

Geographic Information and the Enlargement of the European Union: Four National Case Studies

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Abstract: *This article explores some of the geographic information (GI) policy issues associated with the unique set of circumstances created by the potential enlargement of the European Union (EU) from 15 to as many as 28 countries. The discussion is divided into three sections. The first section is largely contextual in character. It summarizes the main features of the procedures devised by the EU for evaluating progress toward EU membership and provides an overview of the countries that have applied for membership. The second section discusses in detail the GI policy and the emergence of a national spatial data infrastructure in the following countries: Bulgaria, Hungary, Lithuania, and Slovenia. The final sections of the article compare and evaluate the experiences in relation to the EU accession process and the development of national GI policies as a whole.*

Introduction

For more than 40 years, the iron curtain divided the continent of Europe between a prosperous and free west and an impoverished and oppressed east. The European Economic Community, originally made up of six members, gradually expanded to take in almost all of the western part of the continent. More recently, it signalled its growing integration by changing its name to the European Union. When communism collapsed and the iron curtain came down in 1989, the EU pledged to embrace the countries of the east by admitting them to its club. This, it was hoped, would spread the peace, stability and prosperity enjoyed in the west to the east and “reunify” the continent. More than a decade later, the Union looks likely to make good on its promise. (Economist, 2001: 1)

This extract from the Economist neatly summarizes the historic changes that are taking place in the central and eastern European countries at the present time. These changes are likely to have a profound impact on the future development of the European Union (EU). By the end of this decade, the number of members of this body may increase from 15 to as many as 28 and its total population may grow by more than 25% to more than 500 million. However, the procedures for accession are demanding. Candidate member countries must satisfy an exhaustive set of criteria laid down by the EU before they can be admitted to membership. Geographic information (GI) has an important part to play in meeting many of these criteria and requires strategic thinking on the part of the candidate countries.

With these considerations in mind, this article explores some of the GI policy issues associated with this unique set of circumstances. The first section summarizes the main features of the procedures devised by the EU for evaluating progress toward membership and provides an overview of the countries that have applied for membership to the EU. The second section deals in more detail with GI policy and the emergence of a national spatial data infrastructure (NSDI) in Bulgaria, Hungary, Lithuania, and Slovenia. The final sections compare and evaluate the experiences

in relation to the EU accession process and the development of national GI policies as a whole.

Context

Enlargement of the European Union

The European Union has expanded over the last 40 years. Originally, there were six countries that signed the Treaty of Paris in 1951 establishing the European Coal and Steel Community; in 1957, the Treaty of Rome was signed which launched the European Economic Community and Euratom (the European Atomic Energy Community). There are currently 15 member countries. The gradual process of enlargement has not been without challenges but has also offered enormous opportunities to its members. The decision in 1997 by the European Council to initiate the process of enlargement to a further 13 countries (Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, and Turkey) has no comparison to the previous process in terms of the number of countries involved, their area, population, and prosperity, as well as their different traditions and cultures.

The criteria for accession to the EU were designated at the European Council (the Council of Prime Ministers and Heads of State of the Member Countries) in Copenhagen in 1993. The criteria include:

- the stability of institutions guaranteeing democracy, the rule of law, human rights, and respect for and protection of minorities;
- the existence of a functioning market economy as well as the capacity to cope with competitive pressure and market forces in the union; and
- the ability to take on the obligations of membership including adherence to the aims of political, economic, and monetary union.

The European Conference was established to provide a framework for the process of enlargement. The Conference is a multilateral discussion forum on issues of common interest such as foreign and security policy, regional cooperation and economic matters, and justice and home affairs (the three pillars set up by the Maastricht Treaty of the EU in 1992). The accession process itself involves the development of a pre-accession strategy, accession negotiations, and screening the extent to which candidate countries are adopting the *Acquis communautaire*, which is the body of laws and regulations enacted by the Union since its foundation.

The *Acquis* consists of 31 chapters describing policies ranging from agriculture and fishery policies to regional development on the one hand, and from financial and budgetary provisions to education and training on the other. The negotiation process takes the form of bilateral inter-governmental conferences between the EU Member States and each candidate country on a chapter-by-chapter basis. The meetings are held at the level of Minister or deputy for the Member States and Ambassadors or chief negotiators for the candidate countries. The Commission prepares yearly reports on the state of progress for each country toward adopting the *Acquis*. The results of the negotiations are incorporated in a draft treaty submitted to the European Council for approval and the European Parliament for assent. After signing, the accession treaty is submitted to the Member States and the candidate country for ratification. Once this is accomplished, the candidate country becomes a Member State.

The alignment of national legislation to the policies laid out by the *Acquis* is a major undertaking for the legislative system of the countries involved, the size of which cannot be overemphasized. More crucially, though, is implementing legislation once adopted and undertaking the necessary changes in administrative practices, cultures, and procedures for effective implementation, monitoring, and reviewing. This is a major challenge because the organization and the way things are done must change. Moreover,

the changes will have a significant impact on the society and existing economic structures, so that engendering change and maintaining political support throughout the process is possibly the greatest challenge of all.

To assist in the process of adopting the *Acquis*, the EU has developed a framework of accession partnerships and national programs. Support for the process comes from three programs: PHARE (Pologne Hongrie Aide a la Restructuration Economique), ISPA (Instrument for Structural Policies for Pre-Accession), and SAPARD (Special Pre-Accession Assistance for Agriculture and Rural Development). PHARE has an annual budget of €1,560 million, and finances institution-building measures across all sectors not covered by the other two programs, including integrated regional development programs. PHARE is under the direct responsibility of the Directorate General for Enlargement of the European Commission (DG Enlargement), which also has overall coordination between the three programs. ISPA has an annual budget of €1040 million and is dedicated to major environmental and transport infrastructure. This comes under the responsibility of the Directorate General for Regional Development. SAPARD has an annual budget of €520 million and finances agricultural and rural development. It is under the responsibility of the Directorate General for Agriculture. (DG Enlargement 2000).

An Overview of the Accession Countries

The 13 accession countries include all of the former central and eastern European countries together with Slovenia (part of the former Yugoslavia), Turkey, and the Mediterranean islands of Cyprus and Malta. These countries are very diverse in terms of area, population, and relative wealth (Table 1). From Table 1, it can be seen that seven of the 13 countries (Cyprus, Estonia, Latvia, Lithuania, Malta, Slovakia, and Slovenia) are relatively small in terms of land area and population. The population of these seven countries varies from only 400,000 persons in the

	Area 1000 km sq.	Population Millions	GDP PPS/inh	% EU avg.
Bulgaria	111	8.3	4700	22
Cyprus	9	0.7	17100	81
Czech Republic	79	10.3	12500	59
Estonia	45	1.4	7800	36
Hungary	93	10.1	10700	51
Latvia	65	2.4	5800	27
Lithuania	65	3.7	6200	29
Malta	0.3	0.4	n.a.	n.a.
Poland	313	38.7	7800	37
Romania	238	22.5	5700	27
Slovakia	49	5.4	10300	49
Slovenia	20	2	15000	71
Turkey	770	65.6	6200	29

Table 1: Basic data for the accession countries

case of Malta to more than 5 million in Slovakia. The other six countries (Bulgaria, Czech Republic, Hungary, Poland, Romania, and Turkey) are generally much larger in terms of both the land area and population. Their populations range from 8 million persons in the case of Bulgaria to more than 65 million in Turkey. Turkey is bigger than all of the present members of the EU apart from Germany.

The 13 accession countries fall into two categories with respect to their relative wealth (Table 1). Six of the countries (Cyprus, Czech Republic, Hungary, Slovakia, Slovenia, and Malta) have gross domestic product (GDP) levels that range from just under half the EU average (Slovakia) to more than 80% of the EU average (Cyprus). The GDP per capita in the latter is higher than that of two of the present EU members (Greece and Portugal). In contrast, the GDP per capita ranges from 37% to 22% of the EU present average in the other seven countries (Bulgaria, Estonia, Latvia, Lithuania, Poland, Romania, and Turkey). However, it should be noted that these categories cut across the previous group divisions based on size and population.

To illustrate the extent to which the accession countries are taking a strategic view of the importance of formulating and implementing GI policies and strategies, regardless of their size and level of economic development, four of the countries were selected for more detailed consideration. The countries described in this article are Bulgaria (a country relatively large but relatively poor with respect to the group as a whole), Hungary (which is relatively large and relatively rich), Lithuania (which is relatively small and poor), and Slovenia (which is relatively small and rich) (Figure 1). The case studies are presented in a similar format to facilitate the comparison, including the structure of government, the state of public sector information legislation, the main providers of GI, and key elements of an NSDI (i.e., coordination, core data, and metadata services). The format is based on framework used by Masser (1998) in a comparative analysis of GI policies in Australia, Britain, the Netherlands, and the United States. Relevant Web sites are provided in Appendix 1.

Case Studies of Four Nations

Bulgaria

Bulgaria is a parliamentary democracy with a unicameral National Assembly, or *Narodno Sobranie*. The country is divided into 28 administrative regions, headed by regional governors who are appointed by the Council of Ministers. Bulgaria's 278 municipalities constitute the basic units of the country's economic and political organization.

Government Policy in Relation to the Collection, Use, and Dissemination of Public Sector Information in a State of Transition

Important elements of the framework already in place include the Law of United Cadastre and Property Register of the Republic of Bulgaria and copyright legislation. Concerning the provision of digital data, there is no government policy that defines which organizations have rights for providing such data. According to the current State policy, part of the data are classified or restricted

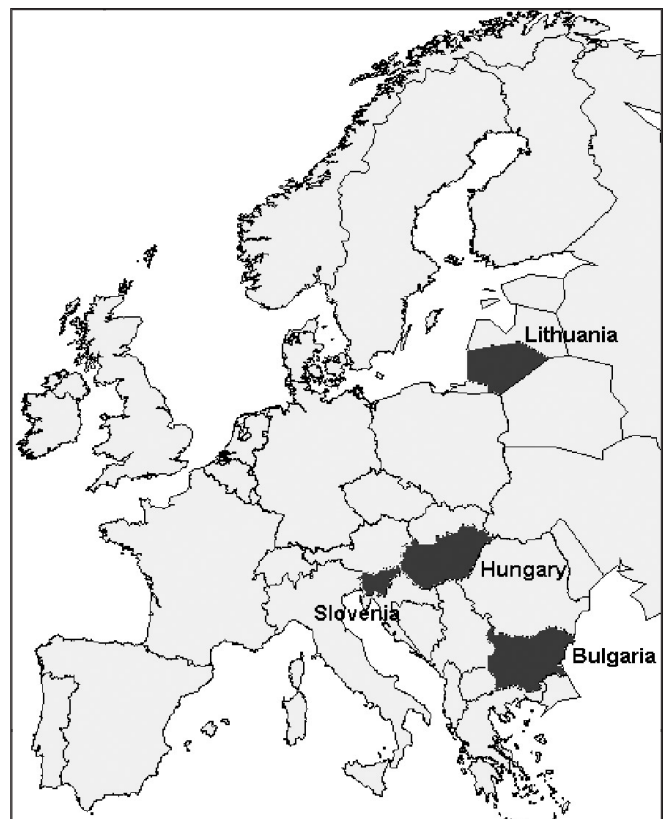


Figure 1: Locations of the four nations included in study

for use. This is regulated by the normative document The List of Facts, Records, and Objects Constituting the State Secret of the Republic of Bulgaria. The provisions of these more restrictive regulations are likely to change with the introduction of new legislation currently being considered by Parliament. This includes the Law for Protection of State and Military Secrets, which will create a common system for classified geographic data for the entire country, a law on Access to Public Information that will harmonize the existing rules with the European ones for using public sector information, and a new Law of Geodesy that will complete the legal framework with respect to the acquisition and use of GI.

The key providers of GI in Bulgaria are the Agency of Cadastre under the Council of Ministries, which organizes and maintains key administrative datasets, and the Main Office of Cadastre and Geodesy under the Ministry of Regional Development and Public Works, which organizes the collection and creation of the data at a large scale (1:5000 to 1:10,000) as well as the data for the 28 administrative regions. It is also in charge of dissemination of the data through the Central Cadastre office. Other key agencies are the Military Topographic Service of the Ministry of Defence (which provides topographic data at a 1:25,000 scale and lower), the Ministry of Agriculture and Forestry, and the National Statistical Office.

Coordination

The government sector is key in the development of the NSDI through its activities of data collection, maintenance, and dissemination. The state institutions are currently the only producers of spatial information; however, there is no central body for coordination of a national GI policy in Bulgaria.

Some steps to coordinate responsibilities result from the new Law of United Cadastre and Property Register, which established the Cadastral Agency. This is responsible for the creation and maintenance of the National Integrated Collection of Geodetic, Cartographic, Cadastral, and Other Data. The agency collects data from ministries and other organizations, such as the Border Police (administrative data of the country borders), the 28 administrative regions, and the Ministry of Agriculture and Forestry (data on agriculture and forest lands).

All organizations collecting geographic data need to follow the regulations issued by the Ministry of Regional Development and Public Works. The only exception is the Military Topographic Service, which collects and organizes data using its own rules. The laws convey rights to the municipalities to assign tasks to companies and other organizations for collecting geodata in their own areas. Therefore, the municipalities are the owners of such data. Local data could also be produced by private companies, schools, and other organizations.

Core Data

Progress has been made in developing core data sets in digital form starting at the national level. In particular, a digital terrain model, geological data, and the forestry and agricultural cadastre are available for the entire country. The urban cadastre has only been completed for approximately 10% of the country.

Metadata

Metadata exist only to a limited extent. The European pre-standard developed by CEN TC 287 has been translated into the Bulgarian language and is gaining acceptance. New developments in this field, including the International Organization for Standardization (ISO) standards, will need to be taken on board; most importantly, the practice of widely documenting information resources in the public sector needs to be strengthened.

Hungary

Hungary is a parliamentary democracy with a unicameral National Assembly. Public administration is organized through 7 statistical regions, 19 counties plus the capital (which has a similar legal status to that of the counties), 218 districts, and 3144 communities.

The Constitution of Hungary states that: "In the Republic of Hungary everyone has the right ... to know and to disseminate data of public interest." On the basis of this fundamental democratic civil right, the Protection of Personal Data and Accessibility of Public Data require all government agencies at a national or local level to facilitate access to information in their possession and "regularly publish or make accessible data concerning their

activities, data types held by them, and ... acts concerning their operation." Regarding the financing, the Act has an important provision: "For the conveyance of public data, the director of the data managing organization may establish a reimbursement of expenses - up to the level of the cost of the conveyance." These laws therefore not only identify the right of citizens but also lay the foundations for the provision of metadata services and the pricing policy of public data.

The main provider of GI in Hungary is the Ministry for Agriculture and Regional Development. The Department of Lands and Mapping has the national responsibility for cadastral and topographic mapping, as well as servicing national land administration. Its institutional network includes 136 district and county land offices and the Institute of Geodesy, Cartography and Remote Sensing (FÖMI), a leading research and development institute in GI where the National Remote Sensing Centre (established in 1980) provides operational services for agriculture and the environment. In Hungary, there is a high-level mapping culture, a strong land registry, and a cadastral tradition one and a half centuries long having its roots in the former Austrian-Hungarian Empire. The network of the Land Offices and FÖMI play an important role in the implementation of land tenure, agri-environmental, and agricultural policies. The Hungarian Institute for Town and Regional Planning, which also belongs to the Ministry of Agriculture and Regional Development, is responsible for data used for regional development, an increasingly important area of policy in all of the accession countries.

Coordination

Senior decision-makers in Hungary are acutely aware of the importance of digital information and the need to respond to the challenge of the information society. A discussion document, Hungary's National Informatics Strategy, was prepared in 1995 and 1996, leading a year later to the formulation of the Governmental Informatics Strategy. Following recommendation of the Governmental Committee on Telecommunication and Informatics, the National Geospatial Information Strategy was completed in 1998, and many of its major elements are now under implementation. A national policy on data access and sharing is being developed by the Inter-ministerial Committee on Informatics under the auspices of the Prime Minister's Office. This Office chairs key subcommittees including those developing and coordinating The National Strategy on Geographic Information, The Harmonisation and Geo-referencing of Addresses, and Data Dissemination, the latter also including the adoption of metadata standards and the development of a national clearinghouse.

Core Data

Several key data sets are already developed and available, including the geodetic reference systems and networks, digital elevation models, and remote sensing imagery, administrative boundaries, geographical names, and land cover data. Regarding the land and property databases, the text portion of the land registry is now in

100% digital format. Approximately 4% of the associated cadastral maps were available in digital format in 1998, and it is anticipated that 15% will be available by 2002. Base topographic maps at a 1:50,000 scale have full country coverage in digital format, while approximately 5% of the country is covered by mapping at a 1:10,000 scale in digital format, with significant activity being undertaken in digitizing existing large-scale maps.

Metadata

In Hungary, many public administration agencies operate Internet Web sites. The Inter-ministerial Committee for Information Technology established a Data Management Technical Committee with the task of facilitating exploitation of public sector information and developing tools supporting this policy. The primary task of this committee has been to establish a public administration data catalog accessible for everyone through the Internet. In addition, two other metadata services are in place: one based at the Geological Institute of Hungary and the other with a server at the Institute of Geodesy, Cartography and Remote Sensing. Recently, these systems have been linked, thus strengthening the centrality of this service that has become a one-stop point providing access to a wide range of information including certain state registries such as cadastres of real estates, land properties, and enterprises.

Lithuania

Lithuania is a parliamentary democracy with a unicameral Parliament, or Seimas. Administratively, it is divided into 10 counties, which are further subdivided into 56 local government units or municipalities. The municipal councils are elected by the local population for a period of 2 years on the basis of universal, equal, and direct suffrage by secret ballot. Municipal elections took place on March 19, 2000. Parliamentary elections took place on October 8, 2000 on the basis of a new electoral law that abolished the second round in the uninominal constituencies.

The emerging national GI policy is part of a broader strategy to deliver an information-based society in Lithuania. The Government Program for 2001 to 2005 sees the establishment of an information society in Lithuania as a strategic undertaking with immediate priority. To this end, the Government has set up a separate budget line to finance information society projects and programs aimed at developing e-government services, including regulatory framework, physical infrastructure, and computer literacy among civil servants and citizens, and ensuring that, by 2005, all children finishing secondary school will be computer literate.

The National Service for Geodesy and Cartography (NSGC) is the main provider of GI in Lithuania. As the national mapping agency, the NSGC develops the national strategy for data acquisition and maintenance in the field of GI, coordinates activities in relation to standards, and oversees the protection of copyright. To carry out its operations, the NSGC established two enterprises dealing with production: the UAB Institute of Aerial Geodesy, and the GIS [Geographic Information System] Centre,

the State Enterprise for Remote Research and Geoinformatics, which carries out activities in the fields of geodesy and cartography including geo-referenced databases. Other key providers of GI are the National Geological Survey, which has a well-developed Internet-based information system, the National Forestry Institute, and the Department of Statistics. The Ministry of Environment and the Ministry of Agriculture have recently set up an Agency for the State Land Cadastre and Register.

Coordination

The coordination of activities can be divided between the generic information society and informatics activities led by the Department of Information and Informatics, and those more specifically addressing GI issues that are coordinated by the NSGC.

At an operational level, an important initiative was the establishment of the Department of Information and Informatics within the Ministry of Administrative Reforms and Municipal Matters in 1998. The Department is charged with creating a national strategy on informatics and the information society, coordinating the provision of the infrastructure, and harmonizing legislation with the EU Acquis. With specific reference to a national GI infrastructure, the Department has developed specifications for geographic data to be included in the integrated geo-information system approved by the Ministry of Administrative Reforms and Municipal Affairs in April of 2000.

The specifications set the standards for the collection, coding, attribute structure, metadata, and data exchange of geographic data among agencies at both the national and local levels. This agreed-upon framework is extremely important for the development of a national GI infrastructure, and its specifications are updated regularly to take into account the proposals and comments made by all the agencies at the national and local levels and private enterprises involved in the creation of spatial databases. To prevent discrepancies in the classification and double coding of the geo-data, the specifications are accessible to the public on the Internet.

Core Data

Key data sets acting as the foundation of the national GI infrastructure are already in place or are being developed. They include topographic databases in 1:1 million and 1:200,000 scales, which are already available, and the 1:10,000 scale, which is under production. Digital orthophotos at a 1:10,000 scale cover the entire country and were developed in partnership to a large extent with the National Land Survey of Sweden.

The database of administrative units, settlements, streets, and addresses was 30% complete in October of 2000. However, building and maintaining an integrated database of addresses for the entire country is one of the key tasks currently being undertaken, with the aim of having a single official source available to all registers, information systems, and users. This task involves the development of a series of datasets including the administrative boundaries, settlement outlines, street centrelines, building locations, down to the coordinates of individual apartments. The creation of these geographic layers

is being done on the basis of large-scale digital maps for towns and cities where available, and the combination of vectorized orthophotos and ancillary raster data elsewhere. Linked to these datasets is an entire series of attribute tables ranging from the level of the individual dwelling unit to the settlement and territorial unit. These are currently being developed in close collaboration with the Land and Property Cadastre and the Registers of Buildings.

Metadata

Metadata specifications are included in the integrated geo-information system specifications as discussed above, but have yet to be fully developed.

Slovenia

Slovenia is a parliamentary democracy with a unicameral National Assembly. Its constitution was adopted in December of 1991. The structure of local government is based on 192 municipalities.

Most of the legislative framework with respect to the handling of personal data and electronic commerce is now in place. This includes copyright legislation passed in 1995, the Data Protection Act approved in 1999, and legislation on electronic commerce and signatures passed in August of 2000. The Slovenian Certification Authority was also established during 2000. With respect to pricing, there are some policy directives recommending that government information should be free of charge or charged only with respect to reproduction costs. However, as a whole, a coherent policy enshrined in law on data pricing is not in place, and data for private companies are charged based on price lists prepared independently by each data provider.

The main data provider in Slovenia is the Ministry of Environment and Physical Planning. This Ministry has a particularly important role, as most of the key providers of GI depend from it, including the Surveying and Mapping Authority (responsible for land cadastre, the basic geodetic system, and the cartographic and topographical database), the Office for Physical Planning (responsible for the development and control of state spatial plans), and the Environment Protection Agency. Among the other government ministries and agencies, the most important is the Statistical Office of the Republic of Slovenia.

Coordination

The Geoinformation Centre of the Ministry of the Environment and Physical Planning was established in 1991 with following mission:

- To regulate and coordinate GI policy at the national level and cooperate with other national and international organizations with respect to GI-related standardization, legislation, policy, and legal and organizational aspects of data exchange and distribution.
- To develop user services including user-requirements analysis, translation of requirements in terms of information processing, technical advice, linking information users and

providers, and quality support (the preparation of quality manual, quality assurance, and quality audits).

- To develop metadata services, remote access to metadata catalogs and data provision through a distributed data warehouse systems.
- To raise awareness of the importance of an information technology infrastructure, including human resources management, research and development, provision of tools, training, and data integration.

Within the process of establishing a GI infrastructure, cooperation agreements have been signed between the Geoinformation Centre and six data providers at the government level as well as with a range of local communities to also develop a regional organization for GI.

Core Data

There are already a significant number of core data sets available in digital format for the entire country. They include the topographic databases in both raster and vector format, the administrative boundaries, and the databases of street addresses. Socio-economic and statistical data are close to being completed and the attribute data of the land cadastre is fully digital while the geographic layer is approximately two-thirds complete. Additional efforts are being made to complete coverage of environmental data and the street network.

Metadata

The Ministry for Science and Technology has the responsibility for the development or adoption of standards. In the field of GI, the Ministry adopted the CEN TC 287 pre-standards in 1999. In that same year, the Minister for the Environment issued an order for all data providers within the Ministry of the Environment and Spatial Planning to update their metadata descriptions every 6 months based on CEN TC 287, and submit the metadata for entry in the Slovenian National Data Catalogue, which is the Slovenian National Spatial Data. The catalog currently contains metadata on 407 information resources by 110 providers, classified into 43 thematic groups. The Directory contains information about the content, purpose, usage, quality, distribution, and all other information necessary to select and use available spatial data. Moreover, a specific tool has been developed for the entry of metadata by data producers (MPEdit). The Government Centre for Informatics and the Geoinformation Centre are working on a common project to develop a GI subportal within the Government electronic portals. The Geoinformation Centre is also collaborating with the Surveying and Mapping Authority to develop on-line access to the geodetic databases.

	BULGARIA	HUNGARY	LITHUANIA	SLOVENIA
Selection Criteria	Relatively large, but poor	Relatively large and rich	Relatively small and poor	Relatively small, but rich
Public Sector Information Legislation	Legislation on access to public information under consideration	Protection of public data and accessibility to the public administration	GI part of National Information Strategy	Legislation mostly in place
Main Data Providers	Agency of the Cadastre, Military Topography Service	Ministry of Agriculture and Regional Development (including Institute of Geodesy, Cartography and Remote Sensing)	National Service for Geodesy and Cartography	Ministry of Environment and Physical Planning (including Surveying and Mapping Authority)
Coordination Mechanism	Limited coordination through Cadastral Agency	Inter-Ministerial Committee on Informatics, Subcommittee on National GI Strategy	Department of Information and Informatics	Geographic Information Center within MEPP
Core Data	Limited data in digital format	Several key data sets developed in 1:50,000 topographic coverage	Several data sets in progress. Complete 1:10,000 orthophoto coverage	Significant number of core data sets in digital format
Metadata	Limited	Public administration data catalogue on internet	Not yet fully developed	Well developed metadata services

Table 2 Summary of the key features of the four case study countries

Discussion

Geographic Information Policy

The case studies illustrated here were chosen because these four countries exemplify the significant variations that exist within the accession countries in terms of levels of economic development. Bulgaria is the poorest country, with a GDP per capita of just over 20% of the EU average and over one quarter of the workforce employed in agriculture. The situation in Lithuania is not better, with a GDP per capita a little less than 30% of the EU average and 20% of the work force in agriculture. By contrast, Hungary is already more fully industrialized, with only 7% of the workforce employed in agriculture and a GDP per capita running at 50% of the EU average. Slovenia, with a GDP at 70% of the EU average, is already ahead of Greece and a little behind Portugal, thus displaying similar levels of economic development as some of the existing EU Member States.

In spite of these differences, all four case studies illustrate the extent of awareness and political commitment of these countries with respect to the strategic role of GI. Clearly, the political importance of land restitution and registration following the demise of former communist regimes has helped to support a broader strategic commitment; however, the extent of this commitment is truly impressive and one that many other nations could learn from.

The main findings of the analysis are summarized in Table 2. As seen in Table 2, Hungary and Slovenia have not only developed a clear framework for NSDI as part of a broader national information infrastructure, but have also gone furthest in implementing its key components which include coordination, core data, and metadata.

Hungary and Slovenia are followed by Lithuania, which has an explicit NSDI policy articulated by the government as part of its Information Society Strategies, which in itself is an indication of the strategic importance attached to GI policies. While the development of core data and metadata in particular still needs considerable progress, the most crucial battle (i.e., making the case for an NSDI, gathering the necessary political support, and crystallizing into legislation) appears to have already been won. Moreover, a specific budget line for the development of the Information Society has been set aside, and the commitment to get all secondary school children to be computer literate is an indication of the forward-looking strategy being pursued by Lithuania. In relative terms, Bulgaria has a less-developed framework than the other three case study countries, but even in Bulgaria there are some indications of a dynamic process taking place that could rapidly alter the extent of NSDI development in this country.

With respect to other elements of the GI infrastructure, most countries already have small-scale topographic data available, as well as varying degrees of environmental and socio-economic data. At present, the major emphasis lies in the development of land information and cadastral data in each of these countries (e.g., Bogaerts 1997, Dale and Baldwin 2001). This promises to become a key block of the infrastructure at the detailed level.

It is worth noting that metadata appears to be given a varying degree of priority, bearing in mind the effort needed to make organizations throughout the public sector appreciate the value of documenting data resources as part of the wider strategy to increase access to public sector information. Metadata services are well developed and have specific funding and

policy support in Hungary and Slovenia, while they are still at a relatively early stage in Lithuania and Bulgaria.

GI and Accession

As argued at the beginning of this article, the accession of up to 13 countries to the EU represents the largest challenge facing Europe in the coming years and is not without critics both within the existing Member States, some of which fear increased in-migration or loss of regional aid, and within the accession countries themselves in view of the major structural, social, and economic reforms necessary to achieve this goal.

The findings of the analysis suggest that GI and related technologies such as geographic information systems have two key roles to play in the accession process. The first relates to the need to develop the infrastructures necessary to support the process of modernizing public administration. The term “infrastructure” includes digital data (geographic, statistic, and administrative), computer systems, networks, procedures, people, and skills necessary to inform policy, target delivery, monitor progress, and evaluate impact. The existence of an efficient administration (e.g., the ability to perform *ex-ante* and *ex-post* evaluations) is a prerequisite to qualifying for regional aid, access to which is seen by many as one of the potential most direct benefits of accession; hence, the pressure from the EU to develop legal and administrative procedures such as the establishment of appropriate regional administrative units, the collection of relevant data, and the setting up of the necessary computerized monitoring systems.

The second role is even more direct as there has been a significant shift in policy at the EU level during the 1990s away from sectoral approaches and top-down regulatory mechanisms, which were manifestly unable to address the increasing complexity and interaction of environmental, economic, and social issues. What has emerged, particularly in light of increasing environmental concerns, is a more integrated approach to policy where the interactions and cumulative impacts of different policies and actions are assessed *ex-ante* to increase their effectiveness. This shift to a more integrated approach is evident in all key policy areas. Directly flowing from the point above is the emergence of spatial planning at the regional scale as a powerful framework for analysis, coordination of intervention, and evaluation of the impact. The formulation of the European Spatial Development Perspective (Committee on Spatial Development, 1999) is the clearest embodiment of this approach, but its principles are also present in all other areas of policy. Regional planning in turn requires an increasing amount of spatial data for policy formulation, implementation, and evaluation.

Finally, major EU policy areas make direct requirements for the development of geographic information systems. Among them, the EU Common Agricultural Policy is particularly significant on two counts: first because it is financially the most important EU policy, absorbing almost 50% of the EU yearly budget of 93 billion euros. Secondly, because agriculture is still a major economic sector in many of the accession countries, employing large sections of the population, the reform of which has major

social implications with respect to rural development, and political implications with respect to land restitution, consolidation, and registration. One of the key requirements to access funds in this area is the development of a computerized Integrated Administration and Control System (IACS) to target intervention, administer the funds, and prevent fraud. The IACS has a strong geographic component, and its development clearly feeds on the GI-related policy developments discussed earlier.

Similar requirements are also increasingly common in environmental policy, including the management of river basins to protect water quality, nature conservation, and integrated coastal zone management, all of which specifically require Member States and relevant local agencies to set up a geographic information system for policy monitoring and evaluation. The strong emphasis on environmental policy in the EU is also leading to a major shift in emphasis toward a more decentralized approach to data management, leaving data at the level at which it can be more easily collected and updated (i.e., at the regional and local levels rather than at the EU level). Assuring access to such geographic and environmental data becomes in this scheme an absolute prerequisite. Hence, the initiative announced by Directorate General for environment in April of 2001 toward the development of an Infrastructure for Spatial Information in Europe (INSPIRE) embedded in community legislation. The path toward the development and implementation of this initiative is not going to be without challenges, but constitutes a significant milestone in European policy.

With these considerations in mind, it might not be surprising that all of the accession countries are taking such a strategic approach toward the development of GI policies and strategies. However, if EU policy were the main driver, we would see a similar strategic approach throughout the current members of the EU, which is not borne out by the findings of the review carried out by Craglia et al. (2000). Therefore, the process of accession and the development of national GI policies and infrastructures are not simply cause and effect, but rather parallel processes that feed into, and derive support from, each other.

Conclusion

In this article, we examined the experience of four of the 13 countries seeking EU accession with respect to the development of national policies on GI and NSDI. These case studies have been chosen as examples of the situation that is emerging across this diverse group of countries, all of which to a greater or lesser extent are making very significant strides both in the road to joining the EU, and in developing and implementing an NSDI.

It has been argued that the relationship between enlargement and the development of national GI policies is not one of cause and effect. Having said that, it is also clear that there are numerous areas of common ground. In particular, the accession process requires:

- the modernization of public administration;
- the development of land and property markets, supported by efficient cadastral systems;

- computerized support systems for policy monitoring and evaluation, such as the IACS, which includes inter alia agricultural parcel identification, and animal identification and registration to track the source and movement of animals and prevent the spread of disease, a very topical issue in Europe at present;
- specific geographic information system-based systems and geographic indicators for a range of environmental and agri-environmental policies including nature protection, water quality protection, and integrated coastal zone management; and
- an increasing shift to spatial planning as the conceptual and analytical framework for policy integration across sectors.

Geographic information systems and infrastructures are clearly crucial to all of the above either directly or indirectly. There is certainly a high degree of consensus that public administration benefits considerably from having modern information systems, not just on direct support of its activities but also by allowing a more open access to public sector information, which in turn enables more informed public participation and accountable administrations.

The difficulties faced by the accession countries in implementing GI strategies and infrastructures are largely the same as those of the EU Member States and include a lack of awareness across different levels of the public sector, lack of management support and technical skills, varying policies with respect to access to data and pricing, weak motivation and coordination across agencies. In addition, limited financial resources exacerbate these problems. However, for those who have argued that it is difficult to make a real business case for the development of national, or even global, spatial data infrastructures (Rhind 2001), the experience of the accession countries is very instructive as it shows that a business case can indeed be made if such policies and infrastructures enable the transition to a fully working market economy and the accession to the largest single market in the world.

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Appendix: Selected Relevant Web Sites

General Interest in Relation to Accession Countries and Geographic Information
DG Enlargement 2000. Country Reports 2000, <http://europa.eu.int/comm/enlargement/index.htm>
European Umbrella Organisation for Geographic Information: EUROGI, <http://www.eurogi.org>
GIS International Group, Panel-GI Project, <http://www.gisig.org/panel-gi/>
Joint Research Centre of the European Commissions, GI-GIS Portal, <http://www.ec-gis.org>

Bulgaria

Main Office of Cadastre and Geodesy, <http://www.mrrb.government.bg>
Technical University of Sofia, <http://www.vmei.acad.bg/>

Hungary

Ministry for Agriculture and Regional Development, <http://www.fvm.hu>
Institute of Geodesy, Cartography and Remote Sensing (FÖMI), <http://www.fomi.hu>
Prime Minister's Office, Governmental Commissioner for Informatics, <http://www.meh.hu>
Metadata Services: METATÉR (Prime Minister's Office), <http://meta.mafi.hu>

Lithuania

State Land Cadastre and Register, http://www.kada.lt/index_en.html

Slovenia

Slovenian National Spatial Data Catalogue (CEPP), <http://www.sigov.si:81/>
The Surveying and Mapping Authority, (<http://www.sigov.si/gu/index.html>)