

# **The Role of ESA in Building the Egyptian Spatial Data Infrastructure (ESDI) Towards the Electronic Government (E-gov.)**

**Sohir M. HUSSEIN, Egypt**

**Key words:**

## **SUMMARY**

Within the geoinformation community we hear a lot of expressions and terminologies such as: Geographic Information Systems (GIS), National Spatial Data Infrastructure (NSDI), Geospatial Information Infrastructure, standards eg. (ISO, OGC, FGDC) Electronic government (E-GOV), etc. All these terminologies and many others can be viewed as parts of a chain that need to be adequately connected. Standards represent the supporting references that guarantee proper and smooth connections of these terms.

In this paper, we will try to define these terms discussing the requirements for each and establishing proper relationship and integration among them.

We will discuss briefly the successful implementation of this concept in the State of Qatar through establishing their National GIS Steering Committee as well as the Center for GIS (CGIS). Also we will discuss the major steps required to build the SDI according to the recommendations of the Global Spatial Data Infrastructure (GSDI) concept.

The paper will also address questions and issues regarding the need for building the E-gov program in Egypt together with relevant issues such as data, standards, funding, legislation, tools, HW, SW etc.

Naturally, and since the digital mapping component plays a central role in the GIS field, the mandate and the role of the Egyptian Survey Authority (ESA) is of prime importance to these concepts. ESA has acquired throughout the years a wealth of information that is indispensable for building the Spatial Data Infrastructure of Egypt.

# **The Role of ESA in Building the Egyptian Spatial Data Infrastructure (ESDI) Towards the Electronic Government (E-gov.)**

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## **1. BACKGROUND**

For a long time the authorities and companies have been concentrating on building GIS system to solve their problems, answer questions related to the spatial locations, and to be a tool for the Decision support system (DSS) .

When we talk about GIS we should mention Qatar success story which started in 1990. They established CGIS to be a national surveying authority for Qatar and steering committee to make polices legislation, and standards. But Qatar didn't build the GIS as separated inland but it unified the standards to be used all over Qatar. This is a promotion to GIS to reach SDI level (see appendix: 1 for Qatar case in GIS).

Since people always think in better way of sharing , they started to build SDI ( Spatial Data Infrastructure) to promote the sharing between parties on the level of foundation data (spatial data) and framework data (themes or application data). The necessity of SDI is to maximize the sharing between parties to reduce the duplication of data processing, to support the country with the geographic information infrastructure (gas, telephone, electricity,.....) which mean to serve all the Egyptian people.(see appendix 3 SDI definition, hierarchy, success stories, major steps and necessity). In the appendix there are steps for implementing SDI in any country written by Dr. Alan Stevens.

But when talking about building SDI in Egypt we should think of standards, what type of standards we need? And who should set the standards. When it comes to the implementation phase we should study the implementation requirement for building SDI. (See appendix1 for steps for building SDI)

## **2. INTRODUCTION**

It's the time to think how we will build our Egyptian Data Infrastructure (ESDI). More than 60 countries all over the world have built or on their way to build their National SDI. Besides three Regional SDIs in Europe, Asia & pacific and America. SDI is a need in the Electronic government (E-gov) because the E-gov can't automate some services without foundation data (spatial data). Building need requirement to be done and has responsibility to know who do what? There are also barriers to be faced in building ESDI and we should know how to overcome them.

Egyptian Survey Authority has a role in building ESDI. It is responsible for providing the foundation data (spatial data) for the parties in the E-gov. and at the same time introduces other services as a part of E-gov.

If we realized this need for ESDI, then we have to dream about the Arab world Spatial Data Infrastructure (AWSDI).

### 3. SDI AND THE E-GOV IN EGYPT

Realizing that GIS is having a role in the decision support system leads to understanding the need for building Spatial Data Infrastructure; which means reducing the effort and money wasted in the duplication of data production. It will also facilitate the accessibility to the data, and make it at the user hand anytime. The data in the SDI has two types: the foundation data (spatial data) and the framework data (thematic data).

But what is the relation between SDI and E-gov.? If the Egyptian government needs to build the electronic government, this means it needs to make a mechanism to facilitate these services through internet or intranet. This services related to electricity, telephone, water, etc. this what we call the infrastructure and the information that the user will extract from this services is the thematic data. Some of these services don't need spatial data (base map) to be plot on and some do. From this point we answer the above question about the relation between the SDI and E- gov. see Fig (1)

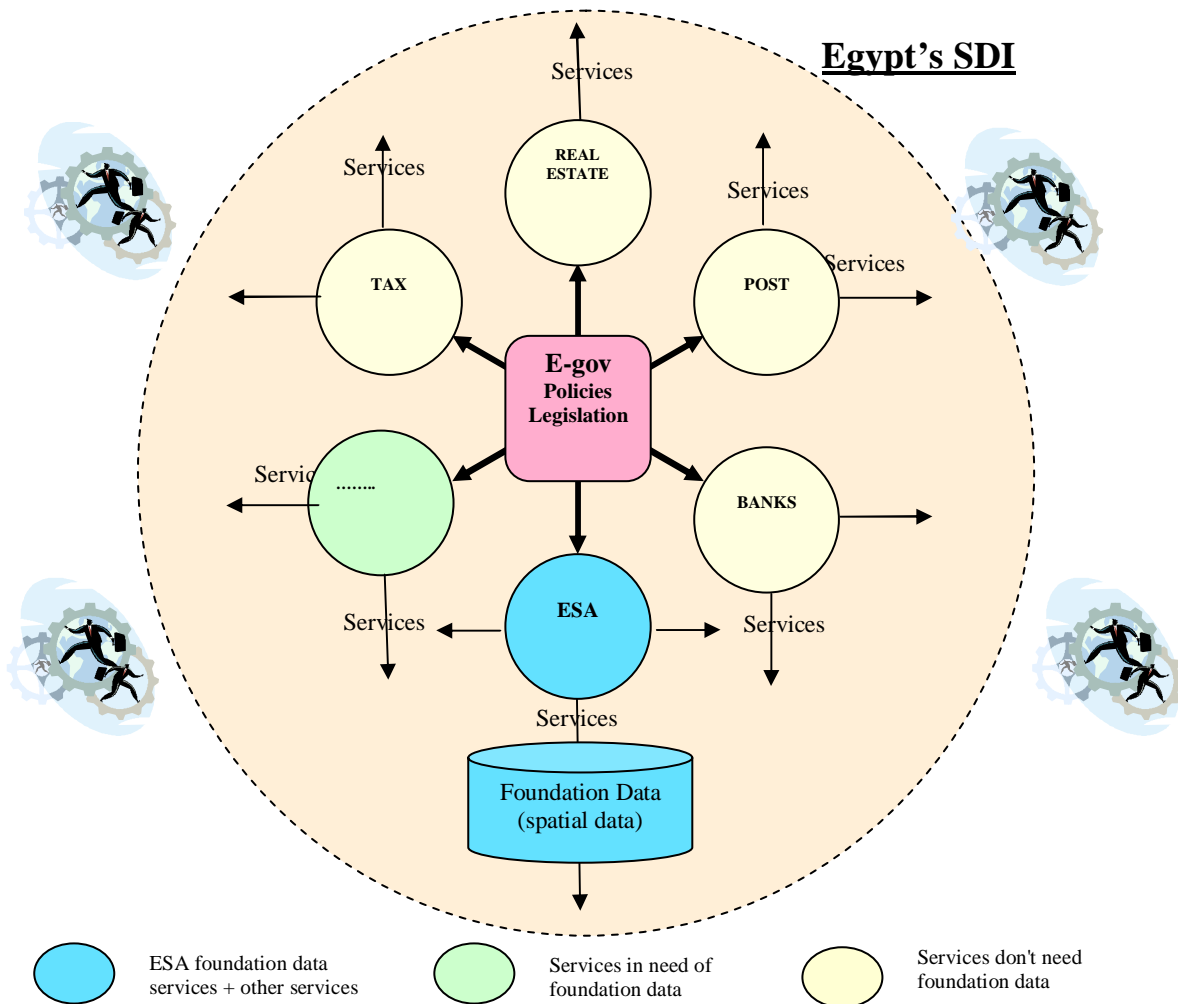


Fig. (1)

To introduce services to the public in the Egyptian street, we should know the services most needed. And when we can get this information we should list them according to priorities. In the next part will discuss this issue.

#### **4. WHAT THE EGYPTIAN CITIZEN NEED FROM THE E-GOV?**

This question should be asked while working setting up the frame of the e-gov services. Let us see what The United States did to get a survey about this “Governments in the U.S. are using a variety of methods to find out what citizens want from e-government services. These efforts are being conducted in a variety of ways, with different levels of formality and statistical reliability. A few are professionally designed public opinion surveys with random selection of respondents and formal statistical analyses. Others are informal efforts that ask citizens who visit state Web sites what they think about e-government services. Another kind of effort invites people to attend events where they discuss their needs and opinions. The professional and informal surveys tend to offer respondents a fixed list of potential e-government services, and the same choices tend to be included from place to place. In response to these surveys, driver's licenses and voter registration usually top the list of desired e-services. The discussion method offers greater opportunity to explore ideas from different points of view and in more depth and therefore tend to generate longer lists of potential e-services that are tied to life events or areas of economic activity” written by Meghan E. Cook, Center for Technology in Government, USA.

Since this is the logic way of thinking, before we start building the E-gov, we need to ask some questions. Why we need the electronic government and what services are most needed by citizens? In order to get answers we have to make a survey. But who to ask? If we need good results expressing all the Egyptian people, are we going to ask 70 millions persons? Of course not. So we should be careful when choosing a selective sample to express all people.

#### **5. REQUIREMENT FOR IMPLEMENTING SDI IN EGYPT**

To build SDI in Egypt we need to go through five steps as Dr. Alan recipe:

##### **5.1 SDI Data**

First we have to collect the two types of data. The foundation data; spatial data at reasonable scale to serve as a base for the framework data (thematic). Many authorities and companies in Egypt have a set of existing data and some need to process their data, but a great effort will be made on this field the data gathered from different sources so it will need to harmonize it and flitter it and other processing to be ready for use. This is applicable for the spatial and thematic data. And we have to take into consideration that the new data processing should be according to the same standards to avoid the problems mentioned before.

The spatial data is vital for some services to be a base for the thematic data. Like the post services. The spatial locations for the post offices need a spatial database. The telephone services as well need it for the spatial location of the centrals, the telephone cables and so on. But some services do not need it like the statistics data about the population census, unless you relate it to spatial location and talk about the population density. Then you need spatial data.

## 5.2 SDI Standard

The existing spatial data will suffer from mismatching due to different data standards used and the frame work data will need standards for exchange. There are also the industrial standards for software/hardware. But what kind of standards should we follow? There are standards like ISO with its different series. Others are also FGDC standards. Let's talk about the spatial data standards first, Since Egyptian Survey Authority is working in the field of the spatial data more than 100 years ago, it has standards that could be followed in this field. And there are three choices, wither to adapt ESA standards with the ISO like different countries did (as Japan) and producing a new standard in the mid way between the Egyptian and ISO or just to follow the ESA standards as local standards.

Or follow the ISO/FGDC standards as it is. The reasonable choice here is the first one to avoid repeating data production. We should also mention the metadata standards. Everybody on the E- gov. should put their metadata with the same standards. This will make it easy for the user to get the search result for any type of information with the same criteria to be easy for the industrial standards. The company who introduce technology (software/hardware) had discussions how to use common standards between them to make it easy to read the data from any software by another without loss of data. This we call interoperability. The same we can say on the hardware company. Once we finish with data and standards we have to think about the available tool to be used to build ESDI.

## 5.3 SDI Tool

Are the tools available now in the geoinformation technology market helping in this topic? The answer is YES. The software/hardware companies are now aware of the need to build SDI towards the electronic government. The Software Company which produces geo software added new modules to their software for internet use. They test it by customer and enhanced it to fit for flexible use over the net. Like "Map Guide" from AUTODESK, "Arc IMS" from ESRI, "Dynamic Atlas" from SKE. This software provide publishing, extracting, analyzing, and manipulating data over internet which help people getting their services/requests in short and with efficiency without going to the door of the organization and follow the routines to get their service /request.

Actually the geoinformation technology market in Egypt is strong and has the ability to help in building ESDI.

#### **5.4 SDI metadata**

The metadata is very important for all type of data. The users who search over the net for information get so many results. He/she chooses the best description about the data needed. But in Egypt not many company or authority care to make this for their product/services. But it will be a *must*

#### **5.5 SDI polices and legislations**

Since everyone on the street in Egypt will access the information the government should make policies for data transfer, data exchange, data access, data security, and data prices. This will stabilize the information society in Egypt and make ESDI strong and supported by the Egyptian street and the service maker.

#### **5.6 SDI Clearinghouses**

Every company and authority either has or is thinking of making clearing house. This CH will be the window for their market. Nowadays ESA is building its clearing house which will contain Metadata about their products/services. The other parties in the E-gov can make also their clearinghouse. With a search engine the user can search any type of information among the whole parties to get the information. Some clearinghouses can be linked to each other. This already exists in Egypt in the sector of news, and newspaper. Ahram website, akhbar website, and all are linked to each other. But the geoinformation sector still need a lot of efforts like many other sectors.

### **6. THE RESPONSIBILITY OF BUILDING ESDI**

Like any other work, we should know who will do what. Who will gather information about the data available and data needed to be done? Who will put the policies and legislation? Who will put the standards?

The government should take care of the policies and legislations. Its own role to set the policy and legislation. There should be a committee from all organization to get information about the framework (thematic data) available and data needed to be done and to take care also for setting standards for data exchange between parties in the E- gov regards the thematic data ( framework data). For the spatial data (foundation data), and it's standards and prices should be the responsibility of ESA. Since the organization has been working in the field for more than 100 year and since great efforts are done in this field together with the fact that they have the specialists on map making, ESA also finished their metadata catalogues about their products and services. It has standards for data sources, data processing. And they were published in the Egyptian code made by the ministry of irrigation.

### **7. BARRIERS FOR BUILDING THE EGYPTIAN SDI**

Usually the new systems facing resistance and barriers, SDI like any other new thing is facing barriers. The most important barriers are the data security, the standards, and the technologies

in some cases, but it's not a barrier in our case here. But to force people to work according to the same standards many questions will be asked; which standards, yours or mine?

To overcome the barrier of standards, since ESA has more than 100 years of experience and has published standards and their product is protected by law and the public decisions. we can use ESA standards or even make like Japan when it comes to the mid way between their standards and ISO standards.

Regarding the other barrier, the data security, everybody is afraid to share for certain reasons. Some of them are not reasonable like losing the control on the data which mean the prestige and domination. And some reasons are logic like data protection from loss or hacking. We have to redefine the meaning of data security to them and to tell and teach them that the technology provides the tools to protect data from hacking or losing when it is shared in the E-gov parties. Even if there is 10% risk in this case of security, it shouldn't stop us from sharing or publish data over net. But of course in some cases we should take care of the security issues and classify the type of data which could be shared and the type which could not.

## **8. THE ROLE OF ESA IN E-GOV**

Since we are talking about the GIS and SDI, we have to talk about Egyptian Survey Authority (ESA). ESA is a governmental organization responsible of the cadastre services, topographic services and maintain the geodetic network in Egypt, besides other services. ESA has its own standards for all steps in producing maps. It also has all the assets of the maps produced by ESA or by other organizations, so all geospatial data are in its own warehouse. From this place it should be the start of introducing the geospatial services over the internet, which should be built on the Egyptian SDI. ESA is responsible for making the foundation data (spatial data) for all the service producers in the E- Gov. Taking into consideration that not all services will need this foundation data ESA will be also service producer in the same time

### **8.1 ESA services and products**

ESA is responsible for producing, updating and disseminating the geographic information in Egypt. This information includes: topographic services, cadastral service, geodetic services, printing services, orthophoto and photo maps, administrative boundaries, and the most relative service to the E-gov topic here is the base map or the foundation data. These types of services serve other organizations like agriculture to plot their frame work data (theme data) over it. (See fig 2)

It illustrates the services which ESA produce. So ESA will make the foundation data for the E-gov parties and at the same time will introduce others services to the society in Egypt through the E-gov.

With regards to the foundation data issue, we have to notice that not all the organizations sharing in the E- gov will need foundation data (spatial data) from ESA so some of them don't depend on the spatial data. See Fig (2)

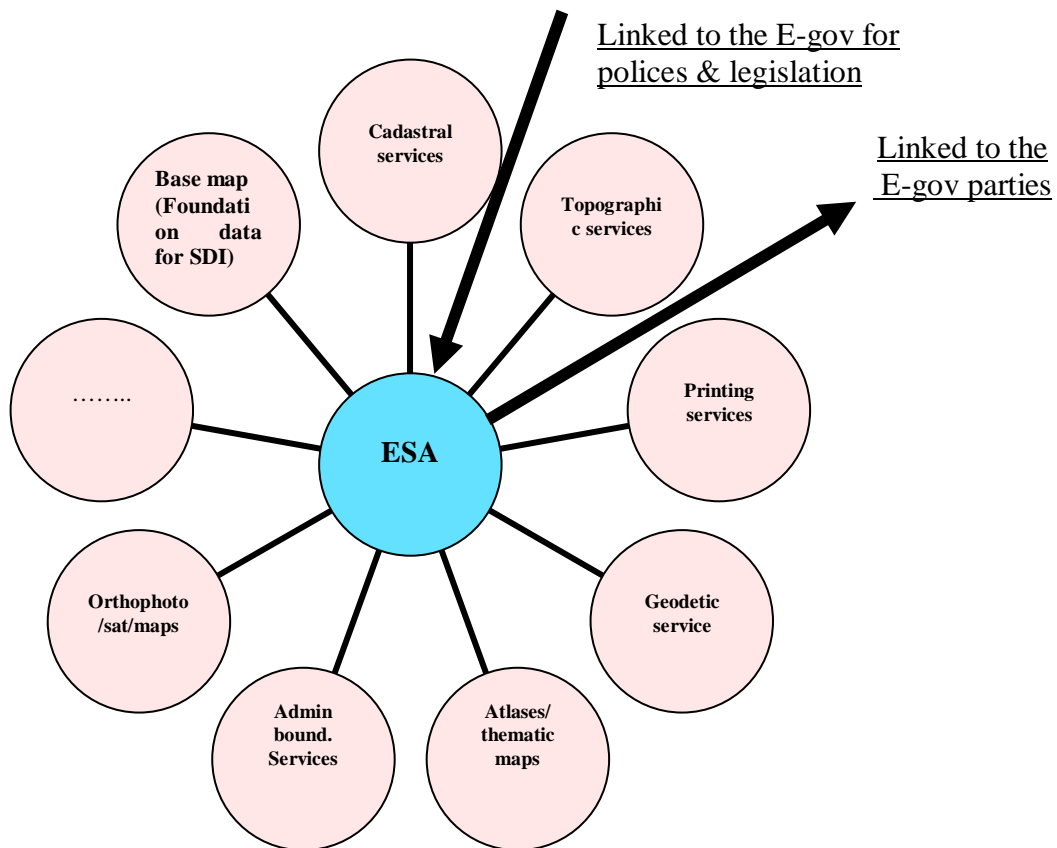


Fig (2)

### 8.2 ESA metadata

ESA produced their metadata for the topographic maps with its different scales from 1: 000 000 to 1:1000. This metadata contains the imagery date, the production data, and the size of the maps in the field and on the paper, the layer in each scale, the colors used, and the projection. It also made the cadastral catalogue for the 26 government. It is designed according to the administrative boundary. It gives information about area, has digital map, or paper maps. There is also the digital catalogue which gives information about all digital maps covered by the topographic sector or the cadastral sector. The topographic and digital catalogue is available at ESA shop.

### 8.3 ESA clearinghouse

Nowadays ESA is building its own clearing house to publish their metadata over it. This is the first step in introducing their market for the services and products over the clearing house. This clearing house will be linked to the other clearinghouses in her E-gov and also as a node in the Egyptian SDI.



## 9. COPYRIGHT

This is an important issue for the parties who will share with their data in ESDI or will introduce services in the electronic government. The government should take care of protecting these products/services by copy right law. A few months ago ESA map was protected by the law of copyright. Its map is treated now as any other certified product, it has numbering and is protected by law.

## 10. RECOMMENDATIONS

### 10.1 SDI in Egypt

Every organization need to be a part of the E-gov and to share in building ESDI the following should be identified:

- What is the data available and what is the data needed to be processed
- What services/products will it introduce on their clearinghouse
- What is the sharable part of data with others?
- What standards are they following (all type of standards)
- How will they find a budget

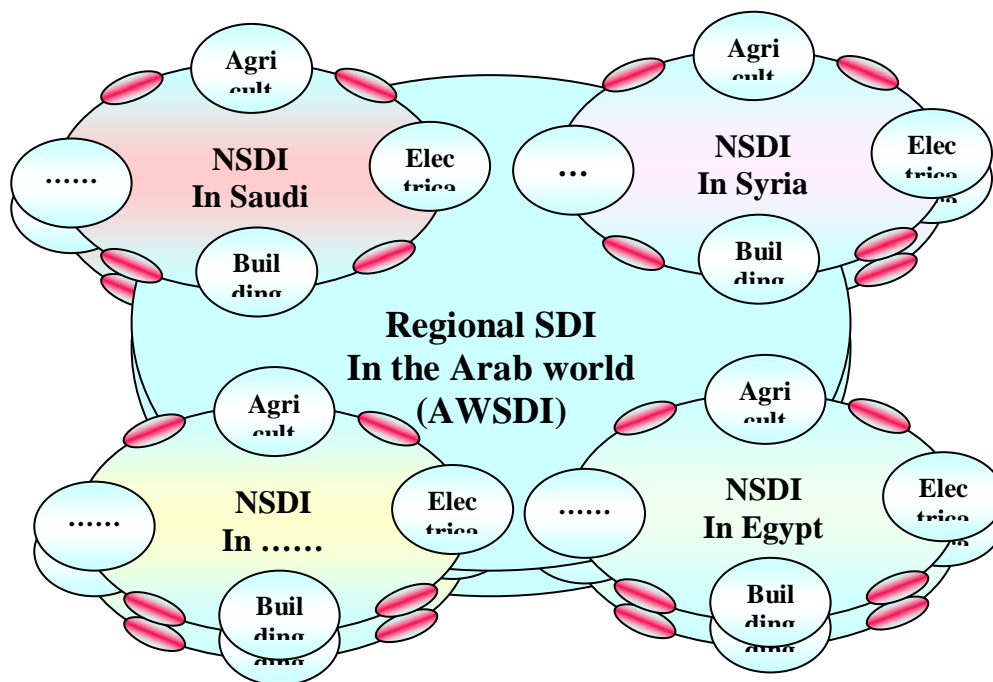
The government also should establish polices legislation for data transfer, data exchange, data access, data security, and data prices. The government also should financially, as example: Services like the "elsegel- El Ainee" to be automated over ESA clearinghouse, the government should supply ESA with a fund to be able to finish it.

### 10.2 SDI in Arab countries

Unfortunately, I didn't find any effort done in the Arab country towards SDI. And sometime when you discuss these issues with someone they will say that this is difficult to achieve with the political circumstances we all know now. But I say NO. The Arab countries may take time to overcome the barriers that prevent them from being in a union at the political level. But what we cannot do on the political level we can achieve in the SDI level. I know that the political level should support the SDI in order to be a success, but I think they can differentiate between the vision in the political level and the information level. For the time being there is work in the field of the infrastructure between some countries in the Arab world. Like road network between Egypt, Libya, and Jordan, or the gas line between Egypt and Jordan. This is the starting point of SDI between Arab countries. If we could reach the level of making SDI among the Arab countries in the field of road network or gas network this will be great success. Then we can say that we have our Arab SDI (AWSDI) like the INSPIRE in Europe. This will be a great success for the Arab countries regardless they have the same vision in the political level or not. See Fig (3).

Someone will say this is a dream, I say YES and NO. Yes because some of the projects of road and gas between Egypt and Jordan are real and No because completing it among all countries could be a dream. But if we start dreaming today we will achieve tomorrow. And like we talk about democracy in the political level, we can also talk about democracy in the spatial data level. This is what has been said by *Preetha Pulusani President Intergraph Mapping and Geo spatial solutions*. (Is SDI the spatial voice of democracy? YES, when it is developed according to the common goal of data sharing, based on open standards. However, continued action and perseverance by the geospatial community is an absolute requirement in order to make this a reality)

### Arab SDI



## 11. QUESTIONS TO BE ASKED

E- gov will play an important role in the Egyptian street. It will facilitate the services and make it available at the people hands. But the question here:

- Is the new way of introducing the services going to suit all different level of educations?
- Will it affect the prices of the services?
- Will the new way be efficient and effective?

Such questions should be answered by the people who are responsible of building the E-GOV.

## 12. CONCLUSION

Building the Egyptian Spatial Data Infrastructure is a necessity to achieve the goal of the electronic Government. In order to achieve this we need sincere efforts and people working to change the rigid thinking. If the sharing concept spread in our environment and if and security issues solved. We can do a lot towards building ESDI. Usually the work itself doesn't take much time in the implementation phase but changing minds take so much time.

## **APPENDIX 1: (QATAR CASE IN GIS)**

### **Qatar as a success story in GIS**

If we talked about GIS in Egypt as Arab country, we have to mention Qatar success story in the field of GIS and to know the success factors helped in setting it up. But we have to recognize that Qatar's GIS is not a separate inland, but it built on the share concept on the specifications and standards. They built the concepts and maximized the sharing importance between organizations before they build the systems. also they distributed the responsibility of the data production, marinating, and sharing.(like we mentioned before Dr. Alan sentence" everyone can play....) They have A National GIS Steering Committee consisting of top government executives from different government agencies and a Center for GIS (CGIS) were created by a Cabinet decision in 1990.

### **Role of the steering committee**

The National GIS Steering committee oversees the development of GIS in Qatar, ensuring that all GIS standards are compatible and in harmony. The committee reports to National Committee for Coordination of Government Services which in turn reports to the Cabinet chaired by HH the Emir. Furthermore, this committee has fostered cooperation between government departments and serves as a forum for discussing any GIS policy. It has the policy and technical responsibility to organize and formulate a GIS implementation strategy.

### **Role of Center of GIS (CGIS)**

The GIS network in the country is coordinated through Qatar's Center for GIS (CGIS), which is responsible for establishing and maintaining national standards and procedures for GIS implementations in the country. The Center is also the National mapping agency and thus responsible for development and maintenance of the country's on-line base map consisting of topographic data. The Center for GIS has responsibility for data administration, application programming plus training and support of the satellite GIS Units in each of the Ministry/Government/Semi- Government department in the Qatar GISnet

## APPENDIX 2: SDI DEFINITION, HIERARCHY, SUCCESS STORIES, MAJOR STEPS AND NECESSITY

### SDI definition, major steps and necessity

GIS when started was like building separate islands for every system or for every type of information. There was no communication between these islands which means that the repetition of producing data is very much expected. So the governments all over world started to think to link this islands each other with Spatial Data Infrastructure (SDI). The different GIS systems in the different fields share the base of this information which is the spatial data. So if they can unify one spatial database as a base for all this systems this will be the first step. Then the themes of the GIS systems could be shared also. As example; if the ministry of interior wants to build system for car navigation it will need the roads information and also the gas stations and other information. This type of information could be shared by more than one system, and this is the second step in sharing information. This share will save off course a lot of time and effort. One spatial database serve the different infrastructure themes; electricity, the water pipe line, roads, telephones ...etc. this spatial database should be available on the server/servers and to be customized with every application... different applications for different themes could be applied then. Many countries/unions in the world had good experience in building SDI but in Egypt and the Arab nations still the concept of SDI is not well recognized or realized as a necessity.

Let's see what Dr. Alan R. Stevens is (*International Program Coordinator Federal Geographic Data Committee (FGDC), Global Spatial Data Infrastructure (GSDI) Secretariat*) mentions as major steps for building ESDI (Egyptian Spatial Data Infrastructure):

- Inventory all data that is collected by all organizations and identify duplication and missing coverage.  
By all data, I mean every different form that you all deal with throughout Egypt: *cadastral, topography, boundary, geodetic control, surface water, ground water, soils, geology, land cover, agriculture, forestry*, and many different layers including *social, economic*, and related data and information such as *health, demographics, famine, poverty*, etc.
- Identify and inventory the *organizations responsible for collecting, processing, archiving, and distributing* the different *data* types.
- Identify which organization(s) is/are *the best data steward* for each type of *data*. The goal here is '*...to collect it once and use it many times.*'
- *Identify institutional barriers* to doing any of this and sharing data among the cooperators.
- Identify and develop *policy changes* that are needed to facilitate SDI development.
- Identify and agree on base data (framework data)
- Develop *metadata standards* and begin to *create metadata*
- Build a *clearinghouse(s)* for data discovery and delivery
- And many other related tasks

He well identifies the major steps for building the ESDI, and it's clear that this task should be a national task that has national support politically and financially too, besides the contribution and sincere will to share and to work. It's not a work without benefits, because usually the good, sincere work has a lot of revenues. And since this is a group task this means "...everyone can play..."...Dr. Alan Stevens

### **SDI hierarchy and Success stories**

"A country's SDI is called a national spatial data infrastructure (NSDI) and regional Spatial Data Infrastructure (RSDI) comprises several NSDI's and /or several countries. The global Spatial Data Infrastructure (GSDI) in the final frontier and effort today to begin at local level will eventually cover the globe." Preetha Pulusani ...president Intergraph mapping and geospatial solutions. Since we have mentioned the hierarchy of the SDI, let's see what happened in the world regarding this hierarchy;

Let's see the success stories for different countries in the field of NSDI. There are more than 60 countries are working to develop their own NSDI's, as example:

*Australia* has "Public Sector Mapping Agency (PSMA)" is self funded corporative government agency that has been extremely successful in building the core of the Australian SDI.

*Catalonia, Spain* has IDEC, a multi partner state initiative. It's objectives to compile existing geospatial information data and generate metadata catalogs, making them accessible through an internet portal.

*Denmark* (KMS) Kort & Matrikelstyrelsen: National Survey and Cadastre in Denmark it implying open standards for topographic and cadastre data. More then 50 million features included in this work.

*East midland, England* combines ordinance survey data with area statistics to improve the public accessibility to information

*India* NSDI in indea has been taking care from the high policy-making levels.

*The Philippines* they integrating what has been done in the frilled of geospatial data between the private sector and the governmental sector to build GII ( Geospatial Information Infrastructure) using open standards in an interoperable application environment and dynamically publishing to the web

*South Africa* NMO is the national supplier of the digital topographic data. It is working to redefine its data model and content in the line with ISO and OGC standards and is implementing policies, legislation, and standards to reduce the duplication of effort and data replication

There are a lot of efforts also has been done in the field of (RSDI)

For Europe: Infrastructure for Spatial Information in Europe (INSPIRE)

For Asia: The Permanent Committee for GIS Infrastructure for Asia and the pacific (PCGIAP)

For USA: Permanent Committee for GIS Infrastructure for America

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Essay: written by Meghan E. Cook, Center for Technology in Government, USA

Paper: GIS Data sharing lessons from Qatar nationwide GIS by: R C S Taragi, Ph.D. GIS Coordinator, The Planning Council, Doha, Qatar, P Balakrishnan, Ph. D. Asst. Professor of GIS, University of Qatar, Doha, Qatar.

## BIOGRAPHICAL NOTES

Sohir M. Hussein, working as an engineer in the Egyptian Survey Authority since 1992. Has Professional Master –specialized in cartography from ITC –Holland (1997), Diploma in operational management from ITC- Holland (1999-2000), and PHD student at Cairo University. She is also teaching cartography, English and computer in the surveying institute-al haram, Giza, Egypt.

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