THE NEED AND NATURE OF REGIONAL SDI FOR MIDDLE EAST

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INTRODUCTION

Spatial Data Infrastructures (SDI) have become a crucial tool in facilitating how spatial data and spatial information systems are used. This is mainly due to the growing need of societies to create multi-participant, decision-supported environments. SDIs allow the sharing of data, which enables users to save resources, time and effort when trying to acquire new datasets. It is a dynamic, hierarchy and multi-disciplinary concept that include, institutional, policy, technical, standards and human resources dimensions. As a result of this, SDIs are very important in determining the way in which spatial data are used throughout an organisation, a nation, different regions and the world.

With this in mind, many countries are developing SDIs to better manage and utilise their spatial data assets. They believe they can benefit more economically and environmentally from this better management of spatial information. Increasingly, these countries are finding it necessary to cooperate with other countries to develop Regional SDIs to assist in decision-making that has an important impact across national boundaries. Particularly this relates more to the globalization and the fact that economies worldwide are undergoing a process of profound and continuing structural change, and the global village is becoming a reality driven by information and communication technologies.

This paper aims to review and discuss the importance and nature of SDI development and in particular Regional SDI initiatives. The main focus would be on institutional arrangements, technological, social and economic dimensions which affect the SDI growth nationally and regionally in a jurisdiction like Middle-East region. To achieve this aim, the paper starts by reviewing the concepts, nature and components of SDIs followed by a discussion on Regional SDI initiatives and their natures. Based on that, the paper then argues that the development of a Regional SDI involves some unique factors other than those basic to an SDI, and concludes by discussing the issues inherent in the development and implementation of a Regional SDI.
SPATIAL DATA INFRASTRUCTURES-Nature and Components

SDI is an initiative intended to create an environment that will enable a wide variety of users to access, retrieve and disseminate spatial data and information in an easy and secure way. SDI is also an integrated, multi-leveled hierarchy of interconnected SDIs based on collaboration and partnerships among different stakeholders. These activities have resulted in different models being suggested for facilitating SDI development.

As illustrated in Figure 1, an SDI encompasses the policies, access networks and data handling facilities (based on the available technologies), standards, and human resources necessary for the effective collection, management, access, delivery and utilisation of spatial data for a specific jurisdiction or community.

There are numerous approaches taken through varying SDI initiatives for the relationships defined between people, data and the initiative’s objectives. One approach has been the development of strategic partnerships. The influence of the level of SDI and the focus for the technical components have an important influence on the approach taken for aligning components towards the development of SDIs.

Viewing the core components of SDIs, Rajabifard et al. (2002) suggested that different categories of components can be formed based on the different nature of their interactions within the SDI framework. Considering the important and fundamental role between people and data as one category, a second category can be considered consisting of the main technological components: the access networks, policy and standards. The nature of these two categories are very dynamic due to the changes occurring in communities (people) and their needs, as well as their ongoing requirement for different sets of data. Additionally, with the rapidity with which technology develops, the need for the mediation of rights, restrictions and responsibilities between people and data are also constantly subject to change. This suggests an integrated SDI cannot be composed of spatial data, value-added services and end-users alone, but instead involves other important issues regarding interoperability, policies and networks. According to this view, anyone (data users through producers) wishing to access datasets must utilise the technological components.

Further, there are two views on the nature of SDIs and their hierarchy concepts. The first view is an umbrella view, in which the SDI at a higher level, say the global level, encompasses all the components of SDIs at levels below. The second view is the building block view, in which any level of SDI, say the state level, serves as the building block supporting the provision of spatial data needed by SDIs at higher levels in the hierarchy, such as the national or regional levels. Based on
these two views, the SDI hierarchy creates an environment, in which decision-makers working at any level can draw on data from other levels, depending on the themes, scales, currency and coverage of the data needed.

**Regional SDI Concept**

Regional SDI is an enabling platform that creates an environment in which member nations and a wide variety of other users who require a regional coverage, will be able to access and retrieve a complete and consistent data sets in an easiest and secure way. Its roots are in the regional governments and their cooperation. Having said that, there are many regional organisations and groups that are made up of countries which often cooperate to address common economic, social and environmental issues related to a specific region like Middle-East.

The primary purpose of this regional cooperation is to organise economic activity in such a way as to maximise regional and individual country benefit. Some of the regional interests that encourage different governments to cooperate with each other in developing a Regional SDI and also encourage them to form different regional groups, are listed in the following table.

<table>
<thead>
<tr>
<th>• Regional mapping</th>
<th>• Shared oceans surroundings</th>
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<td>• Shipping and transport</td>
<td>• Regional security</td>
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<tr>
<td>• Regional emergency management</td>
<td>• Economic development and cooperation</td>
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<tr>
<td>• Regional access to health care resources</td>
<td>• Partnership (initially with emphasis on technical assistance to the regional members)</td>
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<tr>
<td>• Regional environmental monitoring and management</td>
<td>• Fishing</td>
</tr>
<tr>
<td>• Agricultural and forestry management</td>
<td>• Etc.</td>
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In addition to these interests, there are also some other benefits which encourage member nations to participate and input to the development of a Regional SDI. For example, collaboration and data sharing among member nations through a Regional SDI can provide better data for decision making; can save development effort by using fundamental and standardised data, guidelines, and tools; can facilitate and speed up the process of performing any analysis, decision making, and operations in cross-jurisdictional areas; expanding market potential and program funding through recognition and credibility as a stakeholder and as a participant; and also reduced costs of data production and elimination of duplication of efforts.

With regard to the accessibility and applicability of data to respond to the regional needs and interests, any regional bodies or member nations need to access and use consistent regional spatial databases to make an informed decision and to implement and resulting regional initiatives. These databases might need to contain data and information about the whole or part of the region. But, in
current situation, generally the required databases that contain regional data sets of sufficient accuracy and detail do not exist or are not accessible by all member nations.

This is mainly due to the current complexity of communications between the various countries and regional bodies in any region. For the purpose of data sharing, regional organisations and member nations must develop one-on-one agreement with each and every other user within the region for sharing regional data. However, this complexity can be reduced to a manageable form by developing a functioning Regional SDI built upon the cooperation of the regional users.

The establishment of a Regional SDI will form an enabling platform that facilitate the exchange of data across many countries in a region as well as the engagement of all regional bodies and other spatial data stakeholders. This will also provide a clear picture to support and improve existing or even new bilateral and multilateral relations and structures. Further, a Regional SDI can provide the institutional, political and technical basis to ensure the regional consistency of content to meet regional needs in the context of sustainable development. Within this regional platform, any data set can be collected and maintained through collaboration and partnerships among of members. Therefore, as the membership grows the data pool widens and there are further economies and benefits realised.

In order to be successful in any SDI initiative, there are a number of key issues and strategies which need to be considered within the design process:

- The development of a strategic vision and associated implementation strategy,
- The recognition that SDI is not an end in itself,
- To involve as many as possible stakeholders, particularly sub-national (local/state) governments, private sectors, and
- The key institutional strategy is to have all coordinating processes administered within one government department.

Further, based on the results and outcomes of research on regional fundamental datasets in Asia and the Pacific region as an example as highlighted by Rajabifard and Williamson (2001), there are large amounts of digital data with many common data layers are available at different scales in the region that could be useful for the creation and facilitation of the Regional SDI. However, the most anticipated political barriers regarding the establishment of a regional dataset includes access to datasets for security reasons, lack of resources, national administrative boundaries as a data layer, and copyright issues.

To realise the advantages of a Regional SDI and to speed up its development, at least six key factors should be considered. These factors are:

- awareness of spatial information and SDIs;
- cooperation between the various stakeholders;
- involvement of the politicians concerned;
knowledge about the type, location, quality and ownership of data;
accessibility and applicability of data sets; and
the successful widespread use of the data sets.

Any spatial data stakeholders (data providers, value-adders and data users), including politicians and technical people, should be aware of the potential and advantages of spatial information and SDIs. The coordinating agency responsible for a Regional SDI initiative (such as the Permanent Committee on GIS Infrastructure for Asia and the Pacific-PCGIAP, or the Permanent Committee on SDI for the Americas- PC IDEA) must help to raise this awareness. The development of a Regional SDI is a matter of regional cooperation. The involvement of those politicians concerned with the Regional SDI development is essential. The politicians’ support provides legitimacy and encourages the necessary financial investment for the Regional SDI development. Knowledge about the types of data, its location and quality is also required. It is also important to provide access to the data as the measure of success of the Regional SDI will be the widespread use that is made of it and an appreciation by its users that it is providing the promised benefits which were the justification for establishing the Regional SDI. Also, there is considerable documented experience in designing different level of SDIs.

CURRENT REGIONAL SDI DEVELOPMENT

At the regional level, currently, there are four SDI initiatives in the Europe, Asia-Pacific, the Latin American, and in the Africa regions. As was mentioned before, the emergence of Regional SDI organisations is one of the distinctive features of the last decade. According to Masser et al (2003), this began with the creation of the European Umbrella Organization for Geographic Information in 1993 and was quickly followed in Asia and the Pacific by the establishment of a Permanent Committee (PCGIAP) for this region in 1995 under the auspices of the United Nations Regional Cartographic Conference. A similar organisation for the Americas (PC IDEA) followed in 2000, after a three years process, with support from 21 nations. At the turn of the century Africa and the Middle East were the only regions of the world without such an organisation. However, moves are currently under way to create a Committee on Development Information under the auspices of the UN Economic Commission for Africa, and it is due to the potential benefits of developing any type of SDI, promised and documented by other similar organisations.

As a result of the activities of Regional SDI organisations all these organisations achieved some important steps toward the development of their Regional SDI initiatives since their establishment. For example some of the achievements by PCGIAP in Asia and the Pacific region are the implementation of the regional precise geodesy network, definition of a regional geodesy datum, development of a policy on sharing fundamental data, development of guidelines on custodianship
and in particular, the definition of APSDI itself. Also, projects are underway for the ultimate goal of APSDI development in this region.

Although these type of achievements are very important and provide a valuable contribution and will form the basis for any Regional SDI development, but there are some other issues involved in the progress of Regional SDI initiatives which need to be mentioned. These issues include the low rate of participation in these activities, the organisational structure of Regional SDI coordinating agencies, designs of the work program and working groups, and availability of resources to pursue programs.

Influencing Factors for SDI Development

The challenge of designing, building, implementing, and maintaining a Regional SDI draws on many different disciplines and requires examination of a large number of factors and issues. For example, based on the participation rate in Regional SDI development in Asia-Pacific region through the activities of the Permanent Committee on GIS Infrastructures for Asia and the Pacific (PCGIAP), the development of this initiative remains an innovative concept among its member nations. This is due to the fact that Asia and the Pacific region has a complex social and political environment, typified by competing and often conflicting priorities and motivations. Every case in this region is unique because of its national context, language and characteristics (such as size, population, political systems, varied infrastructures and skills), the national traditional and cultural attitudes, and the people who participate, develop and use SDIs.

Therefore, in order to develop a functioning Regional SDI efficiently in any region, the Regional SDI coordinating agency must manage such diversity to gain the support necessary to meet their objectives. Identifying critical social factors and processes in the acquisition, implementation, and utilisation of a technology can facilitate the management of such diversity. It is expected that decision-making responses of individual nations, groups, and regional organisations may be predicted and therefore may also be accommodated or redirected through prescriptive strategies.

By identifying key human and technical factors within classes of potential users, SDI coordinating agencies will be able to better define and develop their strategies to achieve their objectives. Having said that, Rajabifard (2002) has identified three major classes of factors, which are influencing, or contributing to the development of any Regional SDI initiative. These classes of factors are Environmental Factors, Capacity Factors, and SDI
Organisation Factors, as illustrated in Figure 2. According to this figure, the three classes of factors together effect the participation rate.

![Figure 2: Factors influencing the development of a Regional SDI](image)

**CONCLUSION AND FINAL REMARK**

Regional Spatial Data Infrastructure is defined as an initiative intended to bring together the technology, policies, procedures, standards and human resources being devoted to regional spatial information as a regional fundamental dataset. Its roots are in the regional governments and their cooperation. The primary purposes of a Regional SDI are identified as an effort to create an environment as an infrastructure that supports a wide variety of users who require a regional coverage. Regional SDI can facilitate member nations and regional organisations in accessing and sharing their regional spatial datasets. However, the development of a Regional SDI is much more challenging than the development of a National SDI initiative within a nation. This is mainly because of the voluntary nature of cooperation at a multi-national level and participation in a Regional SDI initiative.

Due to this process, the development of an effective and functioning SDI therefore requires a long-term vision and strategy. One suggested strategy is taking short-term goals and demonstrating their results to all stakeholders as soon as they reach completion. Also, the success of an SDI is not dependent on its legal or technical sophistication, but whether it provide an effective communication channel between all stakeholders and permits to easy access to spatial data adequately, simply, quickly, securely and at low cost. However if the resources are not available to keep the SDI up-to-date then there is little justification for its development. Therefore, funding and resources to secure the implementation of SDI is always an important issue.

Further, there are large amounts of digital data with many common data layers are available at different scales in different regions that could be useful for the creation and facilitation of Regional...
SDI initiatives. However, the most anticipated political barriers regarding the establishment of a regional data set includes access to datasets for security reasons, lack of resources, national administrative boundaries as a data layer, and copyright issues. These issues are the major impediments to the widespread and successful use of Regional SDI rather than only technical issues.

There are also some other factors which influence the initiative of a Regional SDI and make it difficult to prepare an environment for implementation by a large number of potential member nations. These factors are the lack of awareness of the potential usefulness of SDIs, social and cultural diversities, languages, total land area of the nations, and so forth.

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