Sustainable development of the Lithuanian Geographic Information Infrastructure

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Geographic information (GI) has a tremendous economic and social value for any society. GI is very expensive to collect, process and maintain, yet ever easier to disseminate cheaply via Web-based services and products. Much GI is collected by local and national governments for specific purposes. One of the most valuable resources of a nation is its data. Not only the need for data sharing is important for everyday business processes, but it shows its value in decision-making phases during ecological disasters where efficiency means life and property saving. The main aim of the LGII (Lithuanian Geographic Information Infrastructure) is to develop an official Geographic Information source system, or Infrastructure, and Information Environment allowing a free incorporation of GI into almost any Public Sector Information (PSI) services in Lithuania.

One of the goals of LGII is an open, shared infrastructure for accessing and distributing information products and services online. To achieve this goal, data residing at regional and national organisations are to be harmonized with common standards.

The overall goal of LGII is to improve the quality of policy making, citizen's participation in the society life and market development through the increased use of GI, hence to provide a new means of acquiring knowledge.

The LGII as part of Information Technology is a knowledge-gathering activity by its geographic nature. It is one of the effective components of the physical and economic infrastructure ensuring a stable and balanced development of the economy and its efficient functioning. The issue for all the countries is not to ask the question whether a National GII should be implemented; the challenge is how to implement it in an effective way based on culture, specific requirements, the priorities and history of the country to promote its economic development, to stimulate its better government and to foster environmental sustainability.

Key words: geographic information, sustainable development, GIS, geographic information infrastructure, spatial data infrastructure, ecological factors

INTRODUCTION

The central government's radical E-Government programme in Lithuania aims to reform the way in which government conducts business at all levels, in part by applying the IT lessons learned by industry. E-Government is all about best value (INSPIRE..., 2002; GINIE..., 2000; Pubellier, 2005; Roberts, 2003; EuroSpec..., 2003; Zavadskas, 2003; Melnikas, 2005; Ventovuori, 2006). This in part is realised through building open, coordinated data stores that all applications can access with controlled privileges providing support to join-up information for analysis and services (INSPIRE..., 2002; Isenmann, 2004; Kolk, 2004; Zavadskas et al., 2004a). In many cases the necessary infrastructure already exists in the core systems used in the public sector today (Availability Report, 2004; Turskis et al., 2006; Sinkevičius, Augutis, 2004; Paliulionis, 2004; Siewczynski, 2004; Jakimavičius, Mačerinskienė, 2006; Trinkūnas et al., 2003; Cypas et al., 2006; Antuchevičienė, 2005). Development of explicit geographic information policy is a part of the national strategy to promote information-based society. Spatial data infrastructure based on information technology is a knowledge-gathering activity by its geographic nature (INSPIRE..., 2002; GINIE, 2000; Pubellier, 2005). It is one of the effective components of the physical and economic infrastructure ensuring a stable and balanced development of the economy and its efficient functioning (Availability Report, 2004; Feasibility Study, 2004; Framework Report, 2004; Assessment, 2004). Spatial data infrastructure serves as a basis for environmental reporting – geographic context and metadata (Amelung, Gomez, 2004; Arndt, Günther, 2004). Significant attention should be paid to the standardisation of environmental sustainability reporting (Isenmann, 2004; Kolk, 2004; Steven, 2004).

As about 80–90% of all the public sector information contain a geographic component, building a successful Lithuanian Geographic Information Infrastructure (LGII) is a fundamental prerequisite for the development and implementation of this policy, for stimulating the private (value-added) sector and for improving services to the citizens in general.

Implementation of the LGII is a major undertaking that requires coordination across a number of areas. The main goal of the project started in 2004 is to make harmonized and high quality geographic information readily available for formulating, implementing, monitoring and evaluating community policy (Pubellier, 2005).

THE GOALS OF THE LITHUANIAN GEOGRAPHIC INFORMATION INFRASTRUCTURE

The main aim of the LGII is to develop an official Geographic Information source system or Infrastructure and Information Environment allowing a free incorporation of GI into almost any public sector information services in Lithuania.

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LGII as a part of Information Technology is a knowledge-gathering activity by its geographic nature (GINIE..., 2000; Pubellier, 2005; EuroSpec..., 2003). It is one of the effective components of the physical and economic infrastructure ensuring a stable and balanced development of the economy and its efficient functioning.

The objectives of the LGII are to (Pubellier, 2005; Framework Report, 2004):

• provide GI (as part of PSI), prime digital material, for almost any public sector information services, research, business and citizens at large – GI availability via the Internet;

• combine / interconnect the GI prime material data into different sources of added value electronic public sector products and services, thus providing unprecedented possibilities to interconnect various registers, databases, etc. – interoperability;

• foster substantial investment in creativity and innovation and thus growth and increased competitiveness in both content provision and Information Technology and more generally across a wide range of industrial and cultural sectors. This will safeguard employment and encourage new job creation – economic gain;

• provide a transparent and applicable environment for the re-use of GI, and thus to remove the major barrier in activating the full economic potential of this key information resource (there are considerable differences in the rules and practices relating to the exploitation of the current insufficient and fragmented available GI resources) – favourable conditions for business and industry.

As a harmonized spatial data infrastructure that will facilitate aggregation of information of various sources and more advanced analytical work, the LGII will stimulate the use of geographic information in different sectors, including those commercially valuable (Roberts, 2003; Zavadskas et al., 2003; Zavadskas et al., 2004a; Zavadskas et al., 2004b; Kaklauskas et al., 2006). Some barriers in a wider use of geographic informa-

tion, which can be overtaken employing the LGII, were analysed and solutions were proposed (Assessment..., 2004).

It is necessary to emphasize two aspects of the LGII at this point:

1. The short-term goals (to be achieved during the time of implementation of the development project – ca. 3 years) manifest in solutions to increase the use and facilitate the exchange of public sector geographic information already available. Connecting state registers through their geographic component or ensuring compatibility of the large scale (at cadastre or municipality level) data and smaller scale (national cartographic database at a scale 1: 50 000) will directly serve this purpose (INSPIRE..., 2002; Stankevičius, 2005).

2. The long-term goals of the LGII are connected with development of the state in diverse aspects for many decades in the future. There were three major long-term goals defined:

• to extend the scope and functionality of the LGII involving more data providers from different sectors and encouraging the partnership of different institutions in development projects using public sector geographic information;

• to build interoperable geographic information systems where they still do not exist and improve the existing ones, for example, the information system for the National Atlas, health services, schools, utility management, etc. Full interoperability of such systems must be sought in the future, providing the services to fully integrate data from various sources, from the local to the European level, into coherent seamless datasets supporting the same standards and protocols;

• to encourage the use of geographic information and technologies for its management for decision support at all levels, where it is still very limited, for example, health care (relationships between disease and ecological factors, planning emergency services networks, investigating food-borne disease outbreaks), law enforcement (tracking crime activities, identifying patterns or trends to take preventative measures), environmental management, etc., up to geographic information for personal mobile devices. This task largely includes capacity building.

THE STRUCTURE OF THE LGII

1. Creation of the national metadata system (register of metadata) and the system of metadata services is the first priority as it serves as the basis for harmonization of information access. Legal leverage over collection and provision of metadata is necessary to ensure that all public sector information is documented in the catalogue. It must be initiated by the coordinating governmental body. For a consistent metadata register, a single standard for geographic metadata must be adopted, the database created and tools developed for an easy transfer of metadata online, geographic and textual search for metadata, and metadata updating.

2. A single national geographic reference databank is the second core component to be created to ensure a proper functioning of the LGII. It requires a single geographic data schema, geographic database management systems and services to support vendor neutral data exchange formats, common industry standards and data conversion on demand (both ways: for data providers and users), extract–transform–load procedures, the Internet mapping, geographic and textual search and different access privileges.

The two components form a partly centralized public data system that provides reference data for all users of the infrastructure and serves as a basis for geographic integration of all State registers in the future. Some of reference data themes like roads, forestry, and protected areas are maintained by different institutions and at scales different from that of the national reference database. One of the most important tasks of the LGII is to ensure proper linking of such data instead of replicating them in the central node, and to keep the system transparent to the users. The National Land Service is responsible for political actions such as legal regulations necessary to ensure the robustness and sustainability of the infrastructure, and necessary institutional arrangements.

Other producers and owners of geographic data are encouraged to connect to the infrastructure as its peripheral nodes. Provision of their data (different thematic layers) to be accessible through the LGII portal is subject to negotiations and mainly based on the free will of the institutions. Technologically, the infrastructure is planned as to require minimal interventions into existing activity models and data schemas. Some nodes of the LGII are of special importance (municipalities, state registers and cadastres, environmental information systems, etc.).

ACTION PLAN FOR THE SUSTAINABLE LGII

It can be stated that striving for interoperability of the national geographic database, State registers and other databanks of national importance, some interventions are essential for all the reference data themes. A general summary of the type of activities and the extent it must be planned to improve the interoperability of each of reference data themes is as follows.

1. Implementation of the LGII policy in respective fields:

1.1. Legal regulations (liability of institutions for different datasets, clear financing, copyright and pricing policies, data exchange regulations).

1.2. Adopting standards (state classifiers system, metadata and data standards, and standards for data quality).

2. Developing an information system in each of the many application fields where geographic data are used, ready to be integrated in the LGII:

2.1. Developing the database management system.

2.2. Harmonization of data among institutions.

2.3. Creating an infrastructure for publishing metadata (data) in a one-stop Internet portal and effective exchange of data among institutions.

3. Data collection:

3.1. Collection, digitizing of missing geographic reference data.

3.2. Updating of the outdated datasets.

Harmonization actions, which comprise standardization of geographic data, creating and making available the full system of metadata and, finally, improvement of existing datasets in different aspects, are the least visible but actually crucial for a successful implementation of the LGII.

Summarizing the experience in developing the relevant components of geographic information infrastructure in other countries (GINIE, 2000; EuroSpec, 2003), it should be stressed that the most important success factors in Lithuania are:

• active governmental support.

• interaction and coordination of the involved institutions, strong multi-sector coordination.

• overall strategy and early adopted top-down approach.

• decentralization and involvement of the private sector from the outset.

• adopted common standards and regulations.

• clear data policy, licensing framework and access procedures.

• flexibility of the system.

• transparency in implementing the strategy and proper communication to the public.

CONCLUSIONS

The rapid increase of the number of countries becoming involved in the National GII development is a fruit of lessons learned from the clear benefits of the first generation of national GII (Australia, Canada, China, Denmark, Finland, France, Germany, Japan, the Netherlands, Portugal, Switzerland, UK and the USA). Their initial motivations were in reducing duplication, using resources more effectively, and creating a base for expanding industry productivity and the spatial information market.

Numerous evaluations derived from experience indicate that there was a lot of diversity in the first generation of national geographic information strategies. Up to now, there have been clear advantages associated with a formal mandate for a national geographic information strategy, providing that this was accompanied by necessary resources to enable its implementation. The lack of dedicated resources is definitely a weak point where initiatives are fundamentally results of existing coordination activities. This model has the advantage that it builds upon existing cooperative patterns.

In that way Lithuania is very fortunate to be able to start the LGII now so that the experience of the first generation National GII has been learnt and mistakes can be avoided. Lithuania will be creating what we call the third generation national GII, implementing the EU initiatives on sustainable development and spatial management – integrating the economic, social and environmental dimensions of regional development (Roberts, 2003).

Several types of interventions have been planned regarding development of the national geographic data infrastructure: strategic-political actions (necessary to ensure the robustness and sustainability of the infrastructure and to serve as the methodological background), development of the technological infrastructure (the technological environment necessary for the LGII to function) and harmonization of geographic information and access to it.

Now the challenge is how to implement the National GII in an effective way based on culture, specific requirements, priority and history of the country to promote its economic development, to stimulate its better government and to foster environmental sustainability.

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LIETUVOS GEOGRAFINĖS INFORMACIJOS INFRASTRUKTŪROS DARNUS VYSTYMAS

S a n t r a u k a

Geografinė informacija (GI) turi didžiulę ekonominę ir socialinę reikšmę kiekvienoje bendruomenėje. GI brangiai ir sunkiai surenkama, tačiau lengvai ir pigiai gali būti platinama internete kaip pasaulinio tinklo paslaugos ir produktai. Dauguma GI surenkama savivaldų organų arba nacionalinių vyriausybių tam tikriems specifiniams uždaviniams spręsti. Tačiau GI ne tik reikšminga kasdieniuose verslo

reikaluose, bet ypač svarbi priimti sprendimus ekologinių nelaimių metu, kai efektyvumas ir patikimumas gelbsti žmonių gyvybes ar turtą. Pagrindinis Lietuvos geografinės informacijos infrastruktūros (LGII) tikslas yra sukurti oficialų geografinės informacijos šaltinių sistemą arba infrastruktūrą bei informacinę aplinką laisvai įtraukti geografinę informaciją į beveik visas viešojo sektoriaus informacijos paslaugas Lietuvoje. Vienas iš LGII kūrimo tikslų yra atvira plati infrastruktūra informacijos produktams ir paslaugoms pateikti ir platinti internete. Šiam tikslui pasiekti regioninių ir nacionalinių organizacijų duomenys turi atitikti bendruosius standartus. Galiausiai dėl padidėjusio geografinės informacijos taikymo LGII pagerins sprendimų priėmimą, piliečių dalyvavimą bendruomenės gyvenime, rinkos vystymąsi, taigi suteiks naujas žinių kaupimo priemones. LGII yra informacinių technologijų sudėtinė dalis, kurios žinių kaupimo veiklos prigimtis yra geografinė. Šiuo metu tik klausiama ne kada nacionalinė geografinės informacijos infrastruktūra pradės veikti, o kaip ją kuo efektyviau sukurti, remiantis kultūros ypatumais, prioritetais, šalies istorija, siekiant paspartinti ekonominį vystymąsi, stimuliuoti geresnį valdymą bei ekologinį stabilumą.