Developing national SDI platform for Greece

This paper aims to develop a National SDI model for Greece incorporating theoretical and conceptual aspects

S Alexiadou and A Rajabifard

The Spatial Data Infrastructure (SDI) has emerged to facilitate the access, delivery and share of spatial information. It also results in greater efficiency as limited awareness of existing datasets can lead organizations to duplicate data collection and register. SDI is an initiative that creates an environment in which spatial data stakeholders from different jurisdictions can co-operate and thus improve the management and exchange of data in an efficient and cost-effective manner. An SDI operates on various levels including: organizational, local, state, national, regional, and finally global scale (Figure 1). Each level focuses on different details of data, institutional arrangements and issues.

As part of SDI hierarchy, the National SDI has very important role in building the upper levels of SDI as well as stronger relationship with all the other levels than any other level of SDI, within the SDI hierarchy (Rajabifard, et al, 2003). This is because of its critical position in the SDI hierarchy. A National SDI generates a detailed representation of the country and contributes to the improvement of national economy and security, and to better management of environment and natural resources. Thus, National SDI is a vital platform for sustainable development.

In Greece, spatial data stakeholders keep data in various coverage and scales of the jurisdiction. Also, there is some SDI activity, such as the Hellenic Cadastre (HC). However, legal, institutional and technological arrangements have not yet been fully set, so as to build a proper National SDI model. The lack of coordination among the stakeholders leads to the delay of SDI development. The undefined relationship between different organizations is another key issue that hinders the establishment of an SDI platform.

Current activities

In 2000 the Hellenic Mapping and Cadastral Organization (HEMCO), which is under the Ministry of Environment, Physical Planning and Public Works, proposed the development of the Hellenic SDI, called NaGi2 (National Geographic Information Infrastructure), so as economic, social, environmental and planning activities to be facilitated in Greece. NaGi2 will operate as a distributed network of databases based on a set of interoperable standards. The databases will be electronically connected, and they will provide data from various resources, such as ministries, government organizations and private companies to the widest possible group of users.

As it is published in NaGi2 website (www.nagii.gr), the proposed core data layers for the National SDI are the following: i) Geodetic reference system, ii) Cadastre, iii) Soil type, iv) Administrative boundaries, v) Land Use, vi) Land cover, vii) Residential zone boundaries, viii) Cultural inheritance, ix) Place names, x) Transportation network, xi) Demography, xii) Hydrology, xii) DSM, xiv) Geology, xv) Utilities network. Also, metadata categories have been proposed as follow: i) Data accuracy, ii) Data analysis, iii) Scale, iv) Spatial reference system, v) Thematic reference system (classification), vi) Responsible sector for the data, vii) Year of data collection, viii) Last update of the data, ix) Permission of copying the data.

To finance the National SDI, a special scientific committee, called geoinformation society (geoinfo-soc) was formed (Orshoven and Beusen, 2004). These funds are covered by OPIS, a program under the Ministry of National Economy. Moreover, the HellasGIS, a national geographic information association, joined EUROGI in 2002. HellasGIS consists of 200 members of various public and private sectors and its task is to raise awareness of spatial information need within Greece, through seminars, international conferences, publications and research programs.

Issues and factors

The steps to develop an SDI model vary among countries, depending on country’s background and needs.
However, it is important countries to follow a roadmap for the SDI implementation. Following, aspects that are essential to be consider for the National SDI development in Greece will be elaborated. Such aspects include the development of SDI vision, the required improvements in capacity of the country, the integration of different spatial datasets, the establishment of partnerships, and the financial support of National SDI.

Development of SDI vision

Vision within the SDI initiative is essential not only for sectors involved to SDI project but for the general public as well, since it helps people to understand government’s objectives and work towards them. Since Greece already keeps spatial data in advanced, the vision of a Greek National SDI can be stated as highlighted below.

Vision

To develop an infrastructure that allows spatial data to be available and accessible to public, private sectors and individuals and to promote proper use of integrated spatial data for effective decision-making process.

In order to reach this target, mission development is the primary key, through which the tasks of each involved sector are defined. Thus, the mission of Greek government for the National SDI can be confirmed as highlighted below.

Mission

The establishment of advanced partnership arrangements amongst spatial data users stakeholders and the increase awareness of the importance of integrating built and natural data are essential.

Capacity building

Currently, HEMCO is responsible for coordinating activities relevant to National SDI development in Greece, and it will tender out to academia and private sector necessary subprojects. Figure 2 illustrates the current situation.

The fact that HEMCO is the responsible organization for the National SDI is logical in some aspect, since this organization is responsible for the HC project as well. However, since National SDI encompasses not only built data, as HEMCO keeps, but also natural data and needs high political support, a national level agency or committee is required to coordinate that initiative. HEMCO is an organization, under the auspices of Ministry of Environment, Physical Planning and Public Works. For that reason an SDI Coordinating Council is proposed at national level being responsible for National SDI in Greece (Figure 3).

The proposed SDI Coordinating Council will provide the leadership required to implement and maintain the SDI initiative. Its priority will be to promote the use of spatial information in a way that underpins sustainable development. Within its responsibilities will be the production of national strategic plans for the management of SDI activities and annual reports detailing the progress of the project. In addition, the SDI Coordinating Council will determine custodianship and promote partnerships. All these activities will be implemented in line with the government’s broad development plan.

The SDI Coordinating Council will consist of the members and the advisors. Each of the members will be responsible for expressing their jurisdiction’s views and plans.
at the Council and promoting SDI activities within their jurisdictions. Moving to the upper levels of the SDI Coordinating Council, the Ministry of Environmental, Physical Planning and Public Works can act as a secretariat and sometimes as chair as well. The Ministry is able to set HEMCO as the holder for that position, since HEMCO is under its auspices. In this approach, HEMCO will have such a responsible task desirable to its personnel knowledge. The Prime Minister of Greece will act as the chair of the SDI Coordinating Council. The PM will ensure effective coordination and foster partnerships for expansion, since during 2004 Olympic Games preparation, the PM proved effective in tackling the difficulties caused by poor coordination (Potsiou and Ioannidis 2002).

Finally, under the proposed SDI Coordinating Council is the secretariat office, which will manage the necessary Working Groups (WGs). These WGs should be formed in respect of the SDI components and requirements. Members of these groups will be people from academia and industry, having as supervisor a person, member of the SDI Coordinating Council, expert in the field of the WG. The main responsibility of WGs is to manage their tasks and provide proposals to the Council. The structure of the WGs should be flexible to any change and reform, since they exist only to meet country’s needs.

The proposed SDI Coordinating Council provides an overall view of the political support required for National SDI development. It is not the final structure, but the first step. Detailed structure can be achieved within each group with further development of the current proposed one.

Additionally to the institutional arrangements, it is important to focus on improving individual capacity during the development of SDI. This can be achieved by increasing the level of awareness, through seminars, trainings and workshops relevant to SDI and LA concepts and applications. Also, focal point should be the upgrading of educational system in national level. Currently, in Greece, a lot of LA courses are offered in universities and technical institutes. Subjects relevant to SDI have to be taught as well. Keeping people’s knowledge current helps them to adapt with technology and support the evolving SDI concept.

**Integration of spatial datasets**

In Greece, although cadastral and topographic datasets are kept in advanced, these datasets are developed and managed separately. This is an obstacle in tackling situations that require integration of these datasets, such as the risk management, land cover and use, planning and archaeological protection. The main difficulties for the integration of both datasets are institutional and cultural structures, as highlighted by Rajabifard and Williamson (2005). However, technical part has to be handled with the same level of responsibility, since various Greek organizations, produce their data in different projection systems, which could lead to problems integrating the datasets. Within the National SDI platform, policies and standards will be implemented, so as to foster the integration of various resource data. Moreover, it is essential that the Greek community is made aware of the importance of integrating these two datasets, in order to complete the SDI project quicker and achieve better land management.

**Partnerships**

In order to achieve successful SDI, good coordination amongst and within all relevant responsible sectors is essential. Partnerships should be dynamic, reflecting the dynamic relationship among the SDI components. Sound partnerships, also, facilitate the data exchange and sharing, therefore reducing effort and production costs. However, it is difficult to achieve thriving partnerships because of diverse
priorities among the organizations, lack of awareness of partnerships importance, limited technical components and poor legal framework.

Successful SDI can be achieved through the accurate definition of the roles and responsibilities within the partnerships, as proposed by Grant and Williamson (2003). Proper policies and legal framework will also foster the collaboration among Greek stakeholders. Vital to achieve effective partnerships is that the involved sectors have to understand its importance.

Funding model

The funding model has a significant role in a National SDI. It is vital for a jurisdiction to clarify the purpose of the need of a funding model, which in turn should be able to respond to the country’s economic resources (e.g. national and international organizations). In terms of the Greek National SDI, OPIS will control the funding of SDI initiative. Its main target is to manage European Union (EU) funds relevant to geographic information activity and define public and private contribution in the budget (OPIS, 2001).

Although the OPIS is well organized, pricing policy is also essential to be implemented in Greece, since it affects the funding process. Moreover, cost-benefits analysis is essential to be applied and compare the returns with the investment. The profit gained from National SDI should not be only economic, but also social, technical and environmental.

SDI model and components for Greek national SDI

SDI Conceptual Model

The need to integrate large-scale data such as cadastre, road network, street addresses and political boundaries with medium to large national natural resources has been increasing over the last years (Williamson, et al. 2005). The constant development of mapping techniques and the growth of Land Administration Systems (LASs) promote the need of large-scale data in National SDI. Therefore, the SDI conceptual model that will be discussed proposes the integration of SDI and LA. As it is presented in Figure 4, which has been adopted from the Centre for Spatial Data Infrastructures and Land Administration from the University of Melbourne, the integration of SDI and LA sectors results in achieving sustainable development objectives.

There are two principal SDI development models: the product-based model and the process-based model (Rajabifard and Williamson, 2001). These models explain the formation of SDI in two different ways. According to the authors, the first model focuses on linking various databases, in order to form the SDI, whilst the second model details the framework that fosters the management of datasets and applications and facilitates the communication channels. Based on these descriptions we can infer that both models are interlinking to each other, since datasets itself and the management of spatial information are mutually vital for the development of SDI.

The Greek National SDI model should follow the process-based approach, which focuses on management and communication among datasets kept by various stakeholders. This model is proposed because the National SDI will be more than a tool for linking the available databases. It will go beyond that stage by creating an environment able to facilitate the sharing, exchange and management of data among different stakeholders. In this approach – and considering the NaGi2 definition (section “Current Initiatives in Spatial Data Infrastructures”) – the appropriate components for the National SDI in Greece would be: i) Access network, ii) Policies, iii) Standards, iv) Metadata, v) Data and vi) Users. Figure 5 presents the proposed conceptual SDI model. The model has been adopted from Rajabifard and Williamson (2001). It illustrates the dynamic relationship that National SDI components have.

Technological framework

The Technological Framework that proposed within the National SDI model and through which users will access the located datasets, consists of three components: i) Policies, ii) Standards and iii) Access Network.

Access Network

Since the development in technology forces people to use the Internet for accessing and delivering data, the establishment of a complete access network is required within the National SDI. A Technical WG that has been proposed under the SDI Coordinating Council will develop the technical architecture for the access network in line with the development plan of and the available resources within the Greek government. Moreover,
the access network of the HC can be used as a foundation. This is an opportunity to improve that network, allowing more services beyond land information activities.

Standards

As countries worldwide develop National SDIs, the need for standards is becoming a basic requirement. Standards are useful for producing, sharing, accessing and using data. They, also, ensure compatibility between data from different resources (e.g. built and natural datasets).

Since Greek National SDI will be node within the European SDI, it would be beneficial to comply with European standards (ISO/TC211, CEN/TC287 - 278, and OGC). Therefore it is not required for Greece to create new standards. If European standards are followed, there will not be issues of interoperability within the Regional SDI.

Policies

Policies, within the environment of SDI should be able to address reliability, testability, verifiability, accessibility, usability, interoperability and maintenance of spatial data (Wallace, 2005). So far, policy making within Greece is incomplete (Orshoven and Beusen, 2004). However, the need for detailed policy on accessing data and particularly sensitive data (e.g. military buildings, culturally protected areas, personal data) is necessary in building of National SDI. A Policy WG that has been proposed under the SDI Coordinating Council will set policy that will cover public, private sector and academia and support privacy, security, confidentiality and intellectual property rights within the jurisdiction. Each organization should be responsible to respect and enforce that policy. Moreover, the development of national guideline policy documents, which will be supported by legislation and be available both to stakeholders and users of spatial data, will significantly foster the success of SDI.

Datasets

Metadata

Metadata provides information about stakeholder of the data, so users know where they should acquire the data. It presents information about the date of data creation, any potential update of data, its accuracy, geographic extent and coordination system and other technical description. With this information users can assess whether or not the data is suitable for their applications.

For the Greek SDI, based on the proposed metadata by Information Society (section “Current Initiatives in Spatial Data Infrastructures”), users are able to get information about the technical characteristics of the data and their stakeholders and therefore to judge whether the data is appropriate for their needs. Thus, the list is complete and it does not require any change.

People

Another important SDI component is the people. This includes private companies, public organizations, academia, and individuals, who provide data or need it to develop applications or produce other data. Their relationship is vital, since all these groups are required in order to have, integrate and utilize data effectively. Moreover, people are the driving force of SDI development, because of the very strong relationship they have with all the other components of SDI platform. For instance, people establish the access network and set policies and standards according to which they access data. Thus, SDI initiative starts and ends with people and their desires drive the evolution of SDI concept. Therefore, all residents of Greece should be allowed to access the data.

SDI implementation plan

The SDI roadmap is important for the implementation of National SDI, because without following any action schedule the project will not be successful. The development of such a plan depends upon socio-economic, technological and political conditions of the country. Since SDI development is by nature a long-term project and a country’s status is always evolving, SDI implementation plan should encompass dynamic approach of the required actions. Considering the current status of Greece, a roadmap for the country’s National SDI is proposed (Figure 6). Within the SDI development, if it is feasible, some activities can be implemented in parallel. A specific duration is difficult to be given, because of the evolving nature of the SDI platform.

A major priority for the Greek...
jurisdiction is the formation of the SDI Coordinating Council, since it will have leading role in National SDI. In this stage, the appropriate WGs will be created and memberships and responsibilities will be delegated to proper sectors. Next step is to define the SDI vision and mission, so as the country to have a clear target to achieve. Since one of the main tasks of the Council is to determine strategies, the SDI strategies action follows. By clarifying the strategies, the country saves time and money from unnecessary activities.

While the selection of the Council members takes place, the government is able to develop and propose organizational structures able to support the establishment and maintenance of SDI. Within this task the capacity building will be reformed, so as the involved sectors to get improved and qualified, to support the SDI project.

The SDI conceptual design can be developed after the formation of SDI Coordinating Council, because at that time the responsibilities would have been allocated and each member will have clearly defined task. After the half part of this stage, the country has clear idea of what they will implement and therefore, the development of the SDI implementation plan can begin.

Then, the actual implementation phase follows. It consists of pilot projects to be completed in the early stage of the phase. These foster the smooth execution of the project, acting as a test for proposed methods and plans. During the pilot projects implementation, they are assessed and the jurisdictional major projects will start. These can be either short-term or long-term projects. Regarding the deliverables during the SDI implementation, these will be annual reports relevant to the activities that take place in each phase.

In addition, the government has to develop a benchmarking strategy to monitor SDI progress with corresponding activities in Europe. Indicators, such as the level of awareness, capacity in the community and system availability can be used in this process. Also, the maintenance of the overall platform is very important, in order to have a functioning SDI. A clear maintenance and support strategy is needed. SDI maintenance is difficult and challenging and requires effort and finance. The country has to maintain and upgrade the institutional structure as well as the SDI components.

Conclusion

This paper evaluated the current situation in spatial activity in Greece, discussed the major issues for the development of a Greek National SDI and proposed a National SDI conceptual model and its components. Finally, it proposed a roadmap for a complete and consistent implementation of the National SDI platform.

Acknowledgments

The authors would like to acknowledge the financial support from the State Scholarships Foundation of the Greek Government and the Centre for Spatial Data Infrastructures and Land Administration of the University of Melbourne, Australia. However, the views and opinions expressed in this paper are those of the authors and do not necessarily reflect the position of the above mentioned organizations.

Sofia Alexiadou comes from Greece. She is currently studying Masters of Geographic Information Technology at the Department of Geomatics, in the University of Melbourne, Australia. s.alexiadou@gmail.com

Dr Abbas Rajabifard is Deputy Director of the Centre for SDIs and Land Administration, and a Senior Research Fellow in the Department of Geomatics at the University of Melbourne. abbas.r@unimelb.edu.au

The complete paper, with detailed references is available at www.mycoordinates.org