different players have interests, which are rationally justified. These interests clash and an European geographic information policy must resolve these conflicts. A set of clear cut rules will stimulate business, because the insecurities in the current situation are a deterrent to business and do not permit investing money in the collection of data and the building of marketing structures.

Most of the problems are very similar to other conflicts regarding the collection, distribution and use of information. The concentration here is on the particulars of geographic information; the general rules are referenced.

There seem to be several strands of discussion:

- privacy vs. need to know,
- commercial interests – ownership interests vs. low cost access to data,
- privacy vs. commercial interests,
- interest of the public at large vs. the interest of the enterprises (commercial interests) and the privates (privacy),
- national security.

Privacy vs. Need to Know

Individuals, enterprises and public administrative units have an interest that the information they produce remains private. They have to make information available to others, but can expect that this information is used only for the intended purpose and is not further divulged. This right to privacy is limited by the legitimate need to know of other agencies and by citizens to make informed political decisions and to control administrations. A review of these issue can be found in [Legal Advisory Board 1995] and apply equally to geographic information, except:

- Geographic information is particular, as much of it is apparent and the individual cannot avoid making it publicly available – everybody can see which flowers grow in my front yard. Nevertheless, there may be an interest that such data – individually available – are not systematically collected and distributed. There was a court case about violation of privacy by using remote sensing (flying over a large company area) to enforce environmental protection rules.
- One may construct a 'right to privacy' for the natural habitat. The distribution of information about breeding places of rare animals (especially birds) can lead to immediate extinction by 'too many visits of well meaning bird lovers'. An intensive discussion concerned a few years ago the public availability (under Freedom of Information Act) of prehistoric burial sites, which will then be immediately poached by amateurs, collecting only the valuables and destroying all ancillary information of eminent interest for archaeologists.

- The administration invests in the collection of geographic data and perceives a opportunity to sell the data collected to other users.

Copyright and Other Protection of the Data Collections

A collection of data represents an economic good and who invested in its construction expects to benefit from its use. The law has developed specific rules for protecting 'intellectual property', the most important being copyright. Geographic data and other similar data collections are a particular case for the copyright law as it is mostly not a work of art, but a description of readily available facts according to standardised rules. A new EU directive for a 'sui generis' protection of databases exist, but is not yet integrated into national laws. How much protection it provides for geographic data collection is not yet clear.

There are other legal instruments to protect an economic investment in geographic data: most important contractual arrangements, but also unfair trade law and trade secrets. How they apply to the geographic information business depends largely on specific national legislation and legal interpretation by the courts. In general, they cover only very particular situations. There is a recent survey by EUROGI "Legal protection of Geographic Information" which gives detailed and summarised description of the European situation [EUROGI 1996].

Consumer vs. Provider of Geographic Information: Liability for Errors

If geographic information is provided on a contractual base the provider assumes some liability for the quality of the information and the consumer is protected in his assumption that the information provided is correct. Moving geographic information business from a service to a product may give the consumer more stringent protection and may increase the fears that geographic information producers have of liability problems. Actually, only a single case (in the USA) of an award for liability for damage due to errors in maps is documented.

Geographic information can never be completely correct – due to the inevitable measuring errors and to the delay between the data collection and the use of the data. Thus the provider must inform the consumer about the quality and suitability of the information he is about to use.

Public at Large

There is an interest in effective and equitable execution of administration. This implies for geographic information for example:

- Public agencies should share the geographic information they collect to reduce duplication of data collection cost and make administration more effective (violates privacy rights). Agencies should use a single common set of base data to reduce the need for reconciliation between data from different sources later.
- Agencies (public and private) should make the publicly collected information available to others to reduce their cost and thus improve the overall effectiveness of business and thus the commonwealth of all (strong violation of privacy rights).
- Scientific research and education need access to geographic information. They deduce often no commercial benefit from the data and can therefore only pay small fees. Often large amounts of detailed data must be 'mined' to find interesting results.

There is also a public interest in an effective way to conduct business for enterprises so that the general economic situation is competitive on a world-wide scale.

National Security

In general the defence organisations have an interest to keep geographic information secret to protect national security interests.

Active Groups

A number of groups are very active on the European level:

EUROGI (European umbrella organisation for GIS), CERCO (Commission Europeenne des Responsables de la Cartographie Officielle) with MEGRIN, European Science Foundation (with a special program GISDATA).

EUROGI is very active in most aspects of GI policy. It has recently completed a study on Intellectual Property Rights legislation [EUROGI 1996] and has proposed - among other efforts - to co-ordinate the European Open GIS efforts (in co-operation with the OGC group in the USA).

The Scandinavian countries have an informal co-operation on GIS and GI policy issues. Regular meetings between professional organisations with interest in GIS are held among the German speaking countries (AUS, GER, CH).

Most European countries have national GI organisations, (represented in EUROGI) which serve mostly for information exchange and occasionally national policy. The national mapping agencies play most often a determining role. Several of these are reconsidering their structures and reorganise. Plans to include modern accounting methods are often studied. Of special interest are the activities of the German Laender, which have joint study groups in GI matters, which address GI policy issues (at the moment the focus is on base data and pricing strategies).

CERCO has recently founded a parallel organisation to include the national cadastral organisations.

Standardisation for spatial data is a hot topic and several groups are active: many European countries have national standardisation bodies developing their own National Spatial Data Standard. Within the European Standardisation Organisation CEN, two working groups (278 and 287) work on GI issues. There is further an ISO working group with a similar charge.

The European Research Centre in Ispra is involved in several practical GIS projects and has recently convened a meeting of experts to help determine a European GIS research agenda (A Strategic View of GIS Research and Technology Development for Europe, Report of the Expert Panel Convened at the Joint Research Centre, Ispra, 19-20 November 1996).

ASSESSMENT OF CURRENT SITUATION

Policy decision must be made with regard to the current situation. The perception of the current situation is often more influenced by the reports in the press, in our case in particular in the trade journals. There is the suspicion that the description in the trade journals is strongly biased - first, only new solutions are interesting to report, second, reports are typically describing as achieved what is only in a planning state, and third, most of the influential GIS trade journals are produced in English and assembled in the UK, with a heavy bias towards UK authors and UK situation and countries nearby. More critical assessments have recently appeared in GIS journals from Germany [Backhaus 1996].

The situation is much more varied than we expected. The variation is large between countries, but also within a single country, and finally the situation varies from discipline to discipline.

Method

An extensive questionnaire was filled in by very knowledgeable specialists from a large number of European countries. The informants were personally known to us and are typically staff members or other resource persons for the GI decision makers. They answered the question themselves or collected the necessary information from other knowledgeable sources.

The first questions of the questionnaire tried to find out the general use and importance of GI within each country. The next three groups of questions dealt with the collection and distribution of GI, especially with the mapping business. In section 5 and 6 we tried to discover the private and public GI-market. After some questions about legal and standardisation issues the questionnaire closed with the facility for listing more or less urgent GI-problems in each country.

The data collected provide a picture of the European GI scene that brings out those aspects most important for the GI policy setting.

Importance of Digital GI

In the most advanced situations, digital distribution of GI makes only a fraction of the total market for GI. On the average, the use of GI in electronic and manual form is in the ratio of 30 to 70%. Looking on the mapping-sector only, this ratio even descends to 15 to 85% (Fig. 1).

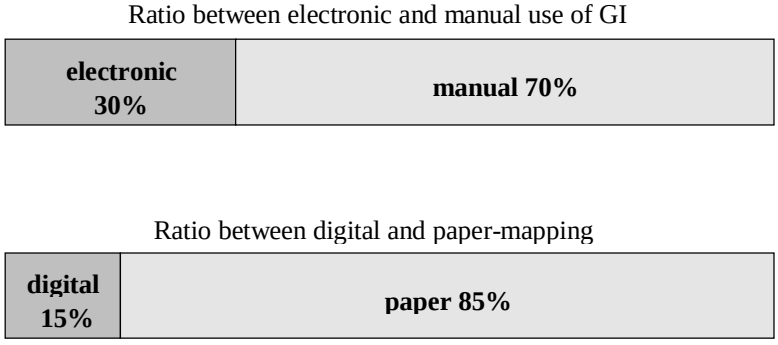

Fig. 1: The ratio between digital and analogue form of GI

Collection of GI

The collection of base GI is typically a national agency (except for Germany, where the mandate is mostly with the Laender and gave rise to independent mapping agencies for each Land); a separate national agency is usually responsible for the collection of demographic data. In few countries tasks are more separated (e.g., military and civilian topographic mapping).

The collection of thematic data is carried out in each country by a large number of specialised agencies which are interested in some data. The variance in co-operation is enormous, but duplication of efforts (and equally lack of coverage for some areas) is very common. Modern technology is often used, but traditional methods account for the majority of data collection efforts.

National Mapping Agencies

The NMAs differ enormously in Europe in their organisation, their mandate, the scope of their activities and their economic situation. As a result, the variations in accessibility and the levels of service provided vary enormously across Europe, but little is known. Only few countries have tried to measure user satisfaction and the UK systematically collects data about the user satisfaction.

Two major mandates can be identified: *national topographic mapping* and *cadastral surveys*. Some NMAs do have both mandates, some only one. It appears that the organisation and the economic principles which guide the topographic mapping are radically different from those for cadastral surveys. As a consequence, policies must respect these differences in order to be effective. The second market (cadastre and utilities) is estimated to be 2/3 of the total GI market [Barr 1996] (the other third being defence uses).

Topographic mapping

The topographic mapping services of the NMAs produce effectively (most of) the base data set, which has an extremely wide usage. The detailed GI is very useful and valuable for a small number of large local users which are willing to pay a high price; this has a tendency to make the same data not available for other users which deduce less benefits from the data and can therefore pay only a smaller price.

All NMAs sell data to the users and recover from them a part of their cost. In many cases, the income from sales of maps and GI are not credited to the NMA. Only three countries with a mandate to recover a significant part of their expenses from their clients through payments for services (cost recovery) surfaced (UK, Netherlands and France); some countries (among them Scandinavian countries) are studying the issue. Several NMAs sell products to the public which are - to a varying degree - in competition with the private sector. In general the GI producing agencies do not have accounting methods which allow for the determination of cost or to offset the cost of production against income from sales. Revenue from sales of printed maps often do not cover the cost of distribution. Distribution of maps in printed form is often limited by complex (non-commercial) distribution channels; the exceptionally well organised, highly technical system in the UK contrasts with administration-controlled systems in southern Europe. In the majority of countries, topographic GI is most often sold in form of a paper map.

The use of digital information for road navigation is in its infancy. In few countries test areas exist, but an organised market has not emerged yet. Information for leisure activities is nearly always distributed free of charge in traditional (non-digital) formats. Other markets for GI in digital form are emerging, but with the exception of some aspects in UK, not firmly established.

Cadastre

The organisation of large scale (cadastral) surveys varies enormously, from centrally organised governmental agency to independent licensed, private firms, many different forms of organisation are found. Very few countries have a fully digital cadastre or complete large-scale data sets. The cadastral data are very useful for public utilities and various arrangements of data sharing exist. These are typically local issues, which have local solutions: there is a small number of potential users, which are well known, and arrangements cover initial acquisition and regular update.

Conclusions for Europe

The variability in the situation of GI production and use in Europe is very large. The use of modern technology, of organisational structure etc. varies from country to country, but also varies within a country for different sectors. There are not only different rules for each National Mapping Agency (which are about 30 independent units in the EU) and each statistical bureau, but other rules apply for other agencies collection spatial data (inter-sectoral differences). Co-ordination between the NMA is through CERCO. The German Laender agency have their own co-ordinating body.

Compare with US Situation

The market for GI in the EU appears to be less developed than the North American one. The “National Data Infrastructure Initiative” currently underway concentrates on the co-ordination within the US federal government, but provides a widely visible forum for the discussion of general GI topics and

creates a positive climate for the business development of GI. A number of differences in current GI policies can be observed:

Uniform legal rules apply for most of GI throughout the USA for privacy (not very important for GI), copyright (data collected by the federal government is not copyright protected), data quality (the federal standard for spatial data exchange includes a section on data quality), liability (is an issue in the USA; in one case an indemnity has been awarded), security of data (a permanently important topic for the intelligence community), data access policy (the same Freedom of Information Act and the ‘no copyright rules’ apply for all data collected by federal agencies), and a single reference frame all work together to make GI - mostly small scale (1:50 000 and smaller) - easy to use in business. The GI business has spread extremely rapidly with the advent of the TIGER files (providing integrated topographic and street address data for most of the USA) and the Digital Chart of the World (1: 1 Mio topographic map in digital form).

The market for large scale data is quite different and separated from the market for small scale data. Large scale data are mostly collected by local government (county or town) or by the public utilities. Such data can be copyrighted and state Freedom of Information acts apply. Data access rules and formats vary. This does not disturb the business for this data as much as one might expect, as the use is mostly local.

POLICY ISSUES

The technical specifications of the contract contained a complete list of potential issues for GI policy. This list is extended by three additional issues: the use of GI by the public, standardisation, and promotion for use of GI. For each issue a statement summarising the current situation with regard to GI is given here and the interactions between these listed.

Privacy

The current national protection of personal data differs within the countries of the EU, but allows the collection and marketing of socio-economic data; there is already a product which is completing its coverage of Europe quickly and plans from other companies to introduce similar products exist. The new directive on Personal Data Protection seems not to affect this development. There is no evidence of abuse of geographic information for intrusion of privacy, even though it is clearly understood that the combination of socio-economic data collected in regular business combined with spatial indexes allows much better associations and constitutes a potential threat to privacy.

The current protection however limits the availability of socio-economic data for scientific uses. The level of protection required and the rules to achieve it are different in different countries. Many of these rules do not stand rational scrutiny. The current situation seems not to stop business usage of data, but to severely hamper policy monitoring and scientific research. Improved scientifically based methods seem to exist, which protect privacy, but still allow access to summary data, which is sufficient for most usage.

Independent of the protection of the private sphere of persons, one might argue for a privacy protection of natural species: breeding locations of rare animals should not be publicly available to protect them from visits. There are good reasons to protect detailed information about archaeological sites etc.

Related to: Access to data.

Main actors: none so far, potentially the regular political parties and bills to protect the individual.

Copyright and Protection of Databases

Copyright and other methods to protect intellectual property rights in the information society were studied by the Commission of the EU and resulted in a EU directive for ‘sui generis’ protection of data collections. This protection is very general and applies, in principle, also to collection of geographic data. There are voices which indicate that the protection awarded to the data producers is stronger than necessary and the rights for access for the public not sufficient [Legal Advisory Board, 1995].

A survey by EUROGI has established the current situation in Europe for copyright and other protection of geographic information [EUROGI 1996]. Discussions by experts in legal protection of geographic information within the GISDATA project of ESF have lead to clarification and assessment of current protection awarded by copyright. The report gives an overview of the situation with regard to legal protection of geographic data for a specific point in time. Rules were drawn up to protect traditional paper maps and their applicability to the electronic formats vary. The findings indicate that a few countries accept a ‘sweat of the brow’ argument (most notably UK) where the protection of collections of geographic facts is extensive. Other countries protect cartographic data with particular rules, especially if collected by NMAs. Most countries, however, follow the Berne convention, which protects the ‘expression’ (not the underlying facts) and demands ‘originality’ to award copyright protection.

There are a number of other devices for legal protection available, but applied differently in different European countries. Protection against ‘unfair competition’ is available in some countries and can be used against blatant copying of data collected with substantial effort.

The influence of the new EU directive awarding a ‘sui generis’ protection to data collections, which brings a uniform protection, is as yet unknown. This must be further investigated, as the member states of the EU introduce these rules into the national legislation, for example as part of the copyright law or unfair trade laws (as currently considered in Austria). This will influence how this new protection can be used for geographic databases. This directive is not yet well enough understood that opinions

about its effects are available. In some countries, notably the UK, special copyright protections is sufficiently extensive.

In general, marketing methods can supplement for incomplete legal protection. Brand names (which can be protected by Trademark laws), organisation of distribution and publicity channels etc. are very strong deterrents against copying. Reports from industry leaders confirm that legal protection is just one of multiple instruments for the protection of geographic information products.

This issue is related to: Access to data.

Main actors in the geographic information debate: Commercial providers of socio-economic data for business uses, national statistical organisations, national mapping agencies, private mapping companies, researchers.

Data Quality

There are no simple rules to determine, how data quality affects the quality of the decision made. Assessment of 'fitness for use' is based on experience and experimentation. It is difficult to predict if a dataset can be used for a particular use. According to the current standardisation for geographic information exchange, lineage information must be included in a dataset. Lineage information is a description of the process of data collection and treatment, which should enable the user to assess the data with respect to the intended usage. It is in addition to more analytical characterisation of timeliness, accuracy, completeness, resolution etc. Accepted methods to measure data quality will be crucial for the geographic information market to develop. Standardisation efforts are underway in several national, European and international groups.

Data quality plays a crucial role: a potential user of data must understand the quality of the data and be able to assess the 'fitness for use'. Data quality information must therefore be included in metadata. Data quality is also a major method for product differentiation and restrict the use of data provided for one purpose (and one price) for another purpose.

Related issues: Liability, Data quality (product differentiation).

Major actors: National Standardisation Organisations in co-operation with CEN and ISO (in particular CEN 287 and CEN 278)

Liability

Liability for disclosure of data which violates privacy (and the more aggravated case of erroneous data) seem not to be a problem special for geographic data.

Liability for data, which is in error and lead to damage, depends if the data are provided as a service or as a product. The problem is related to liability for software and other data collection and it is not apparent that special policy for geographic information is appropriate. There are nearly no cases of liability for geographic data brought before the courts, and only one known award was made in a case in the USA. Cases in the past followed from services, e.g., a mapping job, not properly done which caused damages.

A method of certification – as part of product differentiation – of data for particular uses may alleviate the most obvious problems with liability for geographic information. This will require operational standards to measure data quality, which are only partially available. Certification following the ISO 9000 procedures assures that documented processes were used in the collection and treatment of the data and can serve as a first step.

Related to: Data quality.

Major actors: providers of GI, especially NMAs.

Security of Data

Efforts to guarantee data security are underway. Several technical methods (mostly based on encryption) are used and they can be applied to geographic information. This does however not likely protect geographic data in situations, where detailed analysis of the data by user programs is necessary for spatial statistical analysis of socio-economic data for business usage, policy monitoring and scientific research.

Particular for geographic information are methods to limit data access security for data by limiting the quality. Representation of geographic phenomena exist on many levels of resolution (detail), and most often only more detailed levels of resolution need protection (for privacy or for national security purposes). In traditional systems, this was achieved by protection of large scale maps, making small scale maps freely available. To transfer the same methods to the digital geographic data, which seems essentially scaleless, requires methods to produce 'reduced detail' datasets, which do not need protection. This does not work for cases where complex analysis of detailed data is necessary even if the result of the analysis clearly needs no protection. This applies equally to the related descriptive, e.g., socio-economic, data, which may breach privacy protection. Nevertheless, summary information is traditionally made available (national statistical publications). These methods can be improved in the digital age, to protect privacy better and at the same time, to provide better data for analysis.

Related to: Privacy, data quality (product differentiation).

Actors: the major data providers (NMA and commercial data providers, including local authorities). Substantive efforts by the EU to develop technical means to protect data.

Data Access Policy

The differences in data access policy across Europe are one of the most limiting aspects for the development of a geographic information market. The issue is complex and influenced by the organisation of the data collectors, their mandate, their pricing policy, the organisation of the markets, the data collected etc.

Potential Misuse of Monopoly Power by NMA

Production of geographic information leads to natural monopolies [Ordnance Survey 1996]. It is clearly cost effective if geographic data are collected only once and widely used but according to economic theory, this leads to non-optimal solutions and policies are necessary to correct this. This is similar to the situation with other natural monopolies, e.g., public utilities or Telecom, and similar methods to control and regulate NMAs must be used (e.g., the 'universal public service' concept). (Like NMA, local and regional authority may have a monopoly situation for the detailed data for their area.)

NMAs (and other public collectors of spatial data) have mostly a public mission, but in some cases they enter into competition with the private sector with activities which are or could be performed equally well by private sector companies. Some commercial providers have the suspicion that some NMAs use their data at 'no cost' to produce new products and thus effectively subsidise their own products in a the competitive market. Companies in the geographic information business want 'equal opportunity' access to data, to have the same market possibilities as the NMAs. Only if a 'level playing field' for the private and public sector is created, a competitive market can develop. It appears that improved access and market oriented pricing, at least for some base products of NMAs, should be encouraged, perhaps using the framework of 'universal public service'.

Pricing of Geographic Information, Cost Recovery

Prices of geographic information products should balance the cost of production and the value that the consumer derives from them. Geographic information can be used in different forms, and the same geographic information can often be used for widely varying uses, producing very different values. To set a uniform price in such a situation is difficult. There is a tendency to set price based on cost or highest possible value, which excludes the data from all uses which produce less benefits.

Marketing methods, especially product and price differentiation must be studied to construct specialised geographic information products which serve particular needs without precluding selling other products for other uses at higher prices. Methods for product differentiation include: certification of data, data quality, update level, resolution, access methods etc. There are some examples where the same information is available at different levels of resolution for different prices (MEGRIN, OS UK, town of Vienna).

If a data collector has a natural monopoly then it may set prices higher than the equilibrium price which would be achieved in a free market. The role of NMAs and the natural monopoly they enjoy calls for some counteracting regulation. Two NMA (UK and France) have a direct mandate for cost recovery, some countries discuss such rules (especially in Scandinavia), but a majority of NMA operate without a cost recovery plan. An economic analysis of the position of NMAs was started and is supplemented with

a similar study commissioned by OS UK [Ordnance Survey 1996]. It appears that cost recovery rules are best defined in terms of a public mandate to the NMA and a public payment for this mandate.

Related to: Mandate and Organisation of NMA, data quality.

Minimum EU-Wide Geographic Information Base Data

The national mapping agencies do not have a mandate for integrating their national data in a European-wide geographic information base. Such data are at least necessary for the design and monitoring of EU policy, but equally useful for other organisations with European scope.

From discussion with MEGRIN it becomes apparent that pricing a pan-European dataset is difficult, as the price for the European data set must be such that it does not undercut any NMA selling national data sets; this leads to a high price which excludes many uses. MEGRIN is distributing and has set a lower price for a dataset of lower resolution, a positive example of product- and price differentiation to avoid market interception.

Related to: Reference frame, standardisation and pricing, public domain data.

Major actors: MEGRIN has put together EU-wide base maps.

Public Domain Data

This topic is best approached from an economic, not a legal, point of view. Economic methods to assess value generated with a product indicate that in some products the value generated by geographic information is very large and pays (part of) the cost of data collection. In other uses for geographic information the value generated by the geographic information is very limited and the price for these data must therefore be low (these are often large volume derived geographic products), if they should be made available on economic terms.

It appears that pricing geographic information according to the value it has for the user can alleviate the thorny and controversial problem of ‘public domain data’. It requires that different geographic information products are available and leakage between uses (or cannibalism between products) can be controlled. Practical efforts to achieve this are currently under way (e.g., UK agreement with the educational sector). There may be a justification for some standardised, widely used, highly generalised datasets, for which the collection of a fee is not economically justified. It must be borne in mind that there is sometimes a large difference between the benefits one organisation deduces from a fee (i.e. the fee collected minus the cost of collection) and the cost of the fee for the acquiring organisation (i.e. the fee plus all the cost for procurement). Other concepts than ‘public domain data’ can be used to allow limited use without fee.

Access to data based on Freedom of Information Act is in some countries and under some conditions free, but the limitations are such that it is difficult to imagine that this could become a serious competition for commercial publishers. ‘Library privileges’ (differing from country to country) allow (mostly non-commercial) use of data ‘free of charge’; it remains to be seen how these rules develop for the general case of electronic datasets before special provisions for geographic data are sought.

The Use of Geographic Information by the Public

Access to geographic information is necessary for everybody. Most of these uses are part of the markets for geographic information to be developed.

There are other needs for geographic information, which are related to national interest, science and democratic government. Geographic information is needed for national defence. Last, but not least, the citizenry must have access to geographic information in order to make educated political decisions. In particular, it is important, that both parties in a political debate have similar access to data.

Freedom of Information Acts in different European countries address these issues in general and their relation to the new regulations to protect geographic information must be investigated: access necessary for scientific, educational or political reasons must not preclude the sale of the same data in a commercial market (which requires that leakage can be controlled), and must not violate privacy restrictions.

The use of GI for science and education is an important public use, not covered in Freedom of Information Acts; as the benefits drawn from such uses are typically small, it is questionable if such legitimate uses can be left to market regulations.

Related to: Public domain data, pricing strategies.

Major players: none, potentially political parties, environmental protection initiatives

Standardisation and Reference Systems

There are numerous reports which indicate the high cost of using geographic data; it is often estimated that two thirds of the cost of acquiring data are caused by data conversion. This impediment can be subdivided in several issues:

Co-ordinate Reference Frame

Nearly each country in Europe uses its own reference frame for its co-ordinate system. Conversion between these systems are time consuming and it is difficult to construct data sets which cross boundaries or even pan-European data sets. A conversion of all surveying operations in European countries to a single standard is a slow process.

Intellectual Property Rights: At least in a few European countries (e.g., the UK), the NMAs claim intellectual property rights for the national grid. Claiming intellectual property rights might be an appropriate method to protect a reference system from abuse and falsification, but can also restrict its use by business for fear of future demands for royalty payments. This must be addressed and a policy set for a future European reference system.

Major players: NMAs working jointly.

Non-Coordinate Reference Frame

The co-ordinate system is the basic reference frame, but more often reference systems are used which are not based on co-ordinates, but place names. The most common, daily used one is the postal address. It is included in most business and administrative data collections. Aggregations are formed by the ubiquitous post codes, political subdivisions (e.g., the European NUTS, the identifiers of national statistical enumeration districts).

Several issues need investigation for possible policy recommendation:

- There are detailed reference objects in the urban context (usually down to a single building, often a family dwelling); no commensurate objects exist in the rural areas. Rural reference systems are important for the administration of agriculture programs, which are based on land (not production), but also for the organisation of emergency services in the rural areas.
- Post codes have an extremely wide usage, but are designed and managed exclusively for postal operations. In most countries, post codes are not areal units, but a collection of mail delivery points and changed according to the requirements of postal service. This limits the use of post codes in many cases (or raises costs).
- Non-coordinate reference systems are even more varied in Europe than the coordinate-based ones. The NUTS have created a first (coarse) uniform system. It is likely that a well documented, not necessarily uniform, system of non-coordinate references for urban and rural would be widely beneficial and would open new business opportunities in Europe.

Promotion for Use of Geographic Information

The use of geographic information is limited by the knowledge of what data exist and from where they are available. Potential users generally lack this information. The data already collected could be used for more uses and there are numerous examples where existing data formed the base of new products. Two separate issues surface:

- Metadata describe the data and indicate where they are available. To provide metadata easily is crucial to increase the use of data; metadata must include description of content, area covered, encoding, data quality etc. (this is covered by the separate GI Meta study).
- Mandates to Make Data Available: Most agencies which collect data, including some NMAs, but in particular local authorities, do not have a mandate to make the data available, which they have collected. Numerous administrative obstacles must be overcome to gain access to the data which adds to the effective cost for acquiring the data. Public administration accounting rules are often clearly punishing agencies which try to sell their data.

Interactions between the Issues

There are a number of interactions between different policy issues, which one must take into account when concrete policies are considered. Potentially a policy may advance one point and create an obstacle in another one.

Copyright Law and Cost Recovery for NMA

In countries with stronger protection of IPR for geographic data, the NMA tend to have a higher level of cost recovery. There is clearly a logical connection from a strong copyright to collecting higher fees. Further investigation must show if this mechanism works in practice or if the observed correlation is spurious.

Cost Recovery and Large Scale Data

In some countries where the NMA collects not only topographic (small scale) but also large scale (cadastral) data, cost recovery is higher. It suggests that the market for large scale data is structured in another way, better understood and collection of fees for large scale data is easier to organise.

Access to Data, Cost Recovery and Organisation of NMA

There is a clearly a connection between the level of cost recovery and the level of independence of the NMA from the national administration. Accounting rules in a number of European countries for public agencies do not induce agencies to take a proactive role and maximise income. The same rules act as deterrent to make access to data easier.

Data Quality, Certification, Liability and Product Differentiation

Data quality of a geographic information product must be suitable for the use. Liability may arise if unsuitable data are used, but this is difficult to detect for the buyer of data. A method to describe data quality, to certify that a dataset achieves this quality and to set a price in relation to the guaranteed data quality all depend on generally accepted methods to describe measure data quality.

Privacy vs. Wider Access

The integration of data from different sources – each element not violating privacy protection rules – using spatial keys allows potentially to gain more information about an individual and to circumvent the goals of privacy protection rules. Making more data available, e.g. promoting that local authority sell their data, may create potential for privacy violations.

RANKING OF THE ISSUES

The issues related before are not all of the same import for the emerging European GI market. A ranking by key decision-makers identifies copyright and intellectual property rights as the most important issue, followed by data quality and data access.

To balance this ranking by individual issues which are important for the development of an European GI market, the same key individuals were asked to assess the major barriers to the development of the GI market.

This section draws heavily on the detailed report in Annex A.

Method of Ranking

The ranking is deduced from 20 extended interviews with senior personnel in key organisations responsible for the collection and supply of geographic information (GI) and key organisations which use geographic information.

These interviews were conducted in December 1996-January 1997 by Professor Peter Burrough (University of Utrecht), Dr. Massimo Craglia and Professor Ian Masser (University of Sheffield), and Professor David Rhind (Ordnance Survey of Great Britain), Professor Andrew Frank has provided additional information resulting from his discussions with a number of key policy makers in Germany and Austria. The aggregate results described here represent the sum of the views expressed: in no sense do they represent the individual views of the authors or, indeed, of any one of the individuals or organisations consulted.

Every effort has been made to obtain interviews with the most senior individuals in the organisations identified, to have a broad coverage of countries without over-representation, and to include a wide range of perspectives such as those of public and private sector, data producers and users, agencies responsible for co-ordinating GI strategies in their country, and European co-ordinating organisations.

The interviews followed a brief set of open-ended question. They were conducted by telephone. This has the advantage of high response rate - in this case 100% of the individuals contacted were able to respond to the survey. It further allows the opportunity of exploring in greater detail a number of issues arising during the discussion. Given the qualitative nature of this study this approach was essential as many definitions could be interpreted in different ways and this cannot be checked or clarified in postal surveys.

Topics Discussed

The topics discussed during the interviews can be divided into five sections, addressing

- the key issues identified by the European Commission, and in particular their ranking on a scale from 1 to 5;
- the expected changes over the next 5 - 10 years and the impact on the ranking of the issues;
- issues of special importance in the national or regional context,
- the need for particular actions at the European level, as previously considered by the commission
- perceived barriers to the development of the GI market.

Organisations Interviewed

The organisations interviewed span 12 European countries and include:

- Four private companies operating at national and European level,
- Two European-wide organisations prominent in the GI field,
- Five national associations or agencies for GI,
- Eight national mapping and cadastral agencies,
- A research and policy institute focused on European environmental issues.

For the purpose of analysis, the organisations listed above have been grouped into a number of categories and their perspectives analysed in pairs:

- Private sector vs. Public sector,
- National Organisations vs. European-oriented ones,

- Data Producers vs. Co-ordinating Agencies,
- Northern European vs. Southern and Central/Eastern European.

Overall Ranking of the GI Policy Issues

With respect to the eight issues identified by the 'Invitation To Tender' document as being of critical concern to the Commission, Fig. 2 summarises the main findings.

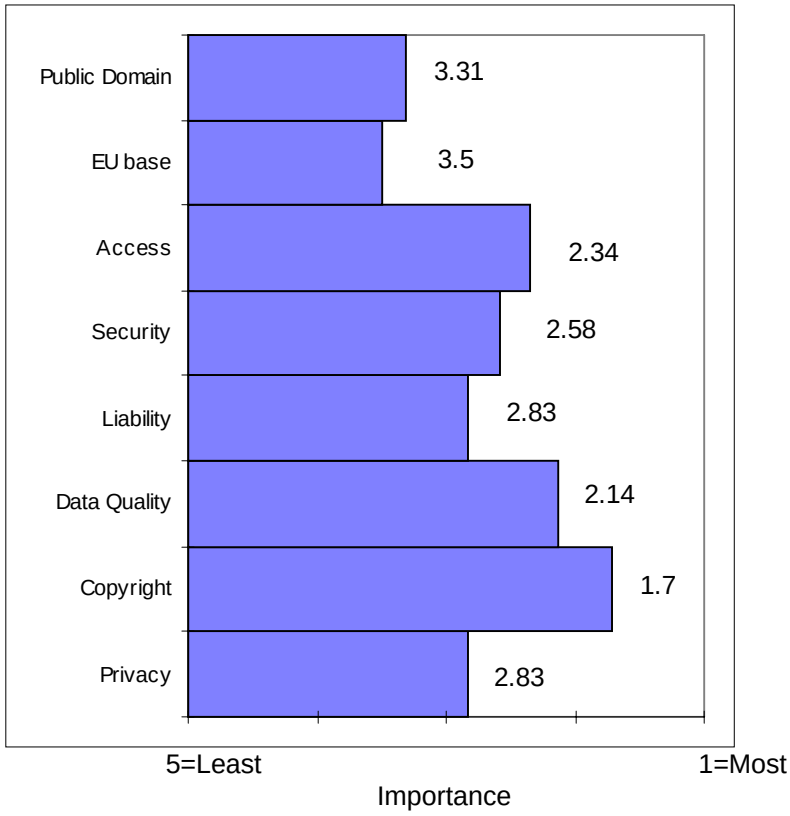

Fig. 2: Summary of Findings on Key Issue (Mean Score Indicated)

As the figure shows, the key concern of the respondents relates to the protection of Copyright and Intellectual Property Rights (IPR). There is a clear majority seeing this as the most important issue, particularly among the data producers (National Mapping and Cadastral Agencies) and the private sector organisations who produce value-added services and products.

The second most important issue is Data Quality, which is rated highly across the spectrum of organisations.

Third most important is Developing Data Access Policies at the European level, although many recognised the considerable difficulties that this poses in overcoming the different legal traditions and frameworks existing in Europe. Again there is a broad degree of consensus on the importance of this issue across the spectrum of organisations. The few who have not rated it highly are, by and large, operating in countries where a well-established data access policy already exists, indeed the respondents from the south and east of Europe would have ranked these three issues in reverse order, with access ranking first.

Besides the relatively clear prioritisation of these three issues, the other five are more or less balanced with some greater concern for the Security of Data, particularly in the private sector, Liability and Privacy than for a European-Wide Base Data and Public Domain Data. The differences however are small in overall terms and, given the qualitative nature of this research, it would be inappropriate to read too much into them. It is also clear that even those issues which are perceived in *relative* terms as less important than others still feature highly in *absolute* terms and need addressing at both national and European levels.

Copyright and IPR

This is the most important issue affecting the operations of the respondents. Although this issue attracts a great deal of consensus, there are significant variations both across the sectors and in terms of perspectives. The sectoral differences are highlighted in Fig. 3.

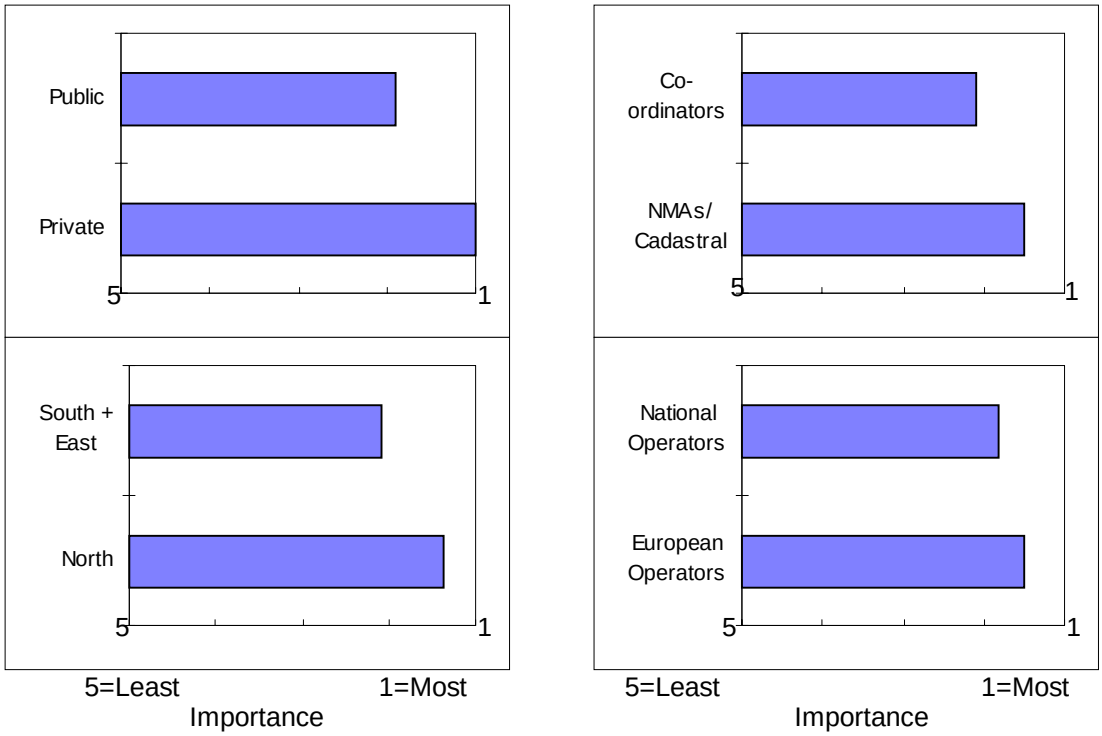

Fig. 3: Sectoral Perspectives on Copyright and IPR

As the Figure clearly indicates, the private sector is even more concerned about this issue than is much (but not all) of the public sector which includes both NMAs and co-ordinating agencies. Within the public sector however, it is equally clear that the data producers feel more strongly about copyright than the national GI agencies. Many of the national GI co-ordinating agencies are arguing more strongly in favour of the development of a national and European public domain.

A viewpoint expressed by one of the national GI agencies was that there may be a contradiction between policies aimed at creating new jobs, which rely heavily on the involvement of the private sector, and those which tend to protect the copyright of public agencies, as the latter may inhibit the development of new products and jobs. Equally, however, one respondent argued that such copyright had resulted in better quality and more data being available.

Copyright and IPR are not only perceived as important in their own right. It is also the significant variations of arrangements existing in Europe which are a major concern. This is particularly important for those that operate already on the European market as a whole. As one respondent put it:

The biggest problem arises from having to obtain data from different owners operating under different copyright regimes ... [which also] leads to delays in supply as individual contracts have to be agreed.

The theme of existing variations in legal status of GI is also evident at the regional level. As Fig. 3 indicates, there is a much higher awareness of Copyright and IPR issues in the Northern European countries than in those in South and East. There are a number of contributing factors to this. In the first place, in those countries where data access or resources or lack of standards are perceived as key issues, copyright features less prominently. In the second place, there are also issues related to the maturity of the market as a whole. Clearly the awareness of copyright arrangements appears to be higher where the digital market for data and services is more developed and where there is greater pressure for cost-recovery, or needs to generate profits.

It is important to underline that these are broad categorisations which hide significant variations to protect the confidentiality of the respondents. For example, one agency within the South/East group argued that:

Copyright and IPR is of major importance not only for the success of the enterprise but for the whole community. So far the production of digital databases [in my country] is totally unregulated and the only legal document that I have used is the EU Green Paper covering issues of copyright and IPR across Europe.

The picture is therefore far from being uniform as could be expected. There is an important issue here about the possible divergence between different regions in Europe in terms of legal framework which may need addressing at the European level if a Single Market is truly to develop.

Data Quality

Data Quality is widely seen as important. It ranked second highest after Copyright, and there are no major variations in the opinion of the respondents on this issue. Those who feel more strongly about it are the operators on the European-wide market where variations in quality are often obvious, and those operating where the markets are less developed such as in Southern and Eastern Europe. Many perceived that the issue of quality is going to get increasingly important over time as data are combined from different sources. It was also underlined that descriptors of quality are still missing or not used.

As quality issues increase in importance, some respondents argued that it will be necessary to develop watermarks certifying the authenticity and quality of the product. On the issue of "fit for purpose", another respondent declared:

In the context of data quality it is necessary to build greater awareness that quality comes at a price and users must understand that each type of application has different quality thresholds. Hence it is not always necessary to demand data of the highest quality.

Data Access Policies

In overall terms the development of clear and explicit data access policies ranked third most important after copyright issues and data quality. The respondents from South and East of Europe rank it clearly highest.

It is however an issue on which there are very strong views on both sides. Some argue that harmonisation of such policies is absolutely crucial either to their business or to ensure citizens' rights to know and monitor government policy. Others argue that the discussion on these issues has not yet been well-focused and that, at the European level, the barriers are so many that it is unlikely to happen in the medium term. A clearer picture of the different perspectives is shown in Fig. 4.

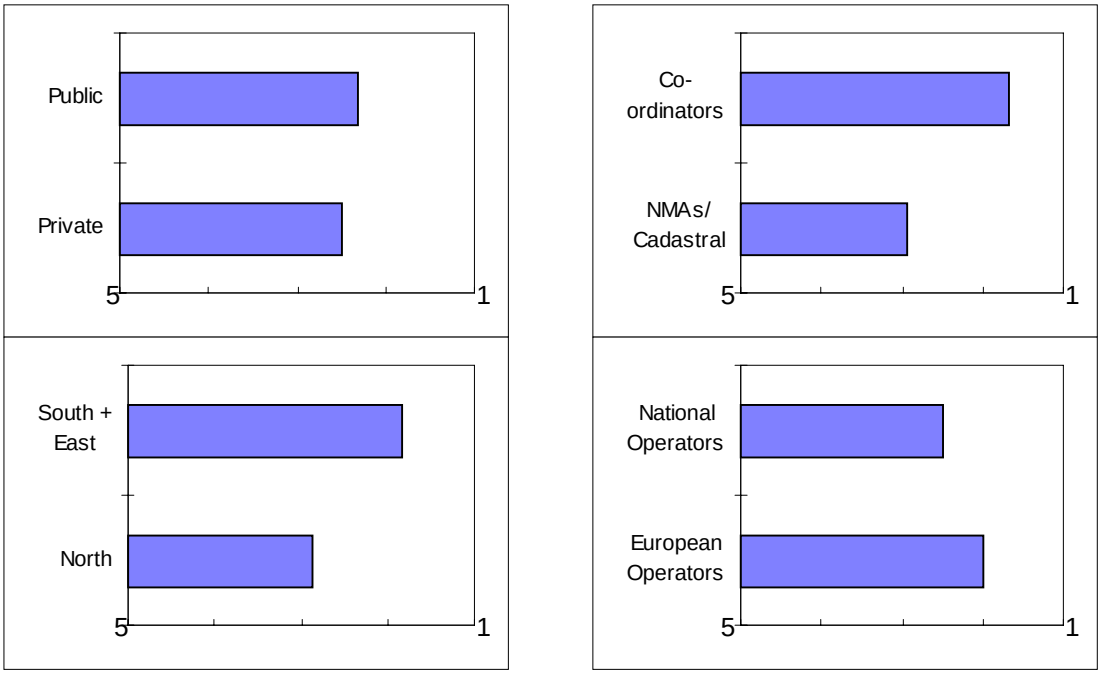

Fig. 4: Sectoral Views of Data Access Policies

The importance of developing data access policies is felt almost equally strong by public agencies and the private sector. The strongest advocates are the public agencies concerned with co-ordinating GI strategies at the national or European level, while the data producers are less concerned about it.

The issue of access has many facets: legal, technical, economic (pricing), institutional (e.g. the role of government and data collected with tax-payers' money), and organisational (the culture of public administration). These viewpoints are clearly reflected by the respondents who link in some instances a policy of data access to the development of public domain and/or free sharing of data among public agencies, while others focus on excessive pricing as a barrier to access. Others still are more concerned by their difficulties in raising awareness in the public administration and overcoming what are perceived as agency feuds. This view is felt particularly by the national agencies in charge of developing GI strategies and co-ordinating other organisations in the public administration.

The most important problem is the institutional structure. This can be seen as a kind of data access issue, but is not quite what is commonly understood under this heading. Most geographic data originates in the public sector (above 50%) and the public sector is not interested in distributing its data mostly due to the public accounting methods, where income does not flow back to the originator [i.e. any profit goes to the Ministry of Finance]. Several fears such as that data could be copied and falsified, or possible differences between the data collection rules for public use and private interpretations, possibly even low quality and errors which could become visible, are not balanced by advantages for the seller. Therefore the data are collected, but not made available.

Privacy

This issue does not appear to feature very prominently yet. However, as the market develops, there is a general consensus that its importance will increase substantially. The problems are clearly not so much related to environmental or cartographic data as to the integration afforded by the use of GI, and the increasing number of digital databases becoming available which contain personal data and postal addresses. It should also be noted that the people who might be most concerned about personal privacy from these developments were not interviewed in this study though a number of respondents deliberately spelled out the views of others who would be most anxious over threats to privacy.

Privacy is regarded most seriously by those in the South and East of Europe than in the North. This somewhat unexpected result can be largely attributed to the fact that in Northern Europe this issue has long been an important one with legislation to protect privacy in some countries (e.g. the Nordic ones) pre-dating European initiatives, while operators in the South and East of Europe feel less well protected.

Liability

Liability of data providers for errors in the data is not yet perceived as being a serious issue. Most argued that it will become so when the market develops further but that for time being it is not critical. Although there are no significant variations on this view across the spectrum of respondents, it is significant that the only respondent who gave this issue top ranking operates in one of the most developed markets in Europe.

Security of Data Bases

In overall terms, Security of Databases scored at a comparable level with issues of privacy and liability. It is clearly perceived as important but not something of crucial importance. In general, it is seen a technical issue and it is somewhat taken for granted that attention has to be paid to security to avoid unauthorised access or misuse.

Public Domain Data

This issue features relatively low on the list of priorities of the respondents, but there are significant variations within each group. It features quite highly for the national GI co-ordinating agencies and for

many of those who operate at the European level. In some cases "public domain data" is equated with "free data", but this is not always the case, as the quotes below suggest:

The view that 'data is too expensive' is often the initial position of those who do not understand the cost of maintenance, etc. Typically, a learning experience occurs and people come to terms with having to pay something for it.

Public domain data and data access issues are closely related and are critical for the obligations to open government. However, there are potential problems of information overload, often of low or uncertain quality, which makes it difficult for people to evaluate alternatives to government policies in anything like a systematic way.

The provision of public domain data at no cost is an important objective but this may only happen if the EU takes steps to ensure that the governments of the member states control of their mapping agencies. This argument runs contrary to the market forces one but market forces left to themselves can never meet this requirement.

The often diverging views on this topic support the opinion of several respondents who argued that, on the whole, the debate is still unclear and the case for public domain data in terms of costs and benefits has yet to be made convincingly.

Provision of Minimum EU-wide Geographic Data Base

Of the eight issues investigated, this is the one that has the lowest priority for most respondents. It was either dismissed as unimportant to their present business (by some NMAs) or as an issue for which the business case as yet to be made. Only the European operators and to a degree the national co-ordinating agencies felt it as relatively important.

The regional differences between North and South reflect to a degree the relative development of the GI market and the perception that a policy of creating a minimum geographic base data set for Europe would provide resources for the less favoured regions to implement it.

Other Key Issues

There are surprisingly few additional issues which the respondents felt are of great importance for the development of GI industry. They are listed below in no particular order of importance.

- *Standards*: some respondents felt that data and interoperability standards must be include in the list of priorities. They also argued that the key issue is not related to the technical aspect of developing standards (as the European progress made in this direction shows), but the extent to which they will be widely accepted and the costs of implementing them.
- The Maintenance and Updating of cartographic and administrative data which is essential for fair taxation and the management of property rights. As the European Single Market develops these issues will have an ever increasing importance for their impact on the equal treatment of European citizens and the mobility of workers.
- Fostering of a *culture of data sharing* and integrating in public administration at national and local level
- Defining more clearly the *role of public and private sector* agencies so that conflicts of interest are limited and synergy/partnership may develop further. The public sector must set policies and has charges which cannot be covered by the private sector easily; public sector agencies are compensated for these public services. Other services can be produced equally wel by either sector and it is important that the public sector does not exploit its position unfairly. This requires equal access to data, similar accounting principles etc. for private and public sector organisations - at least in the domain where their activities potentially overlap.
- Greater awareness in the public administration of the potential value of *remotely sensed data*.

These issues can be subsumed under the topics already listed.

National/Regional Issues

The interviews related strongly the disparities that exist in Europe in terms of data provision and frameworks of incentives and regulations. These differences are not only between North and South, but also between small and large countries and relatively centralised and highly fragmented ones. More than one respondent was critical of the role of the respective NMA:

Some national agencies still want to keep information for themselves and do not see the need for wider dissemination.

This points to organisational and cultural issues, which change very slowly and large differences between countries exist:

The GI sector is evolving but the institutions have not changed yet. In the longer term this seems desirable and inevitable.

Another important issue is that there are very significant differences in public sector resources devoted to GI across the EU and beyond (such as in Central Europe) which affect the ability of the local and national governments to meet quality standards, plan and monitor their physical and man-made environment. Increasing cohesion among the European regions and preparing future applicants to the EU for a smooth transition is a major challenge to the Commission.

Changes in 5-10 Years

Future technological and political changes are widely anticipated as affecting the relative importance of the issues identified above. A significant finding is that the importance of almost all the factors are set to increase as the market matures and more and more digital GI becomes available and is used. This is particularly clear for issues of Copyright, Liability and Privacy but also for the need for European-wide Reference Frameworks and Data Access Policies. The views on the need for Public Domain data remain somewhat mixed, with some rating it very highly and others rating it at the other extreme.

Barriers to the Development of the GI markets

The message from the respondents on these issues is extremely clear, as shown in Fig. 5. There is almost unanimous agreement that lack of awareness at political and management level across national and local governments - as well as in the private sector - is by far the most important barrier. This key factor is taken to include the lack of adequate education and training in the handling of GI and in the many *non-technical* issues related to the use of GI.

The lack of a critical mass of digital data is also perceived as being a barrier although there are clear regional variations between the countries that are relatively well endowed and those in the South of Europe where this is perceived as being a major barrier.

The lack of standards for data documentation and transfer is also perceived as less important, although again there are regional variations. In many cases it is felt that considerable progress is being made in this area and the important question is one of how much it will cost to implement any agreed European standard rather than whether one is needed.

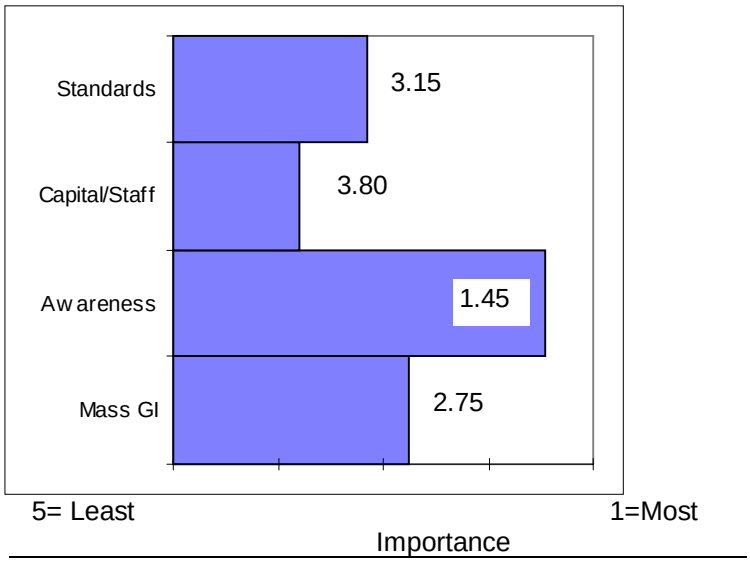

Fig. 5: Barriers to the Development of the GI Market in Europe (Mean Score is Indicated)

Finally, it is important to note that the issues facing the GI industry in Europe are not primarily related to lack of capital and/or staff, although there is an issue of adequate skills.

There are however some differences in the perspectives as shown in Fig. 6. They are essentially geographic and reflect the different maturity of the GI market. As the Figure shows, in the private sector and in the Northern European countries there is unanimity that lack of awareness and education is by far the most important barrier. This is followed by lack of a critical mass of GI, standards (at some distance), whilst lack of capital appears often as the least of the problems.

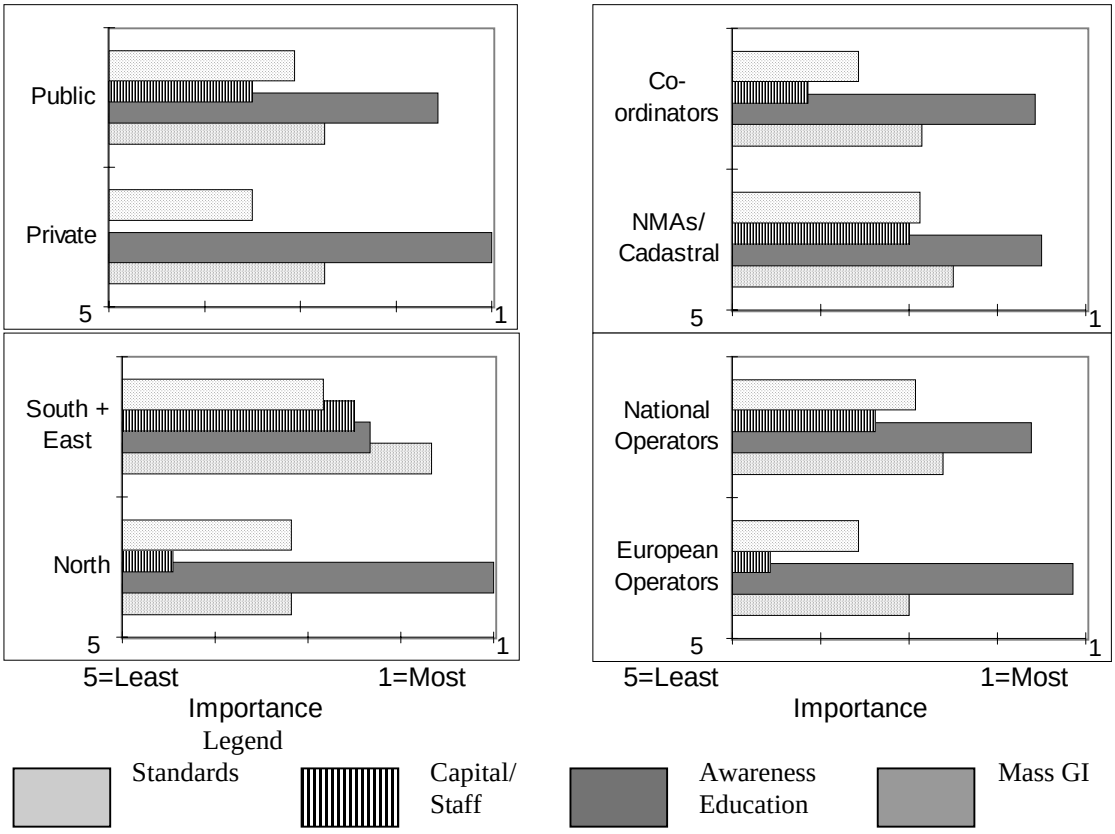

Fig. 6: Sectoral Views of the Barriers to the Development of the GI Market in Europe

In the Southern/Central European countries, the lack of a critical mass of digital GI, and/or users, is perceived as the biggest obstacle to the development of the market. In some respects, the lack of awareness and education is perceived to be a consequence of the lack of data, but it could also be interpreted the other way around. Often in this group of countries the biggest barrier is not so much the absolute lack of digital data as the fragmentation of data sources due to the absence of a clear framework of responsibilities for the collection and distribution of data, and the lack of awareness of its value. This fragmentation leads to a variety of approaches and standards and reinforces the scepticism about data sharing, particularly in the public administration. It is important to note that the lack of resources, capital and staff, is much more important in this group of countries as well as standards.

Two other important issues need to be highlighted. The first is that lack of awareness is particularly acute among politicians and key decision-makers at European, national and local level. Hence some targeted action is needed to raise this awareness in partnership with national associations. Second, that the respondents made it clear that, in relation to education, what is needed is much more than technical skills in handling computer hardware and software. Extremely important and in need of improvement are analytical skills - to extract information out of the data - and a whole suite of other skills including the awareness of legal, social, and economic issues relating to the developing GI market. As one respondent said:

We need simple geographic data but sophisticated data services to build a much wider use of GI.

RECOMMENDATIONS

First the opinions of key decision-makers for three widely discussed issues where the Commission could play an active role are presented. Then follow the recommendations, which were derived from the results of the interviews and other sources to

- create enhanced awareness of the issues, and
- indicate how specific issues can best be resolved.

The recommendations address the issues ranked highly by the key decision-makers. Most of the problems found were clearly of a non-technical nature and caused by administrative, cultural and legal rules. The major issue is the lack of awareness of the potential benefits of GI and in particular a lack of insight how the administrative and legal problems can be solved. Therefore a number of actions to raise awareness and to develop solutions to the highly ranked problems are proposed. There is a need for individual projects which demonstrate solutions and to widely publish the methods used, the legal constructions employed and the marketing strategies developed, so called 'best business practice' projects. These will further demonstrate how far the current solutions are sufficient and where additional actions by the commission are required.

In general, the issues identified as important for a European data policy are also relevant for the GI market. Further development of these issues is important, and in most cases the solutions found for the general case are valid also for the GI case. GI is particular and requires some special modifications of the general rules. It will be necessary to ensure that the working groups treating the issues in general consider the particulars of GI. Most of these issues will increase in importance as the information market grows and matures.

European-Wide Issues and Role of the Commission

In the GI2000 initiative, the Commission identified three important issues for a European GI policy and the key decision-makers were given an opportunity to rank them. From their responses the following order results:

- EU-wide Access Policies,
- Base Reference Framework, and
- Metadata Standards and Services.

Developing a European Access Policy for GI

The Commission has an important role to play in developing and promoting common Data Access Policies. These policies seem to vary quite considerably across the EU and it is felt that only the Commission can act to create a framework of certainty for business and citizens alike. The respondents rated the development of common GI access policies, which may also have to include issues of pricing, copyright and IPR, as the most important of the three issues, and one in which the role of the Commission is absolutely vital. The views are however relatively polarised. Greater concern was expressed by those that already operate at European level and by the national GI agencies, with the argument that

European data access policies are by far the most important issue. By comparison the others are less important.

Decision-makers point to the very complex problems caused by the big cultural, political and financial barriers and the very large problems within several countries (e.g., Germany) - despite some exceptional areas of uniformity (e.g., the Scandinavian countries). It was pointed out that very little real factual knowledge about national policies exist and that without such knowledge European directives would be counter-productive. Sectoral solutions may be possible and enforced by markets, e.g., road data for car navigation.

Developing a European Base Reference Framework for GI Including Base Topographic and Socio-Economic Data

There is some agreement that a base at 1:250,000 scale would be appropriate although some applications clearly need greater detail. To develop such a reference base - which should also include basic statistical data and a gazetteer identifying geographical locations, would require major inter-agency co-ordination

and significant investment particularly if it involved changes to national systems or running parallel operations to satisfy existing local consumers and future European ones. In respect to the development of this base, the possibility of exploiting the military V-MAP was also noted. The geodetic framework already exists (EUREF), and the Commission could do a great deal to get it promoted and accepted.

The demand for this common framework is perceived by some as still weak and one could argue that the Commission, which is the major user of European-wide data, is first to clarify its internal needs and see how the market can meet them best.

Developing Metadata Standards and Services

Metadata is important - but it does not seem an area in which major EU investment is needed. By and large, the message is that such developments are best left to the private sector and the national agencies, building from the 'bottom up'. What the Commission should do is to provide general guidelines to reduce inconsistencies and some financial support as such services are unlikely to be self-financing in the short term. In the eyes of some of the respondents there is a clear role for the Commission to foster co-ordination so that the European users can more easily identify what is available and make better use of it.

Recommendations to Create and Enhance Awareness of Issues

The overall view of the key individuals interviewed is that the European GI market is on the whole still immature and characterised by significant regional variations. There are differences between northern European and South/Central European countries, but there are also wide variation within a country or within an application area. There are opportunities for rapid development both at national and at European level. To avoid major distortions in the development of this market and increasing disparities among the European regions, the Commission needs to consider action on a number of fronts:

- Continue to raise awareness on GI issues across Europe. Unexciting as this may appear, it remains by far the most urgent task. In terms of awareness, particular efforts must be made among officials at the European (i.e. within the Commission itself), national and local level. Efforts should concentrate to inform middle and higher level managers about the potentials and benefits of GI and demonstrate to them the benefits. There are significant fears and it is necessary to address in detail and with respect to the national situation, how the difficult administrative and legal issues can be solved. Dissemination of technical knowledge is much less needed. In order to reach these individuals, national (or regional) short courses, lasting 1 to 2 days could be provided in the national language.
- In relation to education, the message from the respondents to this study is that the breadth needs to be expanded to include issues of spatial analysis, but also awareness of the legal, social, and economic aspects of the digital market. Students are often educated in technical issues, sometimes in economic and legal aspects. There seems to be a lack of entrepreneurial spirit to identify market opportunities and to assess the feasibility of new products. Model curricula giving examples how such topics can be addressed within a GIS course, could be developed.
- Continue to provide financial support through the Structural Funds to the poorer regions in the EU for the development of their internal GI market. This includes support for data sharing arrangements and meeting quality standards, and for projects modernising public administration in order to build a critical mass of GI and GI users. Actions along these lines were already present in the Fourth Framework and need to be continued.

Recommendations to Resolve Specific Issues

The recommendations to resolve specific issues concentrate on the issues which the key decision-makers have ranked highest. The recommended actions are not addressing technical issues, as these were in general thought to be mostly solved or at least not to pose major obstacles, but address the practical, mostly administrative and legal issues which hinder the development of the GI market in the EU.

The ranking of the issues indicated that an issue was perceived as important. A high ranking did not automatically imply that a policy action on the EU level was identified and deemed necessary, but that guidelines how to address the issue in the business context were missing. Therefore as a major measure we propose a 'best business practice' programme, to develop and disseminate practical solutions to the issues identified. Only if the current legal and commercial framework does not permit an acceptable solution, are specific policy actions of the Commission required.

- A ‘best business practice’ program would continue the successful projects from the INFO2000 program, which already has a double focus on technical and business issues. The current impediments are more legal and economical and a new program should concentrate on these. Even though the transfer of solutions to new areas is not as simple as for technical issues, the publication of the approaches of different projects, successful or not, is very important for others to understand how this market operates. The publication of model contracts for access to data models for rational pricing schemes etc. can be used by other interested parties as a blueprint to solve their similar problems.

Copyright

The differences in the copyright and IPR regimes in Europe are a major barrier to pan-European GI. The effect of the new database directive is not yet clear. An assessment is only possible after the directives have been translated to national law (deadline 1.1.98, but experience shows that countries may lag behind considerably). If possible, efforts should be made to harmonise the national copyright regimes for geographic data.

Two actions can be recommended:

- Model contracts to demonstrate how copyright issues can be dealt with under the current legislation in different countries should be established and published to foster new businesses. This will also help to determine the areas where serious deficiencies exist, with or without the implementation of the database directive into national law.
- The copyright and IPR issue is not particular for GIS, but it is one of the issues generally important for the development of the IT market. Significant progress has already been made with the Green Paper on Copyright (COM(95) 382) and its recent Follow-up (COM(96) 586), but there is a need to verify the extent to which the particular features of GI are covered by these proposals and to amend them to include the GI market necessities.

Data Access Policy

Develop an access policy for GI across Europe is a very complex task with a series of strands: legal, institutional, organisational, economic. It includes copyright and pricing, the possible development of a European public domain, but also issues of fostering a culture within public administrations for the sharing and re-use of the data collected. To achieve an optimum for society, this requires a clearer definition of the role of the public sector and the relationships between public and private sector. There exist external benefits arising from efforts of public agencies to establish a geographic data infrastructure. To reap maximum benefits for society from these investments, ‘equal opportunity’ must be achieved for the emerging GI business with respect to the public sector. Under the right circumstances, from relatively small public investment in a geographic framework, substantial new business opportunities may emerge. The impact of guidelines for data access policies for the creation of new businesses and new jobs must be assessed. Independent of the division between private and public sector agencies managing geographic data, the right to access geographic data by the public at large and science, which is crucial in a democracy, must be preserved.

It can be seen that different problems and solutions apply for the large-scale and the small-scale geographic data. There are some technical reasons to treat small-scale and large-scale geographic information differently, but most of the differences observed result from the organisation of its collection, management and usage. It follows that policies must respond to these differences in order to be effective.

Access to data is mostly hindered by the lack of a mandate of the bodies which have the data to disseminate them: Local authorities, which are most likely the largest producers and consumers of geographic information have typically no mandate at all to make their data available. Administrative and legal considerations restrict access to these data. The mandates of NMAs and the corresponding accounting rules do not in all countries encourage giving access to the data. There is seemingly nobody who has a mandate to integrate data at a European level and to organise distribution of pan-European data sets.

The emerging business in GI is hindered by complex and restrictive access to data. National diversities in access policies make the construction and marketing of European GI products very difficult. It is suspected that some of the public agencies which collect data use their own data to

compete unfairly in the commercial market. It is recommended to investigate how the concept of 'universal public service', including equal access to data and an obligation to contract can be applied to geographic data.

The interest of the general public must be explicitly considered. Geographic information is necessary for the proper functioning of democratic government: many of the political discussions are eminently spatial – in particular the environmental issues – and for their rational and democratic solution, geographic information is necessary and must be available to both parties arguing an issue. This includes also the use of geographic data for scientific research. These interests to conflict with economic interests of agencies holding data which has potential market value and with the right to privacy of people.

The Commission is the only organisation to develop such complex policy, which should result in service delivery more equally distributed across the EU. It must balance the interest of the market but also address the citizens' rights to be protected and have access to data crucial for political discussion. The first step is to build a systematic view of current data access policies across Europe, identify similarities and differences, and where harmonisation is possible. The task could separate access to large-scale and small-scale data and treat small-scale data first. Then only differences which impede the Single Market for GI need to be addressed. The role of the Commissions, as major users of pan-European GI will also have a major impact on this issue (see next subsection).

From the understanding of the current situation and the analysis of the examples of successful collection of pan-European data, which could be further developed with case studies and examples, it will be possible to chart a plan for action on this strategic issue, which may have major implications for the development of the Single Market.

- Continue to provide financial support to the poorer regions of the EU for the development of their internal GI markets. This includes support for data sharing arrangements, projects to meet data quality standards and efforts to modernise public administration in order to build a critical mass of geographic information and users.

Minimum EU-Wide Geographic Information Base Data

- There is an urgent need to identify the internal needs of the European Commission for European-wide data and improve its internal co-ordinating mechanisms. As the major user of European-wide data at this stage, it is clearly in the Commission's interest to clarify its needs and identify the appropriate mechanisms to satisfy them. This in turn may be extremely beneficial in supporting the development of the European market. By improving its internal co-ordination it will also increase its credibility when asking national agencies to do so as well. Several respondents were quite critical of the apparent lack of co-ordination between EU requests for data.

The within-EC liaison in regard to GI must be improved. If the EC cannot get its house in order, its credibility for urging this on a much wider and less controllable domain is small.

With respect to the creation of a minimum EU-wide geographic information base data, many felt that this would be best achieved from the 'bottom up' rather than imposed from the top, and that the role of the Commission is essentially one of supporting existing mechanisms like MEGRIN and in providing financial support. The latter may be particularly needed in the poorer regions but also to support the need to run parallel systems over an extended period, one to meet the demand of existing local users, and one to meet putative "European" users.

Metadata

Metadata are essential for interoperability and data exchange, particularly for international exchange and trans-national border projects.

- The commission should support co-ordinating measures for the development of metadata standards and services undertaken by the private sector or national operators. No major funding is required from the Commission in this area but ways to reduce fragmentation of initiatives may be appropriate as well as some financial support in the short term as these services are unlikely to be self-financing.

Issues of Emerging Importance

The issues above appear as being those on which specific attention is needed urgently. In the longer term, two other issues will increase in importance and require attention: legal liability for data quality and protecting the privacy of individuals. The respondents to this study clearly feel that these two issues will increase considerably in importance over the coming years as the market matures and will require some co-ordinated approach across Europe.

The other issues explored with the key decision-makers are, of course, important and by and large are set to increase in significance as the market develops. They are not, however, issues in which the Commission has a key role (e.g. issues of data quality, or security of data bases), or where priority action is needed (e.g. standards, capital funding), or where the business case has yet to be made convincingly (public domain, European-wide core data set).

Liability

Efforts to define methods to assess quality of data and to make operable statements of the fitness for use of data are very difficult for spatial data. Unlike other data, spatial data are collected, managed and distributed at different levels of detail, and providers must be able to define the quality of the data provided to prevent users from misuse of the data for purposes they were not intended for. This issue is particular for spatial data and is in addition to the general issues of liability for data as they apply generally to all IT markets and are already studied within the Commission. It will be necessary to monitor these general studies to recognize issues which need particular solutions for GI.

Privacy

The GIS technology provides the methods to combine data from different sources and integrate it based on location. The use of postcode and postal addresses opens new opportunities for business, especially marketing, but introduces at the same time dangers such as invasion of privacy.

Spatial statistics research has developed mechanisms to deliver census data at detailed levels while protecting confidentiality. Potentially, these mechanisms can be bypassed with digital geographic data and GIS, defeating current rules for the protection of privacy. Particular rules for spatial data and spatial data integration may be necessary to find the optimal balance between the interests of business, individuals and the public at large.

Standardisation

Standardisation of reference systems, both co-ordinate and non-coordinate (location name based) would greatly reduce the cost of integration of data from different national sources. A European common geodetic framework (EUREF) already exists and deserves more publicity. Standardised metadata descriptions or at least compatible description of standards and making metadata widely available, helps potential users to find data and enable them to judge their value and usability. The interoperability standard - developed mostly under US guidance - should be adapted to the European situation.

Data Quality

Data are often perceived as too expensive and not used. The cost of data collection and updating is high if high quality data must be produced, but high quality data result often in higher benefits. It is currently not possible to quantify in general these relations. Best business practice studies could demonstrate for individual projects the relation between cost, data quality and benefits in order to educate potential users.

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ANNEX A:
REPORT OF INTERVIEWS WITH KEY DECISION-MAKERS IN EUROPE ON GEOGRAPHIC INFORMATION POLICY ISSUES

Prepared by
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Introduction to the Study

Introduction

This document analyses the results of 20 extended interviews with senior personnel in key organisations responsible for the collection and supply of geographic information (GI) and key organisations which use geographic information. These interviews were conducted in December 1996-January 1997 by the authors, namely Professor Peter Burrough (University of Utrecht), Dr. Massimo Craglia and Professor Ian Masser (University of Sheffield), and Professor David Rhind (Ordnance Survey of Great Britain). The authors are grateful to all those who have participated in this study and to Professor Andrew Frank who has provided additional information resulting from his discussions with a number of key policy makers. The aggregate results here described represent the sum of the views expressed: in no sense do they represent the individual views of the authors or, indeed, of any one of the individuals or organisations consulted.

Objectives and Scope

The objective of this study is to help identify and clarify issues relating to data policy which are specific to geographic information as opposed to issues which relate to all information or to the information market generally. Given the range of initiatives that have recently taken place at national and European level on geographic information, this study is particularly concerned with getting the views of key-decision makers in Europe who are either in the position to shape their national government's policies on GI and/or would be called to implement national and European policies in this field.

Scope

This study focuses on the results of the 20 interviews conducted by the authors with key decision-makers in Europe in the field of GI. Additional information was provided by Professor Andrew Frank as part of his discussions with key individuals in Austria and Germany, and by colleagues in Hungary. Given the objective of the study, every effort has been made to obtain interviews with the most senior individuals in the organisations identified, to have a broad coverage of countries without over-representation of one or two in particular, and to include a wide range of perspectives such as those of public and private sector, data producers and users, agencies responsible for co-ordinating GI strategies in their country, and European co-ordinating organisations. It is not the objective of this study to duplicate the extensive surveys undertaken by the other two concomitant studies GI-BASE and GI-META (see 1.3 below), and therefore it does not claim to be exhaustive. Finally, this is only part of the GI-POLICY study contract executed by Dr. Meixner and Professor Frank (see 1.3 below).

Background to Study

In August 1995, the European Commission's DGXIII invited tenders for three studies within the framework of its GI2000 initiative: GI-BASE, GI-META, and GI-POLICY.

GI-BASE is concerned with an assessment of the current market for geographic information in Europe, and has to survey existing data sources and services. It must also identify the core of geographic data themes that should be standardised across Europe, and identify the business case for doing so.

GI-META is concerned with the feasibility of providing European geographic information metadata services by reviewing existing local, national and international metadata services, examining the costs involved in creating and maintaining metadata services, reviewing the interconnection options available via EU-wide information networks, and presenting a set of possible implementation scenarios to suit different levels of preparedness for both offering and using such services.

These two studies have been conducted in close parallel to ensure consistency of approach to metadata and data, and have pooled resources to collect data via a combined survey which was included in the June 1996 issue of GIS Europe. This survey aimed in particular at identifying the existing and future market for GI and at evaluating its costs and potential benefits.

The aim of the GI-POLICY study is to examine issues relating to data policies to determine if there are special elements which relate to geographic information. In particular, the invitation to tender identified a minimum list of issues to be examined by the study, namely: privacy, copyright and

protection of databases, data quality, liability, security of data, data access policies, minimum EU-wide geographic information base data, and public domain data.

As part of the specified methodology, it was required that the contractor undertook:

- interviews with senior representatives of key organisations responsible for the collection and supply of geographic information,
- interviews with senior representatives of key organisations which use geographic information

The contract was awarded to an international consortium led by Dr. Harald Meixner, Vienna, and with the scientific co-ordination of Professor Andrew Frank (Technical University of Vienna). A Steering Committee was also nominated to include the authors of this report.

In recognition of the significant contributions already made by the Steering Committee members to the study, it was agreed that their duties would be completed by carrying out a final round of interviews with 20 individuals who are centrally involved in GI policy formulation or who influence it, and by providing comments to the final report of the study as necessary. The contents of the interviews were agreed between the authors of this report and Professor Frank and the agreement was formalised in individual sub-contracts between Dr. Meixner and the Steering Committee members. This report fulfils the requirements of these contracts in relation to the interviews with key decision makers in Europe.

Structure of the Report

There are three other chapters to this report. Chapter 2 provides an overview of the methodology, topics discussed, people contacted, and general findings. Chapter 3 examines in greater detail the key issues discussed in the interviews highlighting any difference in perspective between the different groups contacted such as public and private sector, data providers and users, nationally oriented or European-wide operators. This chapter also analyses what are the perceived barriers to the further development of the GI market in Europe, and in what areas it is felt that the European Commission has a particularly important role to play, over and above what can be expected of national governments within the framework of the subsidiarity principle. Finally, Chapter 4 summarises the findings and draws the main conclusions.

A copy of the questionnaire and the complete list of people contacted in this study are included in the Appendices.

Overview

Methodology

The methodology adopted for this study draws on the considerable experience of the authors in research of this kind. It also draws upon personal contacts accumulated over the last twenty five years in the development of the GI industry. Though the use of such personal contacts might seem liable to induce bias, the range of people known to the four authors and the senior positions which those questioned have attained suggests that such bias will be minimal. To an extent, the diversity of the views encountered also indicates that systematic bias in the opinions does not exist in the responses to this survey.

At the outset it was clear that a postal questionnaire was inappropriate as these tend to have a low return rate at the best of times; also, the authors were targeting key decision-makers in the field of GI who by their very nature are extremely busy and are unlikely to find the time to answer a postal questionnaire. Hence it was agreed to conduct telephone interviews which have the advantage of high response rate as well as offering the opportunity of exploring in greater detail a number of issues arising during the discussion. Given the qualitative nature of this study this approach was essential as many definitions could be interpreted in different ways and this cannot be checked or clarified in postal surveys.

In view of the positions held by the individuals interviewed who are all high ranking officials or businessmen, it was also decided to keep the questionnaire (see Appendix 1) as brief as possible and to focus on the key issues. Detailed technical questions were felt inappropriate in a study focusing on policy matters.

It was equally agreed that the questionnaire would be faxed to the individuals concerned before the interviews to give them an opportunity to think about the issues and consult when necessary with others in the organisation. This strategy proved very appropriate as, by and large, individuals in the private sector at the helm of a company were able to answer all the questions and give additional views directly

whilst some of the high-ranking government officials interviewed thought it appropriate to consult widely in their own organisation and beyond before the interview.

All questionnaires were sent in English with a covering letter in the national language where appropriate. The interviews were conducted when possible in the native language of the respondent to avoid possible misinterpretations and increase the richness of the information provided.

The agreed questionnaire has provided the essential framework for comparing and analysing the interviews. However, it was agreed that it would only provide a common thread around which different issues could be explored as appropriate during the course of the interview.

This methodology achieved a 100% response rate as all of the individuals contacted were willing and able to respond to the survey.

A draft of this report has been sent to all the individuals interviewed to give them an opportunity to comment on its findings and clarify any possible misinterpretation.

Topics Discussed

The topics discussed during the interviews can be divided into five sections.

The first section grouped questions addressing the key concerns of the European Commission as identified in the invitation to tender of the GI-POLICY study, namely:

- privacy (protection of the individual)
- copyright and other protection of intellectual property rights
- data quality
- liability of data providers for errors in the data
- security of data against unintended use or disclosure
- data access policies (How to find data? Who may access them? At what price?)
- the provision of minimum EU-wide geographic base data
- public domain data (should some geographic data be free of legal protection and accessible at near-zero cost to all?)

For each of these issues the respondents were asked to give an order of priority ranging from 1 (most important) to 5 (least important). In addition, they were also asked whether they felt that other issues of significance to their concern were missing in the above list and, in the case of multiple issues having the same level of importance, whether they were able to prioritise them. In many cases this proved unnecessary as the answers were reasonably clear. However, the very act of asking this particular question of priorities often forced the respondent to think more carefully at the scores given and critically evaluate their choices.

The second section is more speculative in nature and includes a question on the expected changes over the next 5-10 years, and the impacts of these changes on the relative importance of the issues listed above. The type of changes was not specified in the questionnaire thus leaving the respondent to focus on those aspects which they felt were likely to be dominant, such as technological changes or political ones.

The third section included only one question but provided an opportunity for the respondent to focus on particular national or regional issues. This is important in two respects. First it provided useful information in its own right and second, having clarified the national/regional picture, the respondent could more easily focus their attention on those issues which are distinctly European in character.

This European focus was embedded in the fourth section of questions which focused on three of the core elements of the GI2000 initiative, namely the need for European level action on:

- developing a Pan-European Base Reference Framework for GI including base topographic and socio-economic data;
- developing meta-data services and standards;
- developing a general policy for access to geographic information across Europe.

In this section, opportunities were also given to the respondents to identify other issues which in their view need particular attention by the European Commission.

The final section of the questionnaire focused on the perceived barriers to the development of the GI market. These were grouped under four main headings which the respondents were asked to prioritise based on their experience:

- lack of a critical mass of digital data
- lack of awareness, education, and training
- lack of capital and/or personnel
- lack of standards for data documentation and transfer

As mentioned in the previous Section 2.1, the topics covered in the questionnaire and detailed above provided only the minimum list of issues that all interviews had to cover for the sake of comparability. As Chapter 3 will show, a number of other issues which deserve serious attention emerged during the course of the interviews.

Organisations Interviewed

The organisations interviewed span 12 European countries and include:

1) Four private companies operating at national and European level:

- Geodan (Netherlands)
- Eurosense (Netherlands)
- TeleAtlas (Belgium)
- GeoInformation International (UK)

2) Two European wide organisations prominent in the GI field

- EUROGI, the European Umbrella Organisation for Geographic Information
- CERCO, the European Organisation of the Heads of National Mapping Agencies

3) Five national associations or agencies for GI which in some countries such as the Netherlands, Italy, and Portugal are also responsible for co-ordinating GI matters:

- RAVI (Netherlands)
- DDGI (Germany)
- AIPA (Italy)
- CNIG (Portugal)
- HUNAGI (Hungary)

4) Eight national mapping and cadastral agencies in

- Finland
- Sweden
- France
- Great Britain
- Ireland
- Italy
- Greece (in Greece both the National Mapping and Cadastral Organisation and the Hellenic Military Geographic Service were interviewed)

5) A Dutch research and policy institute focused on European environmental issues

- RIVM

Additional information on Austria and Germany was collected by Professor Frank and has been drawn upon where appropriate.

For the purpose of analysis, the organisations listed above have been grouped into a number of categories and their perspectives analysed in pairs: Private sector vs. Public sector, National Organisations vs. European-oriented ones (which include CERCO and EUROGI, and the private sector companies operating on the European market), Data Producers (National Mapping Agencies and Cadastral Agencies) vs. Co-ordinating Agencies (CERCO and EUROGI and the national associations or GI co-ordinating bodies), Northern European vs. Southern and Central/Eastern European. Therefore, each organisation features in more than one category and anonymity is preserved without loosing richness of details. It should be clear however, that this categorisation is for analytical convenience only and does not imply that the views within each group are homogeneous.

Overall Findings

The Eight "Hot" Topics

With respect to the eight issues identified by the Invitation To Tender document as being of critical concern to the Commission, Figure 1 below summarises the main findings.

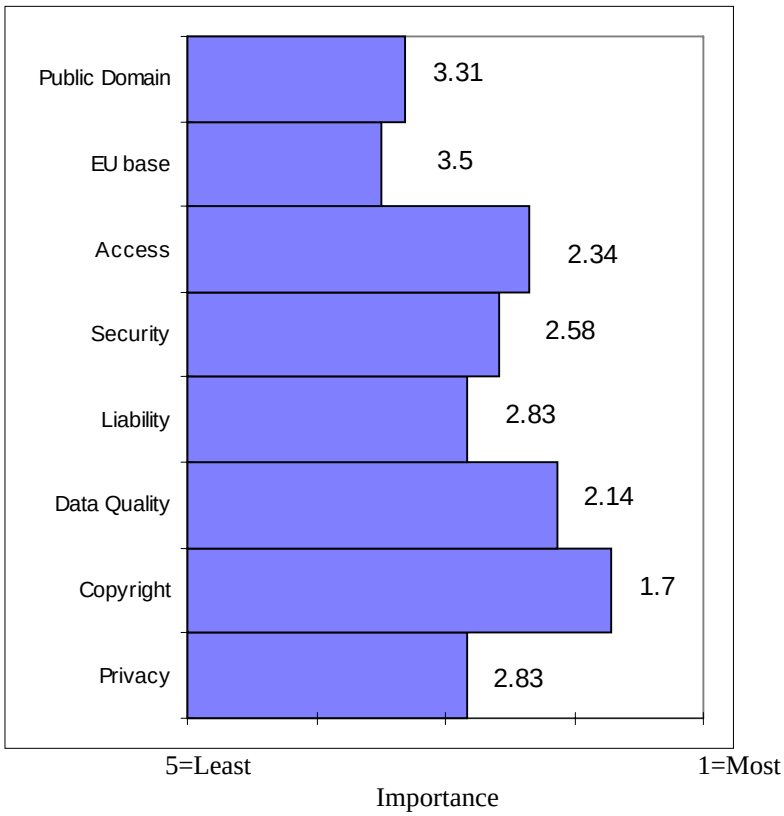

Figure 1: Summary of Findings on Key Issue (Mean Score Indicated)

As the figure shown, the key concern of the respondents relates to the protection of Copyright and Intellectual Property Rights. There is a clear majority seeing this as the most important issue, particularly among the data producers (National Mapping and Cadastral Agencies) and the private sector organisations who produce value-added services and products.

The second most important issue is Data Quality, which is rated highly across the spectrum of organisations.

Third most important is developing Data Access Policies at the European level, although many recognised the considerable difficulties that this poses in overcoming the different legal traditions and frameworks existing in Europe. Again there is a broad degree of consensus on the importance of this issue across the spectrum of organisations. The few who have not rated it highly are, by and large, operating in countries where a well-established data access policy already exists.

Besides the relatively clear prioritisation of these three issues, the other five are more or less balanced with some greater concern for the Security of Data, particularly in the private sector, Liability and Privacy than for a European-Wide Base Data and Public Domain Data. The differences however are small in overall terms and, given the qualitative nature of this research, it would be inappropriate to read too much into them. It is also clear that even those issues which are perceived in *relative* terms as less important than others still feature highly in *absolute* terms and need addressing at both national and European levels.

Changes in 5-10 Years

Future technological and political changes are widely anticipated as affecting the relative importance of the issues identified above. A significant finding is that the importance of almost all the factors are set to increase as the market matures and more and more digital GI becomes available and is used. This is particularly clear for issues of Copyright, Liability and Privacy but also for the need for European-wide Reference Frameworks and Data Access Policies. The views on the need for Public Domain data remain somewhat mixed, with some rating it very highly and others rating it at the other extreme.

European-Wide Issues and Role of the Commission

In this section of the questionnaire, the respondents were asked to evaluate the relative importance of three main issues: EU-wide Access Policies, Base Reference Framework, and Metadata Standards and Services.

Considerable variations exist in the responses, ranging from those who feel that all three are crucial to their business to those who argue that the business case for these developments has yet to be made convincingly.

Overall, the majority - but by no means all - felt that the Commission has an important role to play in developing and promoting common Data Access Policies. These policies seem to vary quite considerably across the Union and it is felt by the majority that only the Commission can act to create a framework of certainty for business and citizens alike.

On the issue of a European-wide Reference Framework, there was a greater range of views but many felt that a common framework for topographic data at a notional 1:250,000 scale would be appropriate. Many felt however that this would be best achieved from the 'bottom up' rather than imposed from the top, and that the role of the Commission is essentially one of supporting existing mechanisms like MEGRIN and in providing financial support. The latter may be particularly needed in the poorer regions but also to support the need to run parallel systems over an extended period, one to meet the demand of existing local users, and one to meet putative "European" users.

An important issue to note is that several respondents argued that it is the European Commission itself which is the major current customer for European-wide data. Hence the Commission needs urgently to define its needs and improve its internal co-ordination in the use of GI, and then identify the appropriate mechanisms to support the development of the GI market to satisfy its needs. Criticism of the lack of internal co-ordination of GI within the European Commission itself was extremely strong.

The issue of Metadata standards and Services was perceived as being of lesser importance, partly because many agencies and companies are already working on this front. However, there is a clear role in the eyes of some of the respondents for the Commission to foster co-ordination so that the European users can identify more easily what is available.

Barriers to the Development of the GI Market

The message from the respondents on these issues is extremely clear, as shown in Figure 2. There is almost unanimous agreement that lack of awareness at political and management level across national and local governments - as well as in the private sector - is by far the most important barrier. This key factor is taken to include the lack of adequate education and training in the handling of GI and in the many *non-technical* issues related to the use of GI.

The lack of a critical mass of digital data is also perceived as being a barrier although there are clear regional variations between the countries that are relatively well endowed and those in the South of Europe where this is perceived as being a major barrier.

The lack of standards for data documentation and transfer is also perceived as less important, although again there are regional variations. In many cases it is felt that considerable progress is being made in this area and the important question is one of how much it will cost to implement any agreed European standard rather than whether one is needed.

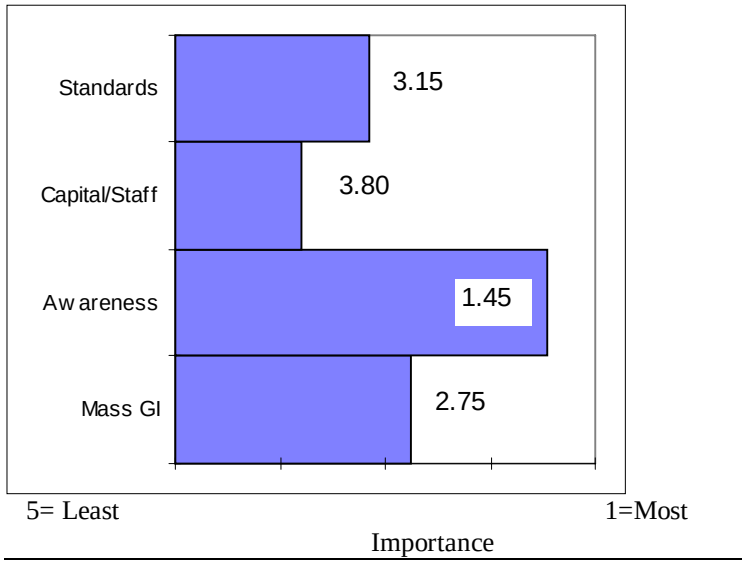

Figure 2: Barriers to the Development of the GI Market in Europe (Mean Score is Indicated)

Finally, it is important to note that the issues facing the GI industry in Europe are not primarily related to lack of capital and/or staff, although there is an issue of adequate skills and official organisations in some countries are said to be suffering from a shortage of capital due to their government's efforts to meet the Maastricht criteria. This is important because it suggests that if the private sector market develops, capital will flow into it. Given this, the view of many respondents was that the primary role of the Commission is not that of financing the supply or creation of software and hardware but rather the one of taking the political and organisational lead and fostering the current examples of best practice in Europe.

Analysis of the Key Issues

Copyright and IPR

This is by far the most important issue affecting the operations of the respondents. Although this issue attracts a great deal of consensus, there are significant variations both across the sectors and in terms of perspectives. The sectoral differences are highlighted in Figure 3.

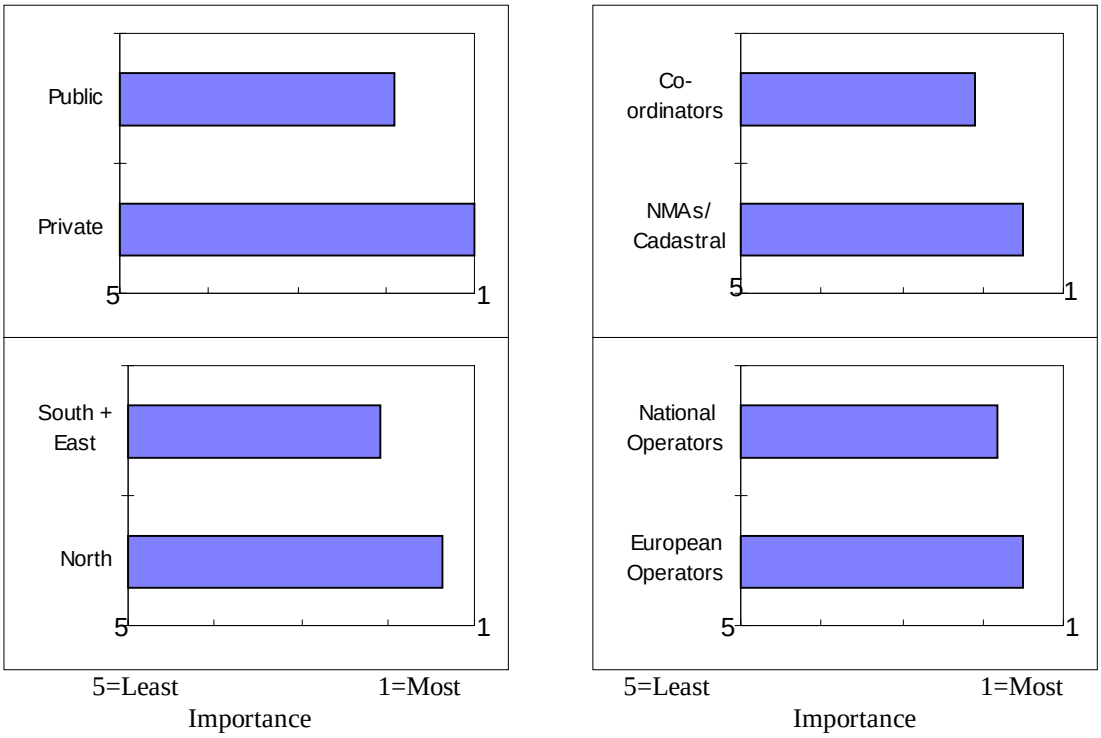

Figure 3: Sectoral Perspectives on Copyright and IPR

As the Figure clearly indicates, the private sector is even more concerned about this issue than is much (but not all) of the public sector which includes both NMAs and co-ordinating agencies. As one respondent from the private sector declared:

As a Data collector and supplier, our company insists on copyright and a licence agreement with the user otherwise it cannot survive. Our right to conduct business must be protected

Within the public sector however, it is equally clear that the data producers feel more strongly about copyright than the national GI agencies. Again this is not surprising as an increasing number of data producers are relying on the revenues generated by their copyright of the data. Indeed, many data producers have explicit instructions from their political leaders (or by some form of statute) to recover a fraction of their costs; in contrast, most GI agencies have little power of compulsion over other government bodies and are largely or wholly state-funded Many of the national GI co-ordinating agencies are arguing more strongly in favour of the development of a national and European public domain. Among the latter, the American Federal government requirement to disseminate its data at the cost or reproduction was sometimes cited (3/20) as a model to be considered in Europe as well.

A viewpoint expressed by one of the national GI agencies was that there may be a contradiction between policies aimed at creating new jobs, which rely heavily on the involvement of the private sector, and those which tend to protect the copyright of public agencies, as the latter may inhibit the development of new products and jobs. Equally however one respondent argued that such copyright had resulted in better quality and more data being available, albeit at a price - governments were generally more convinced about funding when users also demonstrated their need by paying for part of the costs.

Copyright and IPR are not only perceived as important in their own right. It is also the significant variations of arrangements that exist in Europe which are a major concern. This is particularly important for those that operate already on the European market as a whole. As one respondent put it:

Copyright and IPR issues are of critical importance in the operations of the organisations. The real question is to find out who owns what and who has the right to do what, and on what terms.

Similarly, another pointed out:

The biggest problem arises from having to obtain data from different owners operating under different copyright regimes.. [which also] leads to delays in supply as individual contracts have to be agreed.

The theme of existing variations in legal status of GI is also evident at the regional level. As Figure 3 indicates, there is a much higher awareness of Copyright and IPR issues in the Northern European countries than in those in South and East. There are a number of contributing factors to this. In the first place, in those countries where data access or resources or lack of standards are perceived as key issues, copyright may feature less prominently. In the second place, there are also issues related to the maturity of the market as a whole. Clearly the awareness of copyright arrangements appears to be higher where the digital market for data and services is more developed and where there are greater pressures for cost-recovery, or needs to generate profits.

It is important to underline that these are broad categorisations which hide significant variations to protect the confidentiality of the respondents. For example, one agency within the South/East group argued that:

Copyright and IPR is of major importance not only for the success of the enterprise but for the whole community. So far the production of digital databases [in my country] is totally unregulated and the only legal document that I have used is the EU Green Paper covering issues of copyright and IPR across Europe.

The picture is therefore far from being uniform as could be expected. There is an important issue here about the possible divergence between different regions in Europe in terms of legal framework which may need addressing at the European level if a Single Market is truly to develop.

Data Quality

Data Quality is widely seen as important. It ranked second highest after Copyright, and there are no major variations in the opinion of the respondents on this issue. Those who feel more strongly about it are the operators on the European-wide market where variations in quality are often obvious, and those operating where the markets are less developed such as in Southern and Eastern Europe.

Many perceived that the issue of quality is going to get increasingly important over time as data is combined from different sources. It was also underlined that descriptors of quality are still missing or not used:

Existing databases have been assembled over a long period from different sources and methods. Quality therefore varies and often there is no description available of these variations. Improving the situation is a high priority to help users make good decisions on what is "fit for purpose" but solutions are not just a matter of theory!

As quality issues increase in importance, some respondents argued that it will be necessary to develop watermarks certifying the authenticity and quality of the product.

On the issue of "fit for purpose", another respondent declared:

In the context of data quality it is necessary to build greater awareness that quality comes at a price and users must understand that each type of application has different quality thresholds. Hence it is not always necessary to demand data of the highest quality.

Data Access Policies

In overall terms the development of clear and explicit data access policies ranked third most important after copyright issues and data quality. It is however an issue on which there are very strong views on both sides . Some argue that harmonisation of such policies is absolutely crucial either to their business or to ensure citizens' rights to know and monitor government policy. Others argue that the discussion on these issues has not yet been well-focused and that, at the European level, the barriers are so many that it is unlikely to happen in the medium term. A more clear picture of the different perspectives is shown in Figure 4.

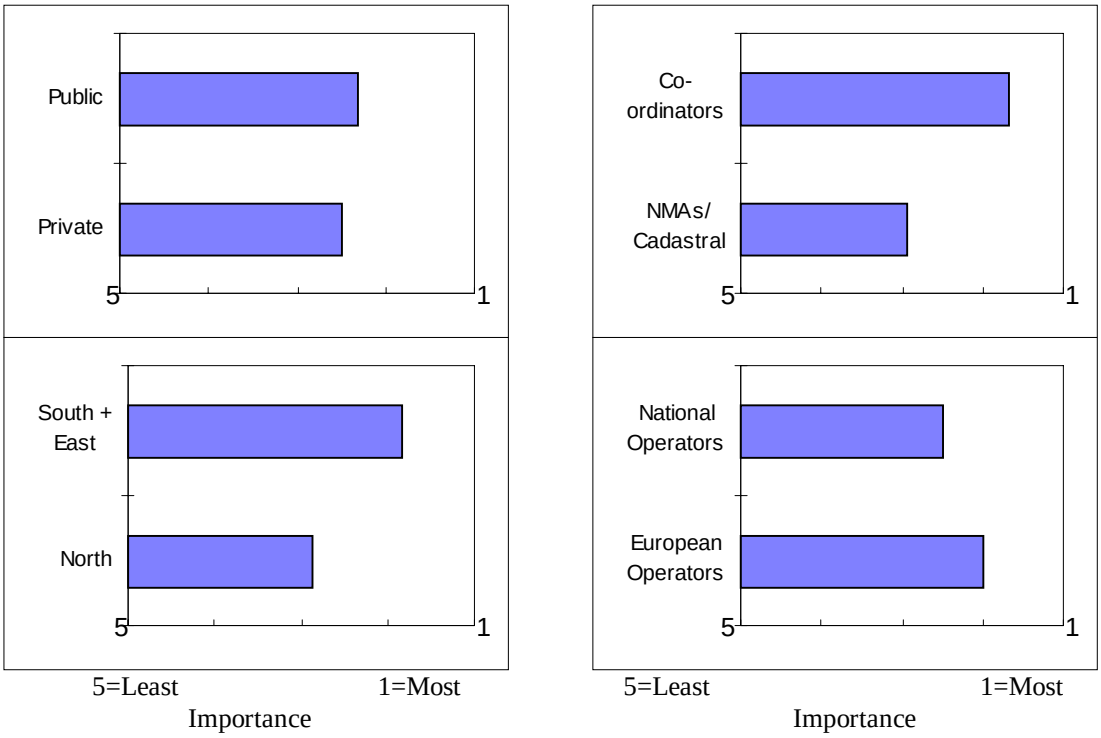

Figure 4: Sectoral Views of Data Access Policies

As the Figure shows, the importance of developing data access policies is felt almost equally strong by public agencies and the private sector. However, it is not surprising to find that the strongest advocates are the public agencies concerned with co-ordinating GI strategies at the national or European level, while the data producers are less concerned about it.

The issue of access has many facets: legal, technical, economic (pricing), institutional (e.g. the role of government and data collected with tax-payers' money), and organisational (the culture of public administration). These viewpoints are clearly reflected by the respondents who link in some instances a policy of data access to the development of public domain and/or free sharing of data among public agencies, while others focus on excessive pricing as a barrier to access. Others still are more concerned by their difficulties in raising awareness in the public administration and overcoming what are perceived as agency feuds. This view is felt particularly by the national agencies in charge of developing GI strategies and co-ordinating other organisations in the public administration.

Again as the figure shows, those who operate at the European level are more sensitive to this issue than are national operators although there are significant regional variations as indicated at bottom left of Figure 4. The complexity of the challenge was summarised by one respondent who argued that:

The most important problem is the institutional structure. This can be seen as a kind of data access issue, but is not quite what is commonly understood under this heading. Most geographic data originates in the public sector (above 50%) and the public sector is not interested in distributing its data mostly due to the public accounting methods, where income does not flow back to the originator [i.e. any profit goes to the Ministry of Finance]. Several fears such as that data could be copied and falsified, or possible differences between the data collection rules for public use and private interpretations, possibly even low quality and errors which could become visible, are not balanced by advantages for the seller. Therefore the data are collected, but not made available.

It is clear that there are significant variations between countries in the way in which the public sector operates. Nevertheless, this issue emerges again in subsequent sections of this report.

Privacy

This issue does not appear to feature very prominently yet. However, as the market develops, there is a general consensus that its importance will increase substantially. The problems are clearly not so much

related to environmental or cartographic data as to the integration afforded by the use of GI, and the increasing number of digital databases becoming available which contain personal data and postal addresses. It should also be noted that the people who might be most concerned about personal privacy from these developments were not interviewed in this study though a number of respondents deliberately spelled out the views of others who would be most anxious over threats to privacy.

Figure 5 shows that, whilst it is not seen as a key issue at present, public sector agencies regard privacy as a more important issue than do the private sector organisations. More surprisingly, the national data producers - cadastral and mapping organisations - see it as being rather more important than do those in GI co-ordination agencies! It may be that the former have had more practical experience than the latter and hence are more sensitised to the problems which can arise. In addition, it is noteworthy that the European operators see this as a relatively insignificant issue: it may well be that the aggregate level of detail at which many operate (up to the whole continent) ensures that they have no need for data about identified or identifiable individuals.

Figure 5 also shows that privacy is regarded most seriously by those in the South and East of Europe than in the North. This somewhat unexpected result can be largely attributed to the fact that in Northern Europe this issue has long been an important one with legislation to protect privacy in some countries (e.g. the Nordic ones) pre-dating European initiatives, while operators in the South and East of Europe feel less well protected.

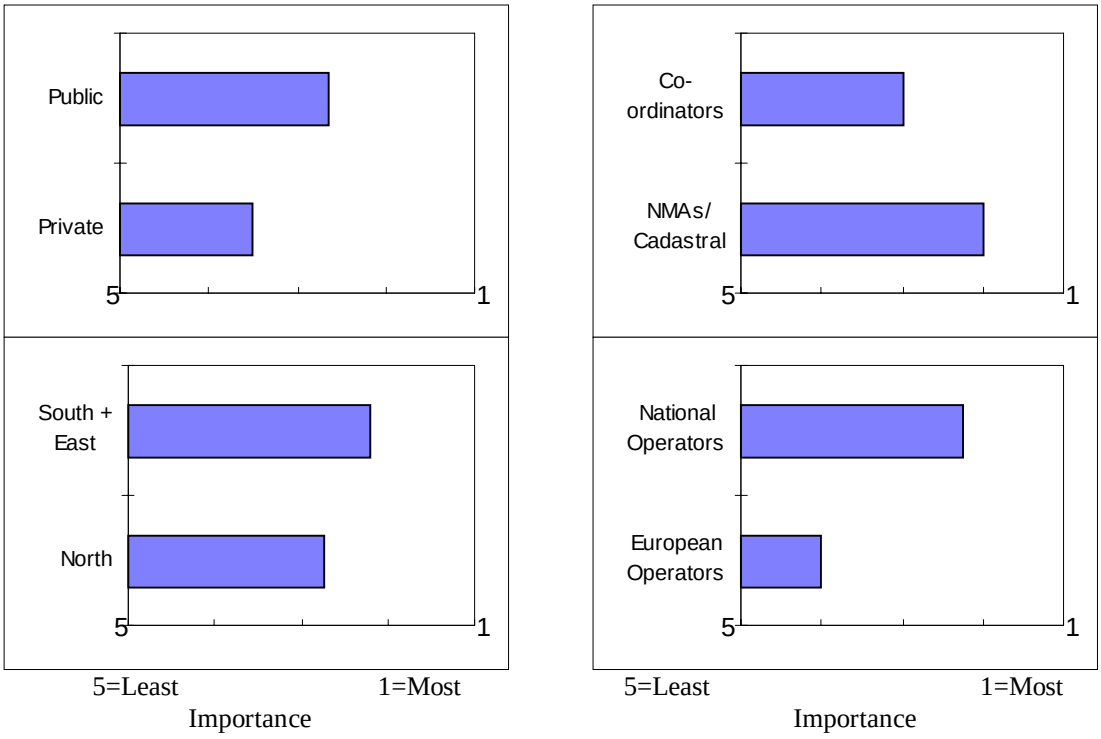

Figure 5: Sectoral Views on the Protection of Personal Privacy

Liability

Liability of data providers for errors in the data is not yet perceived as being a serious issue. Most argued that it will become so when the market develops further but that for time being it is not critical. Although there are no significant variations on this view across the spectrum of respondents, it is significant that the only respondent who gave this issue top ranking operates in one of the most developed markets in Europe. This would support the view that we are going to see a rapid rise in importance of this issue once more data from different sources is integrated and used for operational purposes, and once greater awareness of court cases involving digital data builds up.

Security of Data Bases

In overall terms, Security of Databases scored at a comparable level with issues of privacy and liability. It is clearly perceived as important but not something of crucial importance. In general, it is seen a technical issue and it is somewhat taken for granted that attention has to be paid to security to avoid unauthorised access or misuse. The only noticeable variation across sectors is that the private sector seems to be more concerned about it than does the public sector, and the NMAs in particular. This however may simply reflect the size of business and the arrangement put in place over time to protect databases.

Public Domain Data

This issue features relatively low on the list of priorities of the respondents, but there are significant variations within each group as indicated in Figure 6.

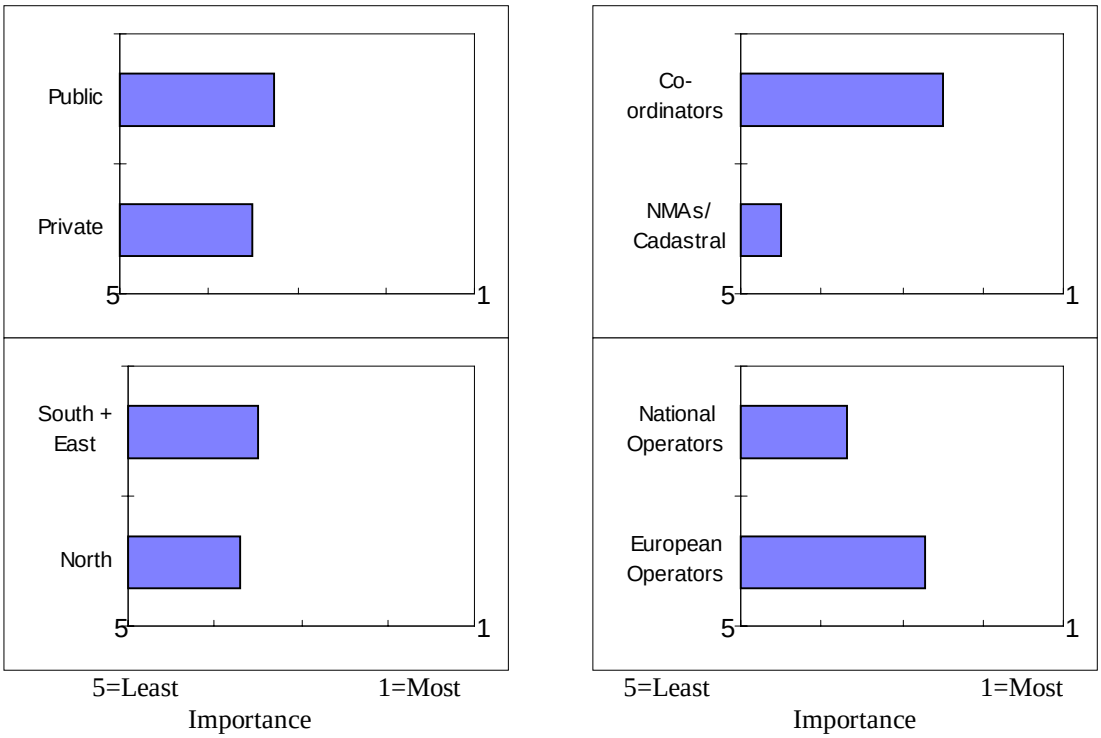

Figure 6: Sectoral Views on Public Domain Data

As the Figure shows this is an issue which, in spite of its overall low ranking, features quite highly for the national GI co-ordinating agencies and for many of those who operate at the European level. In some cases "public domain data" is equated with "free data" but this is not always the case, as the quotes below suggest

the view that 'data is too expensive' is often the initial position of those who do not understand the cost of maintenance, etc. Typically, a learning experience occurs and people come to terms with having to pay something for it

public domain data and data access issues are closely related and are critical for the obligations to open government. However, there are potential problems of information overload, often of low or uncertain quality, which makes it difficult for people to evaluate alternatives to government policies in anything like a systematic way.

the provision of public domain data at no cost is an important objective but this may only happen if the EU takes steps to ensure that the governments of the member states [retain] control of their mapping agencies. This argument runs contrary to the market forces one but market forces left to themselves can never meet this requirement.

The often-diverging views on this topic support the opinion of several respondents who argued that, on the whole, the debate is still unclear and the case for public domain data in terms of costs and benefits has yet to be made convincingly.

Provision of Minimum EU-wide Geographic Data Base

Of the eight issues investigated, this is the one that has the lowest priority for most respondents. It was either dismissed as unimportant to their present business (by some NMAs) or as an issue for which the business case as yet to be made. Only the European operators and to a degree the national co-ordinating agencies felt it as relatively important, as shown in Figure 7.

The regional differences between North and South reflect to a degree the relative development of the GI market and the perception that a policy of creating a minimum geographic base data set for Europe would provide resources for the lesser favoured regions to implement it.

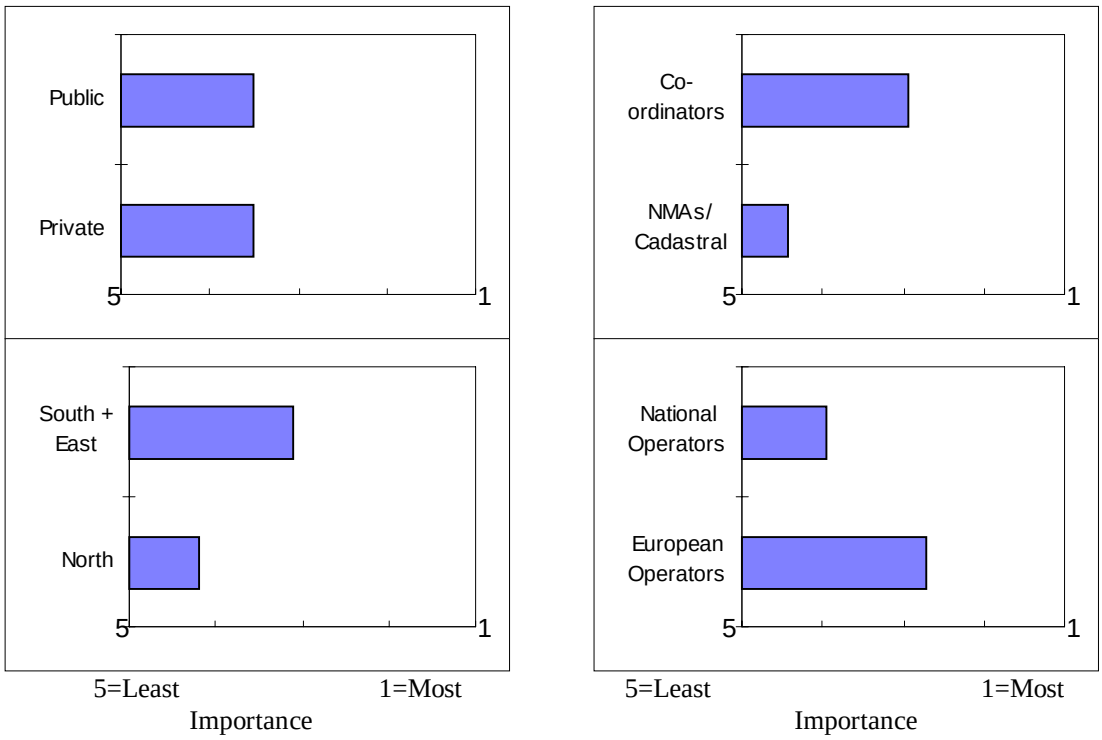

Figure 7: Sectoral Perspectives on Minimum EU-wide Base Data

Other key Issues

There are surprisingly few additional issues which the respondents felt are of great importance for the development of GI industry. They are listed below in no particular order of importance.

Standards: some respondents felt that data and interoperability standards must be include in the list of priorities. They also argued that the key issue is not related to the technical aspect of developing standards (as the European progress made in this direction shows), but the extent to which they will be widely accepted and the costs of implementing them.

The *Maintenance and Updating* of cartographic and administrative data which is essential for fair taxation and the management of property rights. As the European Single Market develops these issues will have an ever increasing importance for their impact on the equal treatment of European citizens and the mobility of workers.

Fostering of a *culture of data sharing* and integrating in public administration at national and local level

Defining more clearly the *role of public and private sector* agencies so that conflicts of interest are limited and synergy/partnership may develop further.

Greater awareness in the public administration of the potential value of *remotely sensed data* which is plentiful, and has important contributions to make in overcoming current data limitations in Europe as well as providing useful insights into thematic issues such as land-use change and pollution. Similarly the use of orthoimagery as a map base could be expanded providing greater facilities (e.g. VR simulation) and expanding the market.

As this list shows, these issues are more often then not organisational or related to lack of awareness than they are technical - a focus which clearly reflects the priorities of the respondents. They complement in many ways the other issues discussed during the interviews, and the perception of the respondents on the role they would like the European Commission to take as detailed in Section 3.12.

Expected Changes over the next 5-10 years

There are different views on the extent to which the major changes will be technology driven or politically driven e.g. greater globalisation and redefinition of the role of governments, including NMAs. Nevertheless, the overall finding to this question is that most of the issues identified in the preceding section will increase considerably in importance over the coming years as more and more data becomes available and is more widely used and the market matures.

- There is a broad consensus that issues of data quality, privacy, security, copyright and access are all set to increase significantly in importance although by an unknown quantity.
- There are mixed views on the extent to which liability issues will emerge as significant in the coming 5-10 years, but this may only reflect the relative immaturity of the market in certain regions.
- The need for EU-wide data is set to increase but also by an unknown factor.
- The discussion on data pricing is also set to increase.

By contrast, nobody referred to technical impediments or standards as being issues of growing importance.

National/Regional Issues

The most significant national/regional issues relate to the disparities that exist in Europe in terms of data provision and frameworks of incentives and regulations. These differences are not only between North and South, but also between small and large countries and relatively centralised and highly fragmented ones.

Differences in national and organisational cultures across Europe also affect the willingness to share data. As two respondents put it:

Some national agencies still want to keep information for themselves and do not see the need for wider dissemination

The GI sector is evolving but the institutions have not changed yet. In the longer term this seems desirable and inevitable

The change in organisational culture needed is clearly a slow process. It has to include a growing awareness in public agencies of the value of their data to other potential users, and a set of incentives to them to make that transfer possible.

Another important issue is that there are very significant differences in public sector resources devoted to GI across the Union and beyond (such as in Central Europe) which affect the ability of the local and national governments to meet quality standards, plan and monitor their physical and man-made environment. Increasing cohesion among the European regions and preparing future applicants to the Union for a smooth transition is a major challenge to the Commission.

Priority Issues for the European Commission

This section of the interviews asked the respondents the priority given to three of the key elements of the GI2000 initiative (Framework, Metadata, Access), and whether they felt that these issues were best dealt with at Commission level or at national level. The issues are analysed below in order of decreasing importance.

Developing a European Access Policy for GI

Overall, a small majority of the respondents rated the development of common GI access policies, which may also have to include issues of pricing, copyright and IPR, as the most important of the three issues, and one in which the role of the Commission is absolutely vital.

The views are however relatively polarised. Greater concern was expressed by those that already operate at European level and by the national GI agencies, with the argument that

European data access policies are by far the most important issue. By comparison the others are less important

By contrast, the views of the NMAs and Cadastral agencies is mixed as can be gauged from the following views:

Data access policies are very difficult given the big cultural, political, financial, and practical barriers. What are the real benefits rather than the theoretical advantages? Some blocs already have some consistency e.g. Nordic bloc is more consistent than EC itself!!!

Common access policies and a reference framework are very important and an area where major EU input is needed.

Not this century! There are major problems within countries e.g. getting all the municipalities to conform to national policies

We do not know how inconsistent national policies are at present except in a piece-meal way. A first stage is to assemble evidence on national policies and variations within them then look for the differences and decide whether these have a significant effect upon the development of the Single Market and on GI development. Then efforts should be made to harmonise the latter. 'Top down' Directives issued from Brussels at this stage (without such knowledge) will only complicate matters because of the very diverse nature of and inter-action effects in the GI marketplace

Access is the real problem: perhaps progress will come via particular sectors like the cadastre, road guidance, or small scale mapping rather than in a comprehensive way.

Developing a European Base Reference Framework for GI including base topographic and socio-economic data

On this issue the views are very mixed, with no clear majority out-turn. Some are in favour, others are at best sceptical and argue that the business case for it has not been made yet.

Among those in favour, there is some agreement that a base at 1:250,000 scale would be appropriate although some applications clearly need greater detail. To develop such a reference base - which should include also basic statistical data and a gazetteer identifying geographical locations, would require major inter-agency co-ordination and significant investment particularly if it involved changes to national systems or running parallel operations to satisfy existing local consumers and future European ones. In respect to the development of this base, the possibility of exploiting the military V-MAP was also noted.

Some argued that a common geodetic framework already exists (EUREF). Although based on a 1989 standard rather than a 1996 one, the Commission could do a great deal to get it promoted and accepted. This is essentially a political role rather than a technical one but with significant financial implications.

Finally among those in favour of greater pan-European activities and databases, there was also some agreement that the best implementation mechanism would be from the bottom up' through MEGRIN or a similar model for the other elements of the framework.

Among those lukewarm about a common framework, the prevailing argument is that the demand is still too small. If there is a role for the Commission, which is the major user of European-wide data, it is to clarify its internal needs and see how best the market can meet them. In addition:

The within-EC liaison in regard to GI must be improved. If the EC can not get its house in order, its credibility for urging this on a much wider and less controllable domain is small.

Developing Metadata Standards and Services

On this topic, there is a much greater degree of consensus as most respondents agreed that Metadata is important - but also argued that they did not see this as an area in which major EU investment is needed. By and large, the message is that such developments are best left to the private sector and the national agencies, building from the 'bottom up'. What the Commission should do is to provide general guidelines to reduce inconsistencies and some financial support as such services are unlikely to be self-financing in the short term.

Barriers to the Development of the European GI Market

In respect of the barriers to the development of the GI market in Europe, some of the conclusions of this study are extremely clear. First and foremost, the key decision makers interviewed feel that the lack of awareness and education on GI issues in Europe is still the main barrier to development of the GI 'industry'. The other three issues are by comparison far less important as shown at the beginning of this report in Figure 2. If awareness develops, so will the market as a whole, with more digital GI becoming available, capital coming in, and standards being developed. Without awareness and appropriate skills, none of this is likely to happen in the medium term.

There are however some differences in the perspectives as shown in Figure 8. They are essentially geographic and reflect the different maturity of the GI market. As the Figure shows, in the private sector and in the Northern European countries there is unanimity that lack of awareness and education is by far the most important barrier. This is followed by lack of a critical mass of GI, standards (at some distance), whilst lack of capital appears often as the least of the problems.

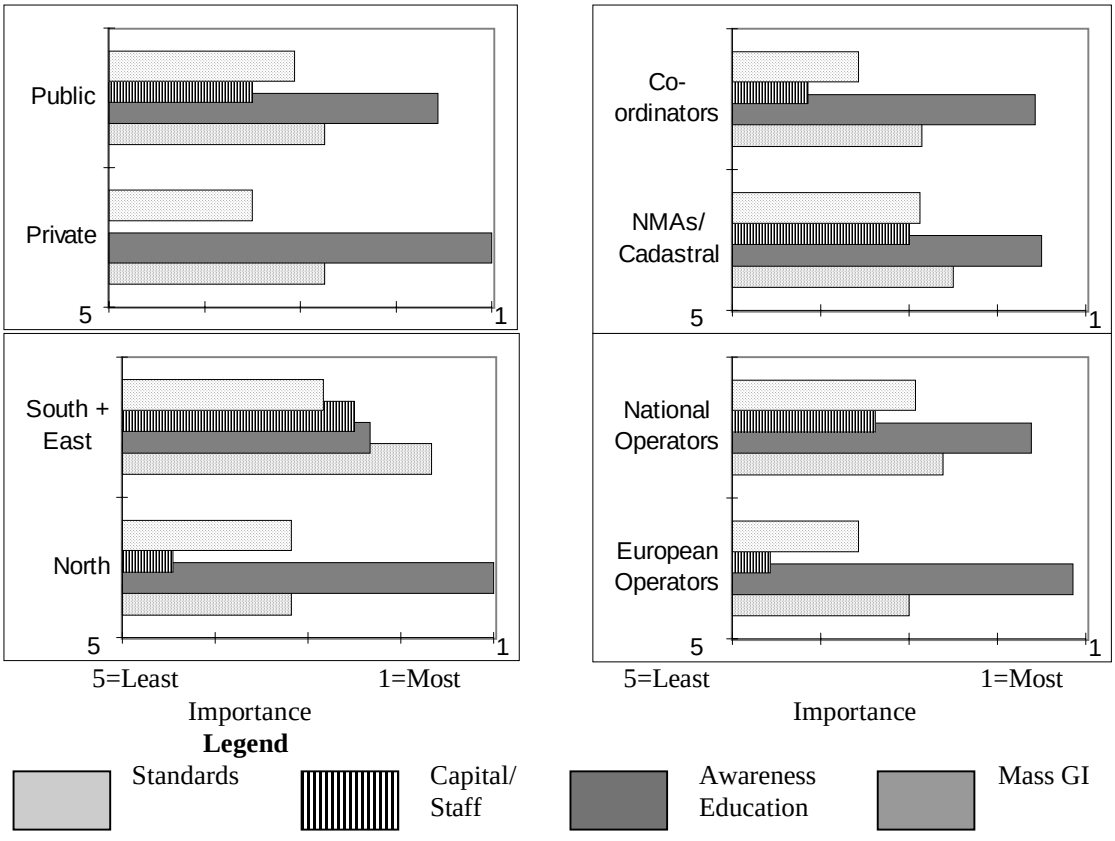

Figure 8: Sectoral Views of the Barriers to the Development of the GI Market in Europe

In the Southern/Central European countries, the lack of a critical mass of digital GI, and/or users, is perceived as the biggest obstacle to the development of the market. In some respects, the lack of awareness and education is perceived to be a consequence of the lack of data, but it could also be interpreted the other way around. Often in this group of countries the biggest barrier is not so much the absolute lack of digital data as the fragmentation of data sources due to the absence of a clear framework of responsibilities for the collection and distribution of data, and the lack of awareness of its value. This

fragmentation leads to a variety of approaches and standards and reinforces the scepticism about data sharing, particularly in the public administration. It is important to note that the lack of resources, capital and staff, is much more important in this group of countries as well as standards (again a reflection of greater fragmentation).

In many ways this important regional difference between North and South/East is the most significant finding of this group of questions and one that will need particular attention from the Commission if widening disparities are to be avoided.

Two other important issues need to be highlighted. The first is that lack of awareness is particularly acute among politicians and key-decision makers at European, national and local level. Hence some targeted action is needed to raise this awareness in partnership with national associations. Second, that the respondents made it clear that, in relation to education, what is needed is much more than technical skills in handling computer hardware and software. Extremely important and in need of improvement are analytical skills - to extract information out of the data - and a whole suite of other skills including the awareness of legal, social, and economic issues relating to the developing GI market. As one respondent said:

We need simple geographic data but sophisticated data services to build a much wider use of GI

Conclusions: Priorities for the European Commission

This report presents the views of key decision-makers in Europe on issues of GI policy gathered during December 1996-January 1997. As the report indicates, the overall view of these key individuals is that the European GI market is on the whole still immature and characterised by significant regional variations. There are however opportunities for rapid development both at national and at European level. To avoid major distortions in the development of this market and increasing disparities among the European regions, the Commission needs to consider action on a number of fronts:

- Continue to raise awareness and the quality of education on GI issues across Europe. Unexciting as this may appear, it remains by far the most urgent task. In terms of awareness, particular efforts must be made among officials at the European (i.e. within the Commission itself), national and local level. Focused GI awareness days at the national level with the support of the Commission may be one of the strategies to raise awareness. In relation to education, the message from the respondents to this study is that the breadth needs to be expanded to include issues of spatial analysis, but also awareness of the legal, social, and economic aspects of the digital market.
- Consider measures to resolve the increasing problems emerging in relation to the different copyright and IPR regimes in Europe. This is not an exclusively GI issue but one that is of critical importance of the development of the GI market. Significant progress has already been made with the Green Paper on Copyright (COM(95) 382) and its recent Follow-up (COM(96) 586), but there is a need to verify the extent to which the particular features of GI are well covered by these proposals. It has also to be recognised that it is likely to take considerable time before an agreed framework is developed and implemented at the European level.
- Develop an access policy for GI across Europe. This is another very complex task with a series of strands: legal, institutional, organisational, economic. It includes copyright and pricing, the possible development of a European public domain, but also issues of fostering a culture within public administrations for the sharing and re-use of the data collected. In turn this also requires a more clear definition of the role of the public sector, the relationships between public and private sector, and their impacts on new job creation. Whether the Commission is in the best position to develop such complex policy at this stage is not clear. As one of the respondents argued (see page 25-26) the first step is to build a systematic view of current policies across Europe, identify similarities and differences, and where harmonisation is possible. Only then it will be possible to chart a plan for action on this strategic issue which may have major implications for the development of the Single Market, and regional integration.
- Identify the internal needs of the European Commission for European-wide data and improve its internal co-ordinating mechanisms. As the major user of European-wide data at this stage, it is clearly in the Commission’s interest to clarify its needs and identify the appropriate mechanisms to satisfy them. This in turn may be extremely beneficial in supporting the development of the

European market. By improving its internal co-ordination it will also increase its credibility when asking national agencies to do so as well.

- Continue to provide financial support through the Structural Funds to the poorer regions in the Union for the development of their internal GI market. This includes support for data sharing arrangements and meeting quality standards, and for projects modernising public administration in order to build a critical mass of GI and GI users. Actions along these lines were already present in the Fourth Framework and need to be continued.
- Support co-ordinating measures for the development of metadata standards and services undertaken by the private sector or national operators. No major funding is required from the Commission in this area but ways to reduce fragmentation of initiatives may be appropriate as well as some financial support in the short term as these services are unlikely to be self-financing.

The issues above appear from this study as being those on which specific attention is needed urgently. In the longer term, two other issues will require attention: legal liability for data quality and protecting the privacy of individuals. The respondents to this study clearly feel that these two issues will increase considerably in importance over the coming years and will require some co-ordinated approach across Europe. They are not very significant at the present time, however.

The other issues discussed with the key decision-makers are of course important and by and large are set to increase in significance as the market develops. They are not however, either issues in which the Commission has a key role (e.g. issues of data quality, or security of data bases), or where priority action is needed (e.g. standards, capital funding), or where the business case as yet been made convincingly (public domain, European-wide core data set). In respect to the latter, the GI-BASE project should provide wider insights than this which was highly selective of key individuals and organisations.

Appendix: Interview Pro-Forma

Dear Sir/Madam,

The European Commission has contracted a consortium to explore policy issues relating to Geographic Information in Europe. This group is led by Dr. Harald Meixner and Prof. Andrew Frank at Vienna and assisted by a Steering Committee consisting of Prof. Peter Burrough (University of Utrecht), Dr. Massimo Craglia and Prof. Ian Masser (University of Sheffield), and Prof. David Rhind (Ordnance Survey of Great Britain).

The study takes a broad view of Geographic Information (GI) to include all information on natural phenomena, cultural and human resources which can be related to a location on the earth's surface. The DG XIII of the European Commission is interested in both business and strategic aspects of Geographic Information and consequently in all activities to collect, manage, restructure, arrange, and distribute geographic information, from paper maps to electronically distributed data sets.

As part of this study, we are gathering the views of some high-ranking individuals like yourself who may influence aspects of the GI business and related policies in Europe. In particular we are seeking to identify the issues which you think are of greatest importance in developing GI in Europe, and those in which you think the European Commission has a particularly important role to play (as opposed to national and local government organisations and the private sector).

The easiest way to proceed seems to be for me to telephone you sometime in the next few weeks to discuss the issues described below. Your responses will then be summarised and assembled with those of the other key individuals contacted to develop a coherent picture of the priorities and inform the decision process of the European Commission on this matter. None of the views expressed will be directly attributed to an individual, and you will also receive a copy of our findings.

Key issues for discussion

Information technology has changed the way geographic data are collected, stored, distributed analysed and presented. While enabling many former procedures to be carried out more efficiently and effectively and new kinds of data analysis to be developed, the technological development has raised a number of issues for which a general European information policy may be appropriate. These issues are:

- privacy (protection of the individual)
- copyright and other protection of intellectual property rights
- data quality
- liability of data providers for errors in the data
- security of data against unintended use or disclosure
- data access policies (How to find data? Who may access it? At what price?)
- the provision of minimum EU-wide geographic base data
- public domain data (should some geographic data be free of legal protection and accessible at near-zero cost to all?)

Prior to our telephone conversation, it would be helpful if you could assess the importance of these issues as to how they affect the success of your enterprise and that of other actual and potential users of geographical Information in your country. Can you give each issues a score from 1-5, where 1 is most important and 5 is not important? On a wider basis, I would also be grateful if you could think about the following questions:

- are there other important issues missing from the list above?
- which of these issues is absolutely critical for your organisation and for other organisations with which you are familiar?
- can you prioritise this list and explain why?
- do you expect the importance of these issues to change over the next 5-10 years? How?
- do you perceive specific national or regional problems which need special attention?

In addition, a number of policies to improve the use and distribution of geographic information are currently being debated at the European level. Please indicate when we talk any priority issues which you believe are better dealt with through the European Commission rather than within a subsidiarity framework in developing Geographic Information policy.

- developing a Pan-European Base Reference Framework for GI including base topographic and socio-economic data;

- developing meta-data services and standards;
- developing a general policy for access to geographic information across Europe.

Please include any other issue which you think deserves attention from the European Commission.

Finally, which of the following issues in your view is currently the most significant barrier to the development of the GI industry:

- lack of a critical mass of digital data
- lack of awareness, education, and training
- lack of capital and/or personnel
- lack of standards for data documentation and transfer.

Thank you for your attention. I will call you at some mutually convenient time in the next three weeks or so and hope you will have time for a short discussion over the phone.

With best wishes

Yours sincerely

Appendix B: List of Individuals Interviewed

Ir. Ad Bastiaansen
Teleatlas
Gent
BELGIUM

Mr. Klaus Barwinski
Deutscher Dachverband fur Geoinformation
Bonn
GERMANY

Professor Roberto Benzi
Director Agenzia Informatica per la Pubblica Amministrazione
Rome
ITALY

Mr. Mike Brand
President
EUROGI
Aamersfort
NETHERLANDS

Dr. Seppe Cassettari
Managing Director
Geoinformation International
Cambridge
UK

Professor N. van Egmond
RIVM
Bilthoven
NETHERLANDS

Ir. F. Hageman
Eurosense
Breda
NETHERLANDS

Mr. George Halaris
Database Development Director
Hellenic Military Geographical Service
Athens
GREECE

Eng, Rui Gonçalves Henriques
President Centro Nacional Informacao Geografica
Lisbon
PORTUGAL

Mr. Dimitris Kalimeris
Head of the Digital Cartographic Dept.
National Mapping and Cadastral Organisation
Athens
GREECE

Mr. Dick Kirwan
Director Ordnance Survey Republic of Ireland
Dublin
IRELAND

Mr. Bas Kok
Secretary General
RAVI
Amersfoort
NETHERLANDS

Mr. John Leonard
Secretary General
CERCO
Paris
FRANCE

Ms. Gonilla Olafson
Director General of Landmateriet
Stockholm
SWEDEN

Mr. Jarmo Ratia
Director General Land Survey of Finland
Helsinki
FINLAND

Dr. Gabor Remety-Fullop
Secretary General HUNAGI
Budapest
HUNGARY

Professor David Rhind
Chief Executive and Director General
Ordnance Survey of Great Britain
Southampton
UK

Mr. François Salgé
Advisor on European Affairs to the Director General
Institut Géographique National
Paris
FRANCE

Professor Henk Scholten
Director GEODAN
Amsterdam
NETHERLANDS

Ing. Carlo Vaccari
Direzione Generale del Catasto
Ministero delle Finanze
Rome
ITALY

Additional information was provided by Professor Andrew Frank as a result of his discussions with:

Mr. Ralf Borchert
Landvermessung Hessen

Mr. Zoltan Daroczi
Manager WiGeoGIS

Mr. John Glover
Intergraph Europe

Mr. Hochwartner
President Austrian Mapping Agency (BEV)

Dr. Heinz Stanek
Stanek Consulting

Information was also provided by Dr. Gabor Kakonyi, at the Budapest Technical University via Dr. Remetey-Fullop

ANNEX B:
PERFORMANCE REPORT AND LIST OF CONTACTS

PERFORMANCE REPORT

Chronology

The kick-off meeting was held in Luxembourg on February 2, 1996.

The planned early meeting of the Steering Committee was postponed and replaced by email discussions (due to problems to find a suitable date, given the current level of GI activities of the persons involved).

A face-to-face meeting of most of the members of the Steering Committee was held in Buoux (France) during the GISDATA Specialist Meeting 'Geographic Information: The European Dimension' from 8 - 12 May, 1996. Roger Longhorn represented the Commission.

The meeting in Baden was held according to schedule from June 21 to 23 in Baden (near Vienna). As discussed during the kick-off meeting, not all partners could attend at that time of the year, as academic staff is extremely busy during this month. The draft materials available at that time (together with other materials from different sources) were distributed to all partners and discussed extensively. A list of issues for policy recommendations was established and a schedule for the elaboration of the final report was agreed.

The interim report is based on the discussions in Baden and was circulated among all partners for review.

The review of the interim report clarified the information of interest to the Commission. In consequence, some adjustments in the performance of the second half of the study became necessary. The focus of the work in the second half of the study was on collecting and analysing the opinions of key decision-makers in the field. The elaboration of a book under this contract was withdrawn. A new time schedule was set up.

During October '96 plans for a set of structured interviews were established based on a meeting of most of the members of the steering committee and further communication by email. The members of the steering committee were willing to perform the interviews. Subcontracts were drawn up and a set of key questions agreed upon by email.

The interviews were held in December '96 and January '97 and a report about the interviews was written. The report was made available to the Commission in early February '97.

The final report was written in February '97 (an extension of the deadline was asked for and granted). Between the conclusions of the interviews and the delivery of the final report no time was available for a final meeting of the steering committee.

Meetings Attended to Represent this Project:

We were represented at the following meetings of DG XIII:

- 'Brainstorming Session on Multimedia Skills' on 21 - 22 May, 1996
- 'Technical Panel on Information Engineering in the 5th Framework' on 22 May, 1996
- 'Meeting of GI Users' on 28 May, 1996
- 'Meeting of GI Vendors and service providers regarding a European Policy Framework in the area of GI'
- 'Meeting on GI2000 Research' on 20 June, 1996

Eric Stubkjaer attended a Workshop of the International Federation of Surveyors (FIG) in Bergen, 'GIS and Legal Issues', on July 1, 1996.

An expert panel was organised by the Joint Research Centre Ispra on 19 and 20 November, 1996: 'A Strategic View of GIS Research and Technology Development for Europe'.

A final presentation will be made at the JEC-GI Conference in Vienna, 16-18 April 1997.

Discussion with Leaders in the Geographic Information Field

A number of influential leaders are part of the team, most notably David Rhind, head of the UK NMA. Other members of the team have regular contacts with leaders in specific fields: Marinos Kavouras is well informed about the Hellenic Mapping Agency; Massimo Rumor and Irene Campari about the

position of Regions and Towns in Italy, Eric Stubkjaer has extensive contacts with the Danish mapping agencies.

The project leader had several additional discussions with other leaders in the geographic information field, among them August Hochwartner, head of the Bundesamt für Eich- und Vermessungswesen (BEV) in Austria, Francois Salgé (IGN and MEGRIN), Ralf Borchert (LVA Hessen and ADV in Germany), Christian Chenez (EUROGI) and Vanessa Lawrence (one of the most experienced publishers in the field). The position of organisations in 'business geography' was addressed by Richard Webber and Zoltan Daroczi. Extensive discussions with Laisla Aslensen (Norwegian Mapping Agency), Christian Twaroch (responsible for National Mapping Law and policies in the Austrian Ministry for Economic Affairs) and Harlan Onsrud on the legal issues contrasted the Scandinavian/Central European position with that of the US. A discussion with Stan Openshaw provided input in the issue of privacy protection vs. statistical analysis, and a discussion with a leading consultant in Austria and the head of the geographic information unit in the town of Vienna covered metadata and pricing policies. Discussions with David Schell and Kurt Buehler from OGC (USA) and with leaders from three European GIS vendors clarified the European interest in the upcoming interoperability standard OpenGIS. Joint work in a INFO2000 project with Intergraph and Laserscan helped to understand the state of the art with interoperability. A discussion with a high-ranking official from a UK organisation involved in GI (but separate from Ordnance Survey) demonstrated the breadth of variation in the opinions, even within a single country.

Interviews with key decision-makers

The Commission expressed great interest in the opinions of key decision-makers and their assessment of the situation. The members of the steering committee decided to interview 20 senior persons in key organisations. These interviews were conducted in December '96 and January '97.

It was decided that a telephone interview was the best method to collect the information desired. To be successful with high level, senior personnel, a very small number of questions was presented to the interviewee in written form before the interview. The interviews were structured around these open-ended questions. The questions touched on the following topics:

- the ranking of the GI policy issues,
- an assessment of three core elements of the GI2000 initiative, and
- an evaluation of the perceived barriers to the development of the GI market.

The discussions revealed varying levels of detail and pointed to different issues, commensurate with the extensive experience of these senior personnel.

The list of interviewees was set up to ensure balance between the European countries, different private companies, public agencies and national GI organisations. The European-wide top experts in the GI field were also included. All persons contacted with an introductory letter agreed to be interviewed.

A 'Report on Interviews with Key Decision-Makers in Europe on Geographic Information Policy Issues' was prepared by Massimo Craglia, Ian Masser, Peter Burrough and David Rhind, which is included as Annex A to the Final Report. It contains a detailed analysis of the responses, typically separating the public vs. private, the South/East vs. North, the co-ordinators vs. the data collectors and the national vs. the pan-European operators. It documents consensus on some questions and a wide variation of opinions on others. The extensive quotes from opinions expressed in the interviews are a rich source of insight and a number of surprising points came up.

The report contains a detailed description of the method and its justification.

The final report draws to a large extent on the material in this 'report of interviews'.

Additional Resources Provide by others

The following studies have become available and proved very useful:

- Economic aspects of the collection, dissemination and integration of government's geospatial information by Ordnance Survey UK (performed under contract by Coopers & Lybrand);
- Results of the Consultation Exercise on the 'National Interest in Mapping' by Ordnance Survey UK;
- Draft of the report from the GI-BASE study.

Integration of the results of an ESF Study

Ian Masser and Francois Salgé have organised a workshop on “Geographic Information: The European Dimension”. This workshop covered some of the topics this study has to consider, primarily the legal aspects, and then gave examples of GI efforts across European boundaries. The meeting brought an extensive discussion of copyright protection for maps from a continental European (including Scandinavian) point of view.

EUROGI Report ‘Legal Protection of Geographic Information’

EUROGI has just completed and published an overview study, which details country by country the situation for the protection of geographic information.

Action:

The major part of the EUROGI study will be summarised in this study.

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