

GIS Technology and Market in South East Europe

Report on a Study

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1. Introduction

Geographical Information (GI) is information about a situation happening on the earth. Geographical Information provides the coordinates of a location, together with attributes such as property, ownership, or the form and size of geographical objects like forests, fields, lakes or countries. GI covers many themes, from climate and weather information to statistical data about people, related to the geographical space.

Spatial information is important for all decisions: we need to understand where things are, need to know how to move in the world to reach our goals and to predict the results of actions to others. In all cases spatial information is instrumental: GI is widely used in many fields and contributes substantially to the well being of people. GI is an important base for the government as well as for any economic activity; it is the base for land restitution, for private investment, and for the collaboration between countries. Traditionally, it is most used in public administration, such as cadastre, where it contributes to urban, regional and national planning; fiscal policy, tax collection, or agricultural policy are other administrative applications. GI is used to improve the efficiency of transportation of people and freight, and it is crucial to protect the environment. Companies use GI to develop their business and market. Many new application areas are opening up, with location-based services and mobile communications as today the most promising market segment for the future. The market of location-based services is considered important for the whole GIS industry because it forms the basis for the development and for the return on investment of high-end and high-quality digital maps and for many new Internet and wireless applications.

GI is information on which many applications are based, and behind which this information becomes invisible. Therefore, non-specialists and especially politicians have little awareness about the importance of GI.

South East Europe has, after the changes from the communist into the democratic society, developed into a region with a lot of internal trade and economic cohesion. The Western Balkan countries were subject to many local wars, which created a region of high instability. Many programs have been launched to rebuild the region and to transform these countries into democratic ones with freely elected governments and a market economy; donors have earmarked a lot of budget for this region. However, without data about location and places available, those kinds of programs will be impossible to execute efficiently. GI will be the basis for collaboration between the countries, for private investment, and land restitution. It is highly important to have data available about the countries, their administrative boundaries, their topography and their land use.

Most is known about the availability of GI in those countries that are candidates to, or members of the European Union. Here, GI is used in various applications. Donor funding has contributed to this. The situation in Bulgaria and Romania, as well as that in the other accession countries has been studied and described following a workshop organized by EUROGI in November 2000. Little is known about the creation and use of geographic information in the Balkans, however.

The authors of this paper have participated in various projects in Bulgaria in the field of GI/GIS that were funded by the European Commission, and have also contributed to the EUROGI study [Ulrich Boes, Raina Pavlova].

2. Purpose and Aims of the Study

Geographic Information is an indispensable factor for the economy, especially for countries in transition. Therefore it is of high importance to study and document its availability, and to provide the information to governments, donors and any private company or research organization interested in it.

The study presented here is a continuation of earlier studies carried out by the authors in Bulgaria, and aims generally to document the situation of GIS in South East Europe. South East Europe is defined here to comprise the countries Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Romania, Turkey and Yugoslavia.

The aim is to provide a comprehensive documentation of the spatial data infrastructures in these countries, describing GIS providers, the systems installed, and in which sectors, the status of research in this area along with an overview of research organizations and universities. On-going and planned projects will be presented, and the use of GI standards.

In a second part of the study, the data collected will be analyzed in order to present the obstacles and the favorable conditions for the use and deployment of GIS technology, the lack and the need for standardization and for harmonization of business processes. Differences and the common issues between the countries will be determined, prospects for further developments provided and necessary future activities for the region in this sector defined, especially aiming at interregional collaboration. Such an activity plan can be used as input for the definition of strategic programs by governments and donors.

3. Methodology

As it is usual for such a kind of work, the study started with a desk research to understand the situation in the countries mentioned. This is based mostly on searching the World Wide Web, but also on literature and specialized journals. One important result of the desk research is a number of contacts in these countries. The second step is the definition of questionnaires that are sent to the known contacts. Questionnaires that have been defined in earlier projects to study the situation in Bulgaria are used as the base for the definition of the questionnaires used in this project. Having collected the questionnaires and analyzed their results, missing information may be added by in-depth interviews, or if necessary on-site visits.

The information collected will be analyzed, according to the goals of the study, and documented. The final result will be made available on the World Wide Web and also in printed form.

It is worth pointing out that GI is understood here as part of the general economy, and will be considered in the context of the political and economic situation of the countries considered. Therefore we are also providing an overview of such more general aspects, so that at the end future prospects can be presented in the light of the overall economic development.

4. The political and economic situation in South East Europe

South East Europe comprises the countries Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Romania, Turkey and Yugoslavia. These countries can be divided into three groups of countries. The first group is formed by Greece alone as the member of the European Union, the second group comprises all candidate countries to the European Union (Bulgaria, Romania and Turkey), and the western Balkan countries build the third group.

All these countries, except Greece and Turkey, formed part of the communist block until 1989. After the changes they turned to democracy and a liberal market, but have not reached full stability and prosperity yet. In particular, the Kosovo war of 1999 has touched several of these countries, but the whole area is today in economic progression. Since a long time, trade is carried out between these countries, and prosperous scientific co-operation has existed. Seven of the Balkan countries, Albania, Bosnia, Bulgaria, Croatia, Macedonia, Romania and Yugoslavia, agreed to work together to form a free-trade zone.

Table 1 displays some indicators for the development of the region, which includes a comparison to Germany, as one of the better-developed countries of the European Union. The data have been collected from various sources. Although these are general data that might be considered as easily accessible at first sight, it is not evident to obtain reliable and comparable information on all points for these countries.

Statistical Economic Indicators for SEE											
	Germany	Albania	Bosnia	Bulgaria	Croatia	Greece	Macedonia	Romania	Yugoslavia	Turkey	
GDP per capita (1996) [\$]		1,290.00	600.00	4,630.00	4,300.00		960.00	5,200.00	1,900.00		
GDP per capita (1998) [\$]	31,141.00	795.00		1,372.00	4,846.00	12,069.00	1,349.00	1,310.00			3,167.00
Population (1998) [mill]	82.10	3.10	3.40	8.20	4.50	10.60	2.00	22.50		10.60	64.50
Phone lines (1998) per 1000 people	567.00	37.00	96.00	329.00	348.00	522.00	199.00	167.00		196.00	254.00
Internet hosts (1998) per 1000 people	17.67	0.05	0.18	1.23	2.12	4.71	0.57	1.05		0.72	0.73
HDI rank	14	94		60	49	25	69	64			85
Net foreign direct investment flow 1998 [mill \$]	19,877.00	45.00		401.00	873.00	700.00	119.00	2,063.00			807.00
Production factors [%]											
Agriculture		1.10		18.70	8.90	10.60	11.40	16.40			17.60
Industry		24.50		25.50	32.40	17.70	28.30	40.10			25.40
Services	44.10	21.00		55.70	58.70	71.70	60.30	43.40			57.00
Tourism											
Web sites [%]											
Government			41	75	85		67	60			83
Universities			1	100	95		28	12			94

Table 1: Indicators of the economy and the Information Society in South East Europe

In general, all countries are progressing economically, but the region is well behind the industrialized world. Greece as a member of the European Union is on a higher economic level than the other countries, with Croatia ranking second, followed by Turkey and then Bulgaria,

Macedonia and Romania. The situation of telephone and Internet connectivity provides the same picture.

A different picture results when looking at the Human Development Index (HDI). The Human Development Index has been defined and provided by UNDP (United Nations Development Program); it is based on three distinct indicators, longevity, as measured by life expectancy at birth; educational attainment, as measured by a combination of adult literacy and the combined gross primary, secondary and tertiary enrolment ratio; and standard of living, as measured by GDP per capita. It is not exclusively focussed on economic opulence, as GDP is, and aims to represent average achievements in basic human development and to produce a ranking of countries. For the countries considered, UNDP did not calculate the HDI for Bosnia-Herzegovina nor for Yugoslavia. Again, Greece takes the first place after Germany, followed by Croatia and Bulgaria. Turkey and Albania have the highest or worst HDI value.

The tendency is generally confirmed when looking at the economic sectors. Today, countries with a high share of services and a low part of agricultural activity in the overall economy are normally considered having a strong economy, also when considering the new Internet economy. This is clearly reflected in Greece as a member of the European Union. Croatia has a low share of agriculture, but a strong industry, and therefore the service sector is weaker here. Except Albania with a very high agricultural part the situation is comparable in all countries, with Romania having also a high part of industrial production.

The evolution of science and technology is hindered by the small size of the market in these countries, leaving little possibilities for investment, by difficulties to access new technology from the West, by deficiencies in the technical infrastructure, and by the contents of education that is not adapted to a modern level. Despite these obstacles, many opportunities and a demand for new technology and for reconstruction using modern technology exist. In Bulgaria, as well as in other countries, ambitious privatization programs are implemented and monetary stability exists.

Strong collaboration and growing trade between countries, democracy and an evolving market economy characterize the region as a whole today. Donor activity is high, and land restitution and reconstruction of the countries is progressing or at least planned.

There are, however, a number of prevailing problems. These are ethnic conflicts, a high number of national languages with little knowledge of English as the international language, a high poverty rate, and corruption.

The telecommunications infrastructure is weak and telecommunication services are not generally available, Internet connection is accessible only to a minority, although it is strongly growing in all these countries, and few web sites exist. This situation is much better in the accession countries, and of course in Greece.

Several countries, in particular Bulgaria are suffering from brain drain, and are trying hard to define programs to keep the educated youth in the country. Land ownership still constitutes a problem, and big cadastre projects are starting or are planned in some countries like Albania, Bulgaria, Romania or others.

5. Geographic Data and their Use in South East Europe

In none of the countries of South East Europe a national spatial data infrastructure exists. There are attempts to build such an infrastructure, and elements exist, as documented for Bulgaria and Romania in [*Geographic Information and the Enlargement of the European Union*]. In all these countries, data is available and various projects exist using GI. However, it is generally difficult to find information about the countries in South East Europe, in particular about those in the Western Balkans; few web sites exist, and if so, they contain only general information about the countries.

5.1 *Geographic Data available*

The whole area is covered by various satellite data, offered for example by Eurimage, in various resolutions, up to 1 m, and from various satellites (Quick Bird, Ikonos, Landsat, Kosmos, etc.). The first and second group of countries is generally well covered by data of high resolution, and the level of digitization is high.

Core data sets exist in Bulgaria in digital form starting from the national level. A digital terrain model, geological data, and the forestry and agricultural cadastre are available for the whole country. The urban cadastre has only been completed for approximately 10% of the country. Data exist in Romania for the rural and the urban cadastre, for the geodetic network, and topographic data is available.

This is different for the third group of countries. Private companies, GeoStrategies in the UK in particular, offer data. For Macedonia and Yugoslavia, companies offer vector and raster maps up to a resolution of 1:500,000, and also land use maps and terrain models.

Various data exist for Albania. The Geographic Studies Center of the Albanian Academy of Sciences has general geographic maps in the scale 1:100,000. The Institute of the Army possesses topographic maps in the scale of 1:10,000 and 1:100,000. In addition, various thematic maps exist, for example touristic or environmental maps. Digitization level is high, with vector and raster data in 1:200,000 and 1:500,000. Land use maps exist in the scale of 1:500,000 and also terrain models have been generated.

Corine Land cover data exist for several of these countries, amongst which are Bulgaria, Romania, Turkey, and Albania.

5.2 *Actors*

In all the countries studied, the organizations that own data are mainly Ministries, National Statistical Institutes, and Military services. Few companies offer data and are active in the region, such as Geo Strategies, or GISDATA, the most actives private companies in the region. GISDATA is distributor of ESRI for Macedonia and Albania, and they have offices in various countries. The most widespread product is ArcInfo or ArcView by ESRI.

Bulgaria has been very active in the GI area. The main data providers are governmental organizations, with some private companies. The major GIS vendors have partners, resellers or distributors in Bulgaria, as they have in Romania. Romania is very advanced on the policy level,

and the Romanian national geographic information infrastructure is considered to be a strategic component of their national information infrastructure. The main actor is the National Office for Cadastre, Geodesy and Cartography, whose role is to coordinate and organize all activities with respect to GI. In Turkey, a Geographical Information Systems Division was established at the State Institute of Statistics in 1991, to deal with remote sensing, water statistics and natural accounts.

5.3 Projects

Financing given by international donors like the World Bank, the Stability Pact or the European Commission promotes the use of GIS through various projects, in which GI is used. For example, GI is used for demining, more generally in projects for rebuilding in Croatia and Bosnia Herzegovina. The Project "Kosovo: GIS and War Crimes Evidence" uses GI. However, there are few projects dealing directly with GIS, and little self-standing research.

A number of projects is carried out in Albania in the environmental sector, especially for the Albanian coast, that use geographic data. A big project has been started in Albania for the conservation of the forests. The Geographical Information Systems Division in Turkey is active in a variety of projects, for water, crop estimation, statistics and production of thematic maps.

A research group at the university of Belgrade (Yugoslavia) is dealing with advanced topics such as location-based services.

The European Commission's PHARE Programme, and the World Bank fund cadastre projects on national and on local level in Albania, Bulgaria and Romania. In Bulgaria, GIS is deployed in many applications, such as cadastre, utilities, construction, telecommunications and government administrations.

The whole area benefits from several partnership programs, in particular in the area of GIS training.

6. Outlook, Future Work and Conclusions

A desk research has so far been carried out leading to first results as summarized above. Various contacts have been obtained for the region. Following the described methodology, the next steps are to collect answers to questionnaires and interviews.

The complete study will provide useful and necessary reference material, which will constitute the basis for future projects and new applications, launched by government agencies, by donors or by the private sector. The data will be instrumental for the cooperation with donors and governments. In particular, the knowledge of the data available in the region will stimulate the creation of new data, which will have a considerable impact on the further economic development of the region.

The results will equally be important for the introduction of standards such as ISO or OGC to create seamless geographic data in this region. They will promote the general use and deployment of Information Technology in the region and therefore be influential on the transition

and integration into the European Union. In so far, this study is hoped to become a contribution to stability and peace in this region.

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