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GIS use in Egyptian Experience
A study for the recent GIS solutions in Egyptian rural villages

ABSTRACT: **Reference number is 56**

Egyptian villages have been suffering for ages from un-balanced problems and suffocations of insufficient resources. Recently, the government has decided to make a project for re-planning these villages, trying to solve as much possible problems. The General Organization for Physical Planning *GOPP*[1] in Egypt is trying to facilitate and analyze the recent situation of these villages. Some trials have been made to solve such problems by *GIS* re-planning for many villages.

This paper aims at briefly reviewing the planning conditions and steps in the Egyptian Planning Profession before the introduction of GIS into the process. It also presents the main aspects and conditions under which the GIS was introduced and used in the biggest and most recent project on developing rural villages in *Egypt*. Explaining the obstacles faced the GOPP to transfer the real data of such villages to GIS system. Facing the real facts in these villages and trying to simplify the problems to be solved by GIS. Then discussing the steps which were taken in GIS for each village.

The paper concludes with some recommendations through which the GIS could be developed to better suit the Egyptian context from points of developing the level practice and practitioners, producing better and more coherent planning project and finally supporting the steps afterwards in future redesign, or managing the implementation of the planning project. Hopping to recommend the missing tools in GIS which were felt by the group to solve the problem with.

INTRODUCTION:

Geographic Information Systems *"GIS"* can be defined as; analytical and decision-making tools that organize, compare, and analyze disparate types of information into one organized system. These systems have powerful visual display capabilities that present the results of analysis on maps and, in doing so, provide unparalleled power to examine social, economic, and political circumstances. In essence, GIS is the best technology to understand and solve problems related to place and space.

The same kind of uneasy dynamics exists in the case of GIS technologies. In giving shape to the future, the proliferation of GIS can either enhance or impede democratic processes. On the one hand, GIS holds the promise of facilitating greater levels of individual participation in democratic decision making (Obermeyer and Pinto 1994; Cleveland 1985). However, it also posses a threat to the democratic process, by concentrating crucial information under control of an elite class of citizens which are

[1] **GOPP:** The General Organization for Physical Planning in Egypt.

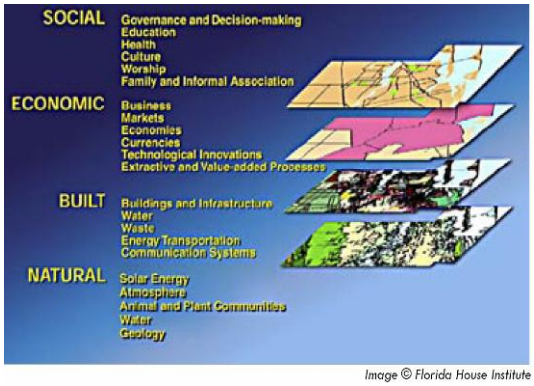
the "*technocrats"* (Habermas 1970; Fischer 1990). As GIS becomes more prominent as a standard tool to analyze the spatial distribution of information, the tension will become increasingly pronounced.

In Egypt's rural villages, this tool has shown very negligible interaction between community and planners or architects, due to the national negative educational background of most farmers and their lack of imagination. As a result, revealing to simpler methods up to understanding the community is a must. Also looking forward to use new system as the *Geodemographic* theory beside GIS. In this case installing GIS system in villages will approach the government needs of creating database for local level of Egypt's rural villages. Database was created before for the scale of locality, but its was new trying to create GIS information database for most of Egypt's rural villages.

For many reasons which are going to be reviewed in chapter one and for the sake of a unique GIS joke, that says: *"Question: Why do people buy a GIS? Answer: Because their neighbour has one."* (Reeve, Derek & James Petch: pp.48, 1999) Egyptian GOPP asked for GIS installation. Egyptian rural citizens have a different life style and concerns. They needed to be treated differently and very sentimentally for their strict religious traditions. Chapter two is discussing problems faced the team work in surveys of rural villages and collecting geographic information. Chapter three is describing the GIS project steps for creating the rural database. Chapter four is recommending some new trials in GIS system for more acceptable future solutions.

1. CHAPTER ONE: PARTICIPATORY GIS PLANNING & GEODEMOGRAPH:

A quick view on any search engine on the World Wide Web for GIS and participatory planning and the result would exceed 100,000 hits. This clearly shows the growing interest in using the capabilities of the GIS in Planning in general and in participatory planning in particular as shown in **(Figure 1).**



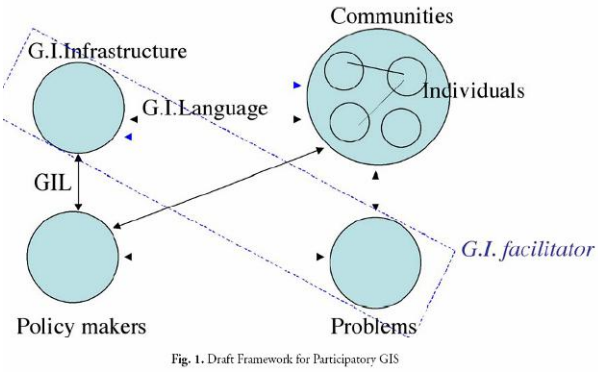
(Figure 1): The main layers of a GIS

1.1 GIS Data management in participatory planning: The use of GIS as a common tool to data management in participatory planning means: the essential need to have all levels of planning local and national using the same system with adequate technology and trained staff. This is not always the case, especially in developing countries (Turyatunga, Frank R., 2004).

On the other hand in other situations, GIS usage is considered the bottom of the ladder in the tools used to facilitate public participation where Boyd and Chan (2002) say "there are a range of tools available… ranging from GIS analysis tools to high-end three-dimensional visualization tools."

1.2 GIS participatory regional usage: Also GIS can be used to help people visualise scenarios for regional change (7.8) and to underpin community-based

planning. It can be used for helping people visualise regional scale change, or underpinning neighbourhood planning by community organisations; its uses in these ways should be explored in England, as shown in **(Figure 2)** ; (DCLG, 2003)



(Figure 2): Rugg, Robert D. 2003

What scholars and practitioners do see in common in GIS is that spatial issues are best addressed with spatial approaches and that GIS can facilitate a broader set of participants in the planning process due to its visual orientation (Al-Kodmany, 2002).

1.3 GIS link with Public participation: Linking a GIS project to notions of public participation, seems arbitrary in the absence of an understanding or consciousness about the domain in which the project takes place. Simply labelling a GIS endeavour as *PPGIS*[2] because a no technician is involved is disingenuous to the many efforts of non-GIS public participation, that seek to enhance the democratic process. On the contrary, being explicit about the domain within which a particular PPGIS endeavour falls can enhance the credibility, efficacy, and theoretical foundation of such a project. The visual nature of GIS presents a great opportunity for increased public participation; we just must be clear on exactly what we mean by both "public" and "participation" in a GIS context. (Schlossberg, Marc and Elliot Ashford, 2005)

1.3.1 Components and continuums for PPGIS: The components and continuums that can be used as a relative assessment tool for existing PPGIS projects see **(Table 1).** (*Melinda Laituri*, 2005)

Components	**Continuums of Key Words**		
1. Context:	Simple		Complex project
a. Purpose	Day-to-day decisions		Strategic outcomes
b. Stakeholders	Marginal	Mainstream	Elite
c. Linkages	Single		Multiple agencies
	No trust		Trust
d. Unit of Analysis	Local	Regional	Global
2. Connectivity:	Donations	Grants	Funding
a. Policies			
b. Infrastructure	Urban		Rural
3. Capabilities	No technology		Best technology
a. Basic literacy	Less educated		More educated
b. Computer literacy	Novice	Training	Education
c. Spatial literacy	Novice	Training	Education
4. Content	Information rich		Information poor
	Public data		Sensitive data

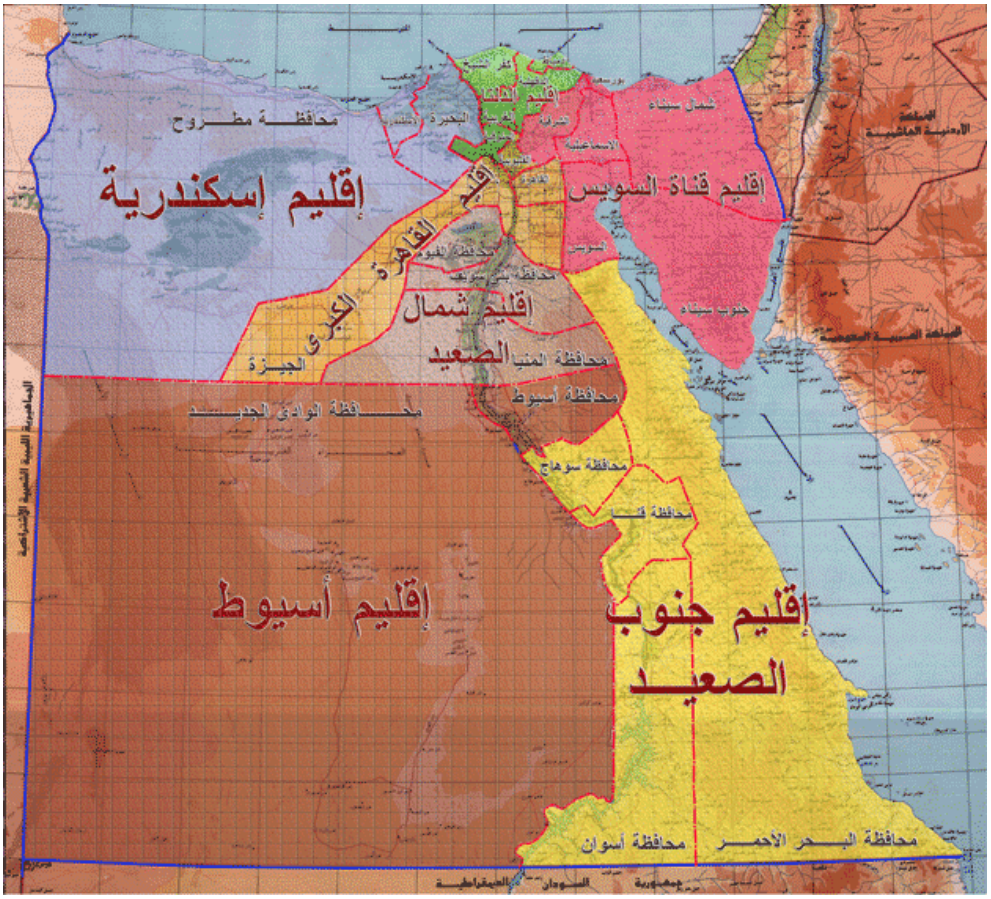
[2] **PPGIS:** Public participation geographic information system.

a. Data availability	New data	Inherited or existing data
b. Data types	Qualitative data	Quantitative data

(Table 1): Components and continuums for PPGIS. (*Melinda Laituri*, 2005)

2. CHAPTER TWO: OBSTACLE THAT FACED THE GIS PROJECT FOR RURAL VILLAGES:

The Egyptian GOPP has opened the opportunity for planners and urban designers to contribute in the huge project of creating a master database for all rural villages in Egypt. The first step taken by the GOPP was dividing Egypt into several planning regions to simplify and unify the work, as shown in **(Map 1).** These regions were further divided into different sizes of localities and cities. Each locality contains number of rural villages that are matching in local life style and mostly in weather and topological surroundings. GIS installation needed a survey team for collecting and updating data. There were many problems faced The GIS planning collecting and installing data, due to the big difference in normal planning work and GIS system introduction.
It presents the main aspects and conditions under which the GIS was introduced and used in the biggest and most recent project on developing the Egyptian rural villages.



(Map 1): The Egyptian Planning Regions. (GOPP, ٢٠٠٧)

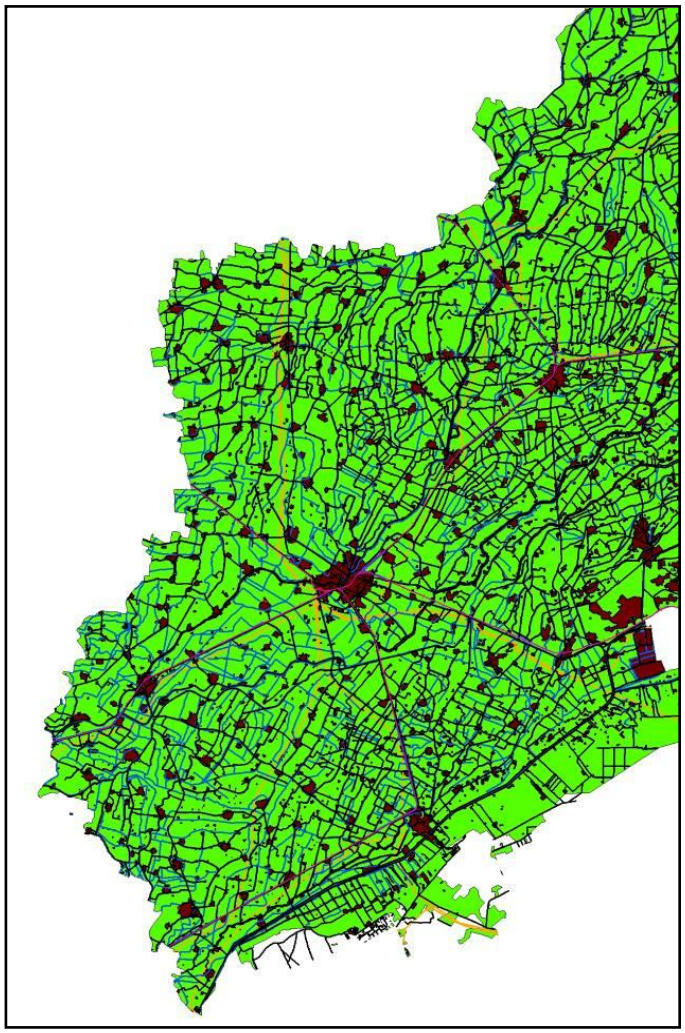
2.1 Planning Profession in Egypt before GIS: Without going into lots of information which might seem historical to this paper, it is fair to say that before the introduction of GIS into the every day practice of urban planning,

all work has had some level of abstraction and coordination of various planning efforts was not possible. Much work has been done, but lacked the solid grounds on which a national planning database could be built.

2.2 **Installing GIS:** The GOPP kick-off shot was the introduction of the data structure that was available as a hardcopy, and not digitally. This was the first obstacle as it resulted in non-coordinated work flow from various consultants. Then there was no test module on which the GOPP can check the coherence and correctness of the data delivered. These two main obstacles were later made up for by the GOPP.

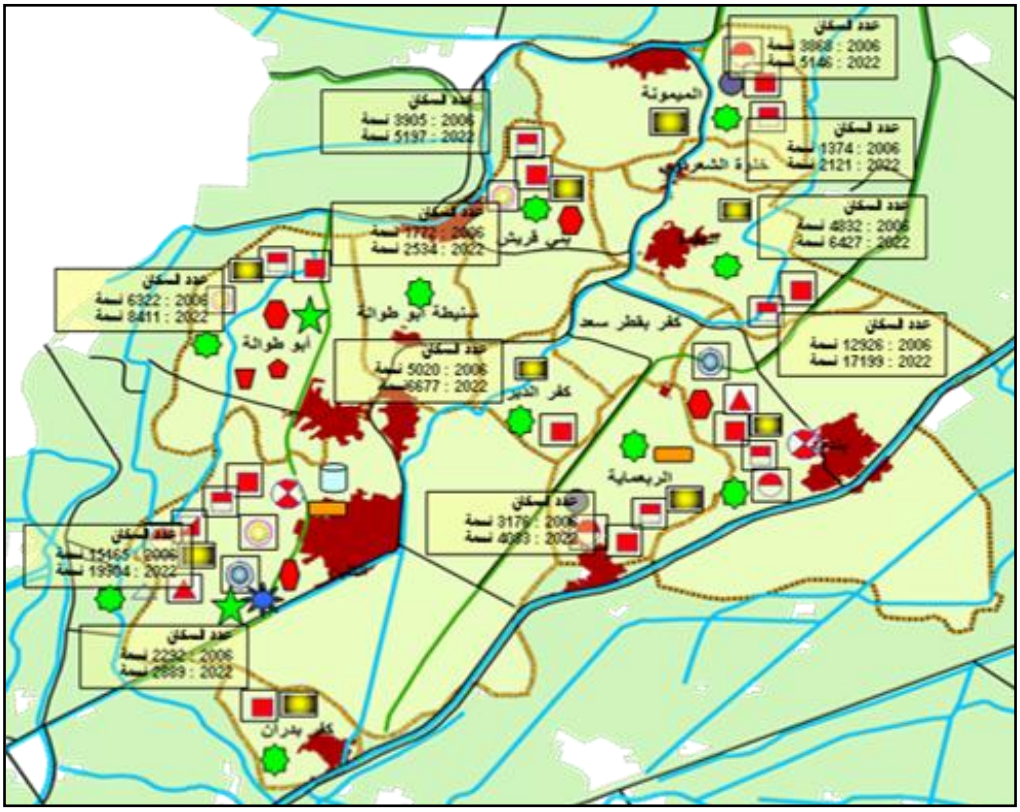
2.3 **Obstacles:** It might be the first obstacle that faced the application of GIS is the limited number of qualified GIS experts and operators compared to the massive workload required in the short time span of the project (about 550 villages every 4-6 months). Another obstacle is the rigidity of the system when it comes to the special nature of each village and its geographic content/features. This includes birds flu especially in Teleen and Sharkeyia, 284, 000 birds were culled in El Sharkeyia. 12 bird flu infections were reported in the farms of Al-Hamoul, Kafr el-Kheir, Fowa district and Teleen. (Bird Flu, 2007) That affected the time schedule of producing the GIS on the project.

3. CHAPTER THREE: STEPS OF THE EGYPTIAN GIS PROJECT FOR RURAL VILLAGES:



(Map 2): El Sharkeia Governorate GIS map, Egypt.(GOPP).

Working in the GIS project for Egyptian rural villages had similar steps which were taken in order to achieve the goal. If we took an example on one village, it will explain the whole idea that is resembled in all other villages. The project was requested to provide information and planning recommendations on two levels of planning; *level one* is the Locality level and *level two* is a village level. The level of the governorate was given as background information and no work was executed on this level. Even the GIS map of the governorate handed to the consultants from the GOPP used another coordinate system from that which is used for the whole project and its outcome!



(Map 3): GIS database for El Teleen locality (EL Sharkeyia governorate). (Source: The Authors)

3.1 Level One: <u>Locality level</u>: This GIS level map is produced based on the Satellite image and data collected from each village. The project team was asked to update the existing GIS maps of localities. Updating should include; projections unifying, convert old GIS versions to newer ones and finally updating the existing situation of the urban mass as done for *"El-Teleen", El-Sharkeyia Governorate,*[3] locality and shown in the GIS map **(Map 3).** (The Authors). A file.mxd[4] should be designed or updated in a especially produced GEODATABASE for locality "*El-Teleen*", containing the following feature classes; (TOR of the strategic planning of Egyptian villages of the GOPP)**.**

- **The demarcation:** With fields for names of villages and governorates. (Polygon feature class)**.**
- **Canals:** With fields for names and kind. (Line feature class)

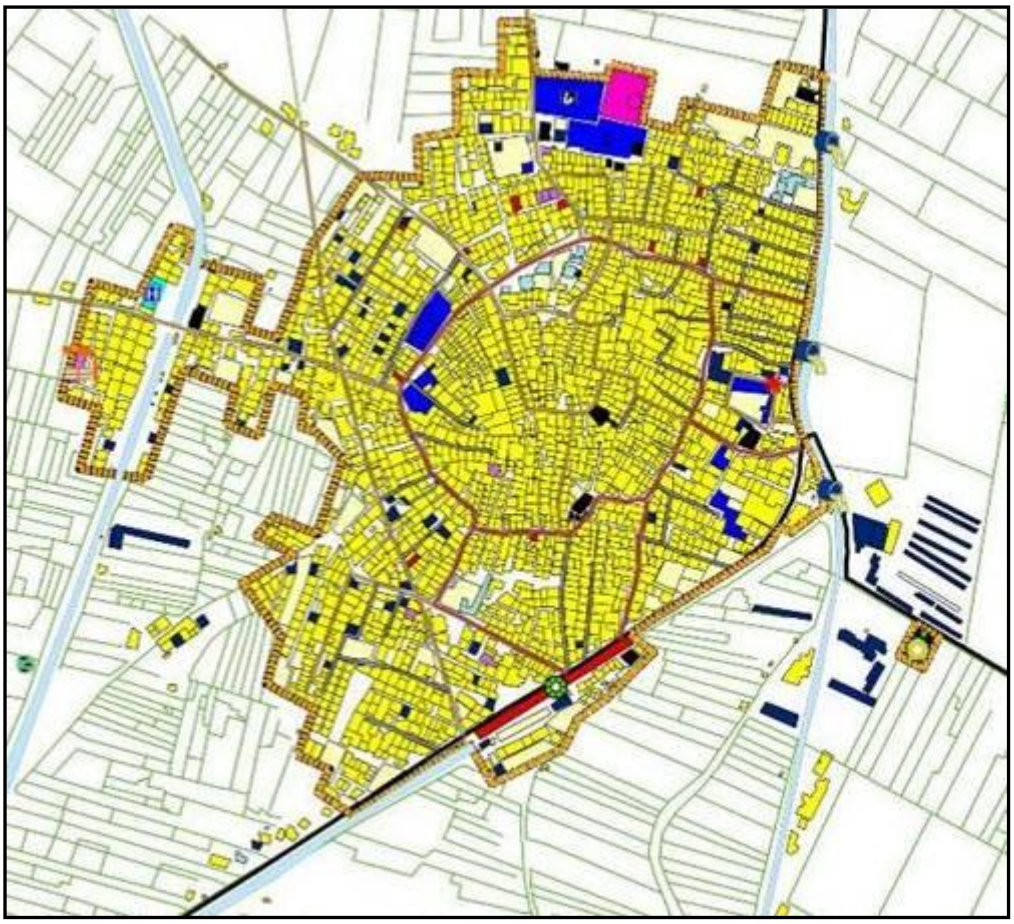
[3] **El Sharkeyia:** The governorate is located approximately 70 km northeast of Cairo and 25 km east of the city of Zagazig. It is about 80 km inland from the Mediterranean Sea. (<u>http://www.touregyptforums.com/index.php?showtopic=33</u> –3/1/07)

[4] **.mxd:** The extension of ArcMap saving files.

- **Main roads:** With fields for names. (Line feature class).
- **Urban settlement for each village:** With fields for names of villages, locality of governorate, number of existing inhabitants 2005 and expected inhabitants in 2022. (Polygon feature class)**.**
- **Main water resource:** With fields for names of served villages. (Point feature class)**.**
- **Hard Sewage capability:** With fields for names of villages. (Point feature class)**.**
- **Places of sewage ending on locality level:** With fields for names of villages and the way of solving (Point feature class)

3.2 Level Two: Village level: This is a typical design level for the database of the villages. It was started from scratch as there was no previous infrastructure or data available digitally for these villages. There was very little data and information available for many of the villages at the GOPP or at other governmental bodies. Taking an example "*El Teleen* [5] *locality*". A New separate Geodatabase as designed for the village with information and feature classes for all the geographic information recognized in the surveys as will be explained in the working steps needed for the project;

[5] **El Teleen:** A constituency in Sharkeyia governorate. It is considered as a mother village that contains many tine farms and villages like; El Maymona and Kafr Koraysh.



(Map 4): New demarcation for El Teleen village 2006. (Source: The Authors)

3.2.1 Step Number one: *fetching a satellite image*[6] for El Teleen, with resolution of 1 metre to work as the base for GIS work.

3.2.2 Step Number Two; *vectorization*: Using the satellite image in ArcMap as a base to draw the vector data needed to form: polygons for area features such as blocks, poly-lines for linear features such as roads. Features classes which are represented as points were not extensively used as the survey was urban survey using bare eye observations and not using instruments such as total stations and GPS units.

3.2.3 Step Number Three: *Data Installation* of the survey information collected by the survey and social team. These data is installed in the form of filling the fields of feature classes forming the next maps;

- **Land feature maps:** Preparing maps for each of the following information; kinds of ownership, land-use and ecological production. (Polygon feature class)

[6] **Satellite image:** Consists of photographs of Earth or other planets made from artificial satellites. The first satellite photographs of Earth were made April 1, 1960 by the weather satellite TIROS-1. (http://en.wikipedia.org/wiki/Satellite_imagery ---2/3/07)

- **Buildings maps**: Preparing maps for each of the following information; Buildings heights, construction, use nature, kind of use, water system, sewage system and end of sewage system. (Polygon feature class)

- **Roads map**: With name, quality and width of roads. (Line feature class)

- **Canals map**: With name and kind of canal. (Line feature class)

- **Informal activities map**: With fields for; Kind of activity, production partition, affiliation, time and action rate time if; {*daily, weekly, monthly or per year*}. (Point feature class)

- **Pollution map**: With development sectors either; {*commercial, infrastructure, ecological, industrial, power, construction, fishing, transportation, communications, tourism, education, health and housing*}s , kind of work, time if; {*day, night or all day*} and action rate specific time if; {*daily, weekly, monthly or per year*}. (Point feature class)

- **Demarcation map 1985**: Connected to date of creating the demarcation 1985. (Polygon feature class)

3.2.4 Step Number Four: Analyses: Form the previous collected and database information for El Teleen. Special analyses maps can be prepared as a result of integration of such previous dataset.

3.2.4.1 Projects settling map on level of locality Sharkeyia: This map will be analysed from the (Geodatabase_Sharkeyia). The new analysed information should be added to the map as feature classes of;

- ***Suggested Projects' locations for Sharkeyia***: Including fields for name of projects, name of village settling the project, name of locality or governorate, development sector either; {*commercial, infrastructure, ecological, industrial, power, construction, entertainment, fishing, transportation, communications, tourism, education, health and housing*}, estimated duration, names of beneficed villages, execution partners, estimated labour value, cost in Egyptian pounds, aims, main results, project main activities, project needed machines, suggested steps of execution. (Point feature class)

- ***Suggested lands for special projects for Sharkeyia:*** Project name, area by Acre, land ownership and owner's agreement if {*possible or impossible*}. (Polygon feature class)

3.2.4.2 The new urban demarcation map of Teleen village: This map will be connected to the Geodatabase_Teleen. It can be outlet to show the following demarcation information; (Point feature class)

- ***The new limit of the demarcation:*** With date of the demarcation 2006.

- ***The geometric co-ordinates of the new urban demarcation:*** With X co-ordinate & Y co-ordinate.

3.2.4.3 **Vacant lands map inside the new Teleen demarcation:** The map is also connected to the Geodatabase_Teleen. It has to have information about all the vacant lands inside the suggested new urban demarcation 2006 and the ecological fields inside it.

3.2.4.4 **The Teleen's construction conditions map:** Connected to the Geodatabase_Teleen showing all systematic lines in a polygon feature class.

3.2.4.5 **Maps of projects' location with priority in Teleen village:** Connected to the Geodatabase_Teleen showing all the following information in point feature classes;

- ***Activities and projects' locations suggested in Teleen village:*** With fields for name of project, name of village of the located project, name of locality or governorate (Sharkeyia), development sector either; {*commercial, infrastructure, ecological, industrial, power, construction, entertainment, fishing, transportation, communications, tourism, education, health and housing*}, estimated execution duration, names of beneficed villages, execution partners, estimated labour value, cost in Egyptian pounds, aims, main results, project main activities, project needed machines and suggested steps of execution.

- ***Suggested lands for project inside Teleen village:*** With project's name, area by Acre, land ownership and owner's agreement if {possible or impossible}.

3.2.4.6 **The general Strategic plan for Teleen village:** Also is connected to the Geodatabase_Teleen beside all the previous added information. It includes;

- ***Limit of the new demarcation.***
- ***Geometric co-ordinates for the new demarcation.***
- ***Construction conditions.***
- ***Landuse plans inside the new demarcation.***
- ***Suggested projects located in Teleen.***

4. CHAPTER FOUR: RECOMMENDATIONS AND SUGGESTIONS:

The research concludes with some recommendations through which the GIS could be developed to better suit the Egyptian context, from points of developing the level practice and practitioners. Producing better and more coherent planning project and finally supporting the steps afterwards in future redesign, or managing the implementation of the planning projects. It would be useful

if GIS were merged by Geodemographic theory, which will be explained in this point for better human performances. Also facing inappropriate file sharing by website can be redesigned for more capabilities for users or explores.

4.1 Geodemographics and GIS: Geodemographics is the analysis of people by where they live, linking people to places (Sleight: pp.16, 1997) while as was explained before GIS is a set of technologies that helps us to see our blue planet in better ways. (Longley, P. & Goodchild, 1999) That is why it would be very professionally if we linked our Egyptian farmers to their own rural villages.

4.1.1 Geodemographic use: It can be the shorthand label for both planning development and the village or area typologies. Profiling the behaviour of citizens households. It becomes a framework for public and private sector decision making. (Harris, Richard: pp.1-3, 2005)

4.1.2 GDIS: Is the Geodemographic Information system. In our modern days, GIS users expect more integration of wide range of geographic information. This range is not required in Geodemographic analysis, as in this new system the focus is on collecting data about, visualising socio-economic and classifying demographic and consumer patterns. Both GIS and Geodemographic systems can overlap under the ideas of geographic science in different softwares includes CACI's Insite (www.insite.info), Claritas' COMPASS (www.claritas.com) and EuroDirect's MICROVISION (www.microvision.info). (Harris, Richard: pp.111, 2005)

A criticism was made for GIS, that it takes a narrow view of geographic space, seeing it as a container. (Curry, M., 1998) Also it was said that a false sense of separation between users of GIS and the world represented on the computer screen. (Goss, J., 1995) The Geodemographic system deals with the vector inputs or information of GIS. However vector data always store topological relationships which speed the geographical enquiries of the database. Tables of data can be related and joined, combining datasets to create new information with hierarchy and ranking. The relationship view is important in Geodemographics. Where GIS offers a variety of special, geometric, geo-statical and 3D analysis, GDIS emphasis on assigning data to a comparing neighbourhood profiles. (Harris, Richard: pp.116, 2005)

4.2 Web sharing: Not dreams, but expectations and soon will be reality in developing an Egyptian site for not just viewing GIS information, but to achieve a mutual sharing as editing and connecting data. Sharing and commercialisation of GIS data through web site will always depend largely on quality and availability. Data are issues of liberty on one hand and its protection as an asset on the other hand. (Cho, pp.54-55, 2005)

4.3 Participatory GIS: It should also be noted that the process as it happened did include very little of participation from the local community in all levels of GIS. Ideally speaking a participatory GIS should include the community at the; levels of: data collection, data entry, data management and finally data updating. However, this involvement should be preceded by capacity building and training. Given the very limited time allowed for the completion of the whole project it was not possible to

involve the community in the process of the GIS. This should be considered in the future development in order to support the sustainability of the system and its update.

BIBLIOGRAPHY:

Al-Kodmany, K.: ***"Visualization Tools and Methods in Community Planning: From Freehand Sketches to Virtual Reality."*** Journal of Planning Literature, Vol.17, no.2, p189-209, 2002.

Boyd, Susan, and Roy Chan: ***"Place-making tools for community action: Tools that engage the community to create a future that works for everyone",*** Environmental Simulation Center, U.S. Department of Housing and Urban Development, 2002.

Cho, George: "***Mastering GIS: Technology, applications and management.*** G***eographic Information Science",*** John Wiley & Sons, Ltd., Chichester, 2005.

Cleveland, H., 1985. The twilight of hierarchy: Speculations on the global information society. PAR, 45, 185-195.

Curry, M.: ***"Digital places: Living with Geographic Information Technologies",*** Routledge, London, 1998.

DCLG: ***"Participatory Planning for Sustainable Communities",*** Office of the Deputy Prime Minister (ODPM), UK, 2003.

Fischer, Frank, 1990. Technocracy and the Politics of Expertise. Newbury Park, CA: Sage.

Goss, J.: ***"Marketing the new marketing: the strategic discourse of the Geodemographic information system." "In Ground Truth: The social Implications of geographic Information systems"*** (ed., Pickles, J.), The Gilford Press, New York, 1995.

Habermas, J***., "Toward a Rational Society: Student Protest, Science, and Politics",*** J.J. Shapiro, Trans. Boston: Beacon Press, 1970.

Harris, Richard & Peter Sleight & Richard Webber: ***"Mastering GIS: Technology, applications and management. Geodemographics, GIS and Neighbourhood targeting",*** John Willey & Sons Ltd., Chichester, England, 2005.

Laituri, Melinda: ***"The Issue of Access: An Assessment Guide for Evaluating Public Participation Geographic Information Science Case Studies"***, URISA Journal • Vol. 15, APA II: pp 25-32, 2003.

Longley, P, Goodchild, M., Maguire, D. and Rhind D.: ***"Geographic information systems: Principles, techniques, Management, Applications",*** John Willey & Sons Inc., New York, 1999.

Obermeyer, N. and Pinto J. 1994. Managing Geographic Information Systems. New York: Guilford Press.

Reeve, Derek & James Petch: ***"GIS Organisations and People: A socio-technical***

Approach", Taylor & Francis Ltd., London, England, 1999.

Rugg, Robert D.: ***"A Framework for the Use of Geographic Information in Participatory Community Planning and Development",*** URISA Journal • Vol. 15, APA II: pp 75-80, 2003.

Schlossberg, Marc and Elliot Shuford: ***"Delineating "Public" and "Participation" in PPGIS"***, URISA Journal • Vol. 16, No. 2: pp 15-26, 2005.

Sleight, P.: ***"Targeting customers: How to use Geodemographic and life style data in you business"***, NTC Publications, Henley – on- Tames, 1997.

Turyatunga, Frank R.: ***"Tools for Local-Level Rural Development Planning: Combining Use of Participatory Rural Appraisal and Geographic Information Systems in Uganda",*** World Resources Institute, US, 2004.

INTERNET **INTERNET**

-The Egyptian GOPP الهيئة العامة للتخطيط العمرانى

إعداد المخططات الاستراتيجية العامة للقرى المصرية :*" الاقاليم التخطيطية المصرية"*.,

الهيئة العامة للتخطيط العمرانى, وزارة الاسكان و المرافق و التنمية العمرانية, ٢٠٠٧.
http://www.gopp.gov.eg/villages/egy_map.htm - 1/3/07.

-Bird Flu: All you need to know about Bird Flu", Tuesday, March 6, 2007.
الهيئة العامة للاستعلامات
http://birdflu.sis.gov.eg/html/flu01001.htm 6/3/07.

PROJECT **PROJECT**

- TUR of the project for preparing the strategy plan developing the Egyptian rural villages, The General Organization for Physical Planning in Egypt GOPP,2005