Transforming the Egyptian Cities into Smarter Cities! Is It A Dream? What Is the Role of GIS?

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Abstract:

The Egyptian cities have a substantial growth today due to a lot of reasons and the regular ways of building and managing traditional cities are not good enough for the needs and challenges facing cities in modern life , So they have a lot of problems that in need to solve accordingly. The cities improvements can succeed as the joint effort of all stakeholders and Technologies.

Whereas The world is moving rapidly to transforming the cities into smart cities, plans of transforming the Egyptian cities into smart ones are suitable. These plans have to integrate all elements: expert guidance, the donors and the city improvement plans.

Accordingly, the use of the city's spatial data to create a geo-database could benefit city stakeholders to transform the Egyptian cities into smart cities.

The GIS's powerful vision helps in developing the cities themes towards tomorrow's smarter cities, where geospatial data can be recognized as a key element of smart city vision.

The research provides in-depth analysis of the important elements of the GIS applications that can help in transferring

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the Egyptian cities into smarter cities through the studying of smart cities criteria's.

Keywords: GIS, Egyptian cities, Smart cities Transformation.

1. Introduction:

The population growth of cities around the world has become a source of nuisance here and there, that the second half of the last century produced streams of urban rural migration, which were intended to take advantage of the city's facilities and services.

The Egyptian cities like those of the world have successive increases that have caused a constant pressure on their resources causing a disruption of urban ecosystems also. Urban facilities and services can no longer accommodate these growing numbers by the day.

The Egyptian city shown by the old cinema films was organized and provided with urban services, where the streets were clean, stylized and the roofs of the buildings decorated with flowers, the roofs themselves became warehouses for broken furniture, and some filled bird sheds. This issue has been filled with researchers trying to find acceptable solutions.

According to UN reports, 64.1% of the population of developing countries and 85% of the population of developed countries are expected to live in cities by 2050, which means that more than 6 billion people will occupy cities, twice as many as today. So it becomes necessary for countries (Egypt as well) to adopt new plans and projects to create capable cities. To absorb the newest of urban problems, to meet the

current needs of the population, as well as to try to conserve the environmental resources of future generations.

These problems have been accompanied by the emergence of a range of modern projects, which are full of scientific research in the disciplines of urban planning, urban geography, urban sociology, information technology and communications. Accordingly, a range of terms have emerged, such as: The Future City, Sustainable City, Knowledge City, Digital City, Resilient City, Creative City, Child Friendly City, Eco City and The Smart City.

The United Nations has adopted the philosophy of urban development and set a time frame for 2030, which aims to raise the quality of life in the world's cities by 2030. One of his themes was the information management and information intelligence systems. These high-capacity systems facilitate the intelligent management of a huge amount of spatial and descriptive data and enable different, more accurate analyses to find innovative solutions to urban problems and To raise the quality of life in cities .

This paper discusses the idea of transforming a number of The Egyptian cities into smart cities in a conceptual framework that explains the philosophy of smart city and some transformation mechanisms in addition to examples of the use of GIS applications to support the idea of transformation.

The Egyptian city and mechanisms of the development:

The Egyptian city, like other cities of the 21st century, has become plagued by problems of inadequate services and facilities quantitatively and qualitatively, problems of the increasing of unemployment, pollution, traffic accidents and all kinds of crimes, etc. It is even possible to say that most Egyptian city dwellers today live in structures that are unable to provide adequate services and at low levels of quality of life.

It can be said that, Cities in Egypt face a range of challenges as they are part of the global urban fabric, but the regional dimension gives them a mixture of Middle Eastern, Afro-Asian, Arabic and Islamic characteristics, which appear in other specific problems as a result of the cultural, economic, Social, and environmental specific characteristics of the Egyptian population.

The urban development is often implemented in two parallel directions, some plans try to reduce the level of the existing problems (mitigation), while the other trend seeks to develop complete solutions to them;

The first trend is to explore the possibilities of opportunities for the establishment of new cities in the desert margin adjacent to the old cities themselves so that their visions are formulated to accommodate a part of the population of the old cities, so that they are planned taking into account the social, economic and cultural conditions of these inhabitants.

This solution (at first) seems to be an ideal one because 93% of Egypt's area is uninhabited or cultivated, but the Egypt's cities map of the 20th century reflects a lot of the

syndrome of the cities, as there is new cities mostly named after the old cities, such as The New Cairo, New Fayoum, New Beni Suef, New Mansoura, New Damietta, and others. While a deeper problem arises: Are these cities achieving the goals for which they were created? In most cases, the answer is no, as a result of multiple reasons. The problem of financing and the huge amounts of resources required to build new cities is often a stumbling block to this trend.

The second trend, which goes hand in hand with the first, is to develop the old cities themselves in an attempt to solve some of their problems or find solutions. It can be said that, the departments of cities management and the local administrations in Egypt have developed a lot of plans for the development of cities and some efforts are made to find solutions to these problems of the lack of services and inefficiency, problems of housing, unemployment, pollution, accidents or others. But they have just temporary analgesics.

It is worth mentioning that despite successive efforts and studies to find solutions in this developmental aspect, the past experiences of most development policies in most countries of the world have proved to be unable to find solutions to the problems of cities, as they are complex problems in most countries.

The Smart City emerged as a solution:

Over the previous few years, world leaders, European institutions and major technology suppliers have discussed the idea of smart cities. Smart cities are now more than just a word, a concept that has developed into various aspects of the quality of life in cities. According to the European Commission, in this vibrant perspective of smart cities, the word has come to be defined as "a location where traditional networks and services are made more effective by using digital and telecommunications technologies to benefit their residents and businesses."

In fact, The smart cities are planned to integrate the Internet of Things (IoT) and Information and Communication Technologies (ICT) into their digital strategy, where people are encouraged to experience the transformation of the urban characteristics.

Amsterdam and Barcelona are two of Europe's major examples of prioritizing "Smart" urban growth, addressing problems and applying a green strategy that has encouraged the development of local innovation clusters that include start-ups, research organizations and service providers focused on particular geographical regions.

The announcement of establishment of constructing the new administrative capital of Egypt which is planned to be a smart city (at the Egypt Economic Development Conference2015) It has been announced that the Egyptian government is currently implementing a new generation of smart cities, (called the fourth-generation cities) and there is a plan to establish 16 cities, including the new administrative

capital and the new El Alamein. After three years (at Egypt Government Excellence Conference 2018) the government determined the orientation on the transition to smart cities through the application of E-government standards, access to services through the Internet, intelligent management of utilities and all utility networks such as water, telecommunications, gas and electricity, central air conditioning systems, drinking water rationing, treated wastewater for irrigation, relying on renewable energy, managing the entire traffic system through intelligent systems, and entering more than one means of transportation in this system.

It's worth mentioning, there are challenges face the transformation towards smart cities as follow,

- Capacity and coverage technology difficulties.
- Security digital.
- Law and policies.
- Citizens ' absence of trust or reluctance (lack of clarity about advantages).
- Models of financing and company.
- Interoperativeness.
- Existing power, water and transport infrastructure.

What is a Smart City? The term and the concept:

There is no perfect definition of the word "smart", which we may describe as a human being or a place. Smart is the ability to accomplish things in some body point of view, but it is the ability to remember for others. It may be the ability to

make the best use of the available techniques of the times in a third opinion.

Since the smart city is a fast-growing research field, it has confused its concept for several years. At the beginning of the creation of the term "Smart Cities," the focus was only on the word "smart," so some said that the confusion of meanings ascribed to the word "Smart" and the label "Smart City" was a significant difficulty in defining the smart city. In addition, the belief that the "Smart City" is similar to The "Digital City," "Wired City," "Knowledge City" and "Green city" which link the technological informational transformations with the economic, political and socio-cultural changes. (Hollands, 2008).

"The smart city is where the use of smart computing technologies makes the critical infrastructure components and services of a city more intelligent, interconnected, and efficient." (Washburn, 2010).

"The smart city concept implies a community-driven reaction to solve traffic congestion, school overcrowding, air pollution, loss of open space and skyrocketing public facilities cost." (Pardo, 2011).

Some mixed the confusing term "Smart City" and some terms that were simultaneous and consecutive such as: Digital City; Wired City; Green City; Information City, Annalisa Cocchia tries to compare various city definitions linked to the "Smart City" label and list them according to the literature review (Cocchia, 2014).

It related to the concepts of smart community, sustainable city and green city including economic component,

environmental component and social component. It was also searched in the previous years from different perspectives. In the same vein, Berardi reviewed some of the definitions proposed in this literature, which contained different concepts. (Amrita Singh, 2019).

It can be said safely that "Smart City" is now more than even focusing on the city. "It is becoming wider to include aspects of applying the benefits of modern technologies to true city element development in alignment with technical transformation" (Stratigea Anastasia, 2017).

Finally, the smart city is a comprehensive idea that defines cities with smart communication, urban, governance, environment and individuals and leads to a smart living. It can also be said that the city cannot be smart when its elements (such as energy production, water, facilities or services) have a lot of shortage or surplus. (Abu El Ela Hany S., 2016).

Main Components of smart cities:

As mentioned previously, there is no size that suits all smart cities model, but rather a process or series of measures that allow cities to become more resilient and faster to react to difficulties. Cities are therefore becoming smart. In essence, smart cities use connectivity, environmentally distributed sensors and intelligent leadership systems to address instant issues and generate creative responses to the city's sustainability challenges.

Although information and communication technology (ICT) are essential to apply, they are only instruments that have to be combined with the process of planning and

management. They should make changes in practices and the dynamic of the urban life. They have to improve the public services and infrastructure performance too.

There are different approaches to identify **HOW** the city can be a smart one and what are the main domains.

In order to filter the main themes and elements of smart cities, a number of stakeholders visions have been brought together, The Regional Smart Cities Institute(RSC), The United Nations Economic and Social Commission for Western Asia (ESCWA), The International Telecommunication Union (ITU) and The British department for business, innovation and skills (BIS).

Komninos outlined them in his famous book "The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies." (Komninos, N. 2014.)In seven domains as follow;

- Smart Economy: The innovative investments and projects based on creativity, scientific research and innovation, as well as markets for trained employment and contemporary services, as well as an organized export and import movement.
- Smart Life: The development of all aspects of life in the city, such as housing, health, education, entertainment, security, social welfare and sports.
- Smart Utility & Infrastructures: Includes transportation, parking, energy, water management, waste and internet networks.
- Smart Environment: The attractiveness of natural manifestations, environmental protection efforts,

pollution reduction, as well as sustainable resource management.

- Smart Population: This standard means a certain level of qualifications, as well as flexibility, creativity, and a level of participation in social life.
- Smart Governorance: The level of population participation in decision-making, the level of attention to public social affairs, the transparency of decisions, and the efficiency of political strategies.
- Smart Mobility: Innovative, safe, energy-efficient, non-polluting, cheap transport.

Is this a dream or Can be done?

"*What gets measured, gets managed*." Peter Drucker wrote in 1954 in his book titled, "The Practice of Management".(Drucker, Peter F. The Practice of Management. New York: Harper & Row, 1954) , so The Egyptian cities (like others) need to be able to benchmark their performance periodically on local and global scales. Determining and setting basic expectations of performance and tracking advancement over time will assist them identify areas for enhancement.

There are a lot of key performance indicators (KPIs) which have already been performed by several organizations, governments. Each KPI is part of a ranking category that evaluates a particular smart city dimension or field.

The most famous measure is the ISO 37120 published in 2014 by the international organization for standardization (ISO), which introduces 100 indicators divided into 46 core, then 54 supporting indicators covering 17 themes as follow:

- Economy
- Governance
- Telecommunications
- Education
- Recreation
- Safety
- Wastewater
- Shelter
- Fire and emergency response
- Transportation
- Energy
- Urban planning
- Health
- Environment
- Finance
- Solid waste
- Water and sanitation

What is GIS and how it can Help?

The significance of using GIS in smart cities is primarily due to location-based services being identified. It promotes the storage, updating, analyzing and visualization of geographic data that helps decision-makers without wasting time.

"It also presents strong instruments that enable urban managers as well as people to generate interactive spatial queries, evaluate, get maps, report and outcomes." (ISO.ORG 2014) Joseph pointed out that, The environment of the Geographical Information System (GIS) is regarded an appropriate spatial data platform for many smart city pivots such as mobility, power, communication, population and others (Joseph, T. 2014)

On the other hand, researchers discussed the interaction between GIS capacities, cloud computing, geo-visualization, and human-computer under the term of "Interdisciplinary Urban GIS science" to convert city management to a more effective level, particularly in the areas of transportation, risk

management, urban planning, noise mapping and solar power (Li, D., et al.2013)

By agreement with that., Wang, 2013 defines GIS ' role in the context of Smart City. With examples from transportation and mobility, risk management, urban planning, noise mapping and solar energy, he obviously emphasizes the benefits that contemporary GIS technology brings to the Smart City. He discusses problems of voluntary geographic information collection under the same term of "Interdisciplinary Urban". (Wang, T.(2003).

It can be said that The GIS technology bridges the gap between distinct industries and functions as an integrated cross-sectoral platform for collecting, managing, compiling, analyzing and visualizing geospatial, temporal, sustainable urban planning, growth and management data.

In other words, the role of GIS in smart city is an active role, starting with obtaining, organizing and classifying primary data, and then integrated data management in geographical databases, so that they are ready to analyze, represent and find the best solutions at any time to problems of the following:

1-The constructed urban environment like infrastructure, houses and government spaces.

2-Urban services like transportation, municipal waste, water, power, health and education.

3- Natural surroundings such as biodiversity, green spaces, air, soil and water.

Thus, It is very evident that geospatial data and GIS should play an important part in most smart city dimensions in

improving the degree of smartness by offering a geo-reference structure for the virtual environment, an integrative information organisation platform, an intelligent decision-making geo-analysis system and a context-adaptive means for government information sharing.

Interdisciplinary urban GIS platform for Smart Cities:

At a report, Esri Indea (https://www.esri.in) published that A GIS platform offers an IT framework to maintain and deploy information and apps across all aspects of the life cycle of urban development at various aspects of the smart city as the following:

- Planning & design: deficiencies are identified and ideal solutions are suggested. Integrate GIS with most design programs, including Computer Aided Design (CAD), Building Information Modeling (BIM) to make the infrastructure design method more analytical and cost-estimated.
- Find a suitable sites for urban development, show the legal limits, assess existing / new locations correctly.
- integrate GIS project and financial management software for better handle projects.
- Understand where and how urban developments can be marketed.
- Manage and maintain the critical investments in a cost-effective manner.

The Indian smart cities and GIS:

India has witnessed a huge transformation of the urban environment, recently. Many individuals have become jobseekers, possibilities to enhance their life and generate a better future for their kids, every minute 30 people leave rural India and at that state by 2050; the nation will need some 500 new towns to house 700 million more urban residents. Thus, the government has intended to convert the town into an upgraded town with a spatial technology-based infrastructure and facilities that improve the intelligence, quality of life and other characteristics of the town (i.e. environment, entrepreneurship, education, culture, transportation, etc

Indian transformation strategy towards smart cities depends upon The integration of GIS with Doran model (one of the most well-known models) created using three dimensions -Economy, Environment and Society (fig. 1) .).(Anuj Tiwari, Dr. Kamal Jain 2014).

The model demonstrates a three aspects of environment (conservation), financial (growth), and social (equity). Sustainable development of the Smart City is based on these three pillars, so the model is called the model of 'three pillars'.

1- The environmental element involves management infrastructure and resources. It includes water, air, power and waste management, government and alternative transport, green buildings, green spaces, intelligent development and measurement of climate change. GIS can answer the generic questions of locations of all the environmental element and their condition, routing and pattern. On the other side, with geo-database manipulation and analysis, GIS has the spatial

analysis capacity to demonstrate their distribution patterns for these components.

2- The economic element includes Public administration. It includes models of governance, urban regeneration, open data, large information, bandwidth, mobility, cloud, safety, company intelligence. In addition to mapping and data storage. GIS provides analytical capacities to support company decision-making processes and enhance coordination between overlapping jurisdictions such as public works and public health –for example: the spatial analysis is one of the famous GIS application for site selecting of firms and other financial agencies and helps for the decision making. Besides, The Internet has become the fastest way to disseminate data to people using GIS, with the growing amount of government agencies online. they put their GIS-based maps on the Internet for streamline activities.

3- social element Includes people of the city and community life, urban mediation, participatory democracy, social innovation, human scale cities and, facilities of closeness. GIS applications can be used in analyzing and monitoring the social elements - for example: The public uses inside the city can be analyzed on the basis of there being significant disagreement regarding each use and their actual or potential impact on the landscape. In addition to the use of GIS modelling in the planning of different service sites and uses of land based on community need studies.

Figure 1. The integration of GIS with Doran model using three dimensions Economy, Environment and Society.

GIS applications for transportation, risk management and urban planning:

Amsterdam, Singapore and Dubai smart cities use GIS applications for analysis of the geospatial data in implementation of the smart city.(Wang TAO 2013).

GIS for smart Transportation:

GIS can play significant roles in reducing energy consumption and enhancing urban transportation smartness during the process of offering effective transportation alternatives to urban residents, attaining sustainable transportation management - for example: The tool of navigation for finding ways, road management, safety investigation, finding the shortest and the fastest way and all

the network analysis application capabilities can make the transportation system more smart.

GIS for risk management:

The academic and governmental sectors of the smart cities focus on the management of risks. The management has to include the early warning, the fast response, recovery and mitigation. The Gis capabilities of site selecting and modeling can help in selecting suitable sites for material deployment and provision to effective rescue work for potential disasters. On the other hand, a real-time 3D GIS can facilitate rapid emergency response to multi-level terrorist attacks.

GIS for Urban planning:

The GIS applications are divided in distinct parts of cities and have distinct characteristics. With the rapid growth of urbanization and smart cities application, an interdisciplinary urban GIS is pushing for the theoretical growth and technical innovation to advance in-depth GIS applications.

In practice, many quantitative GIS urban models have been suggested and applied by urban planners and scientists to assess or enhance the sustainability level of cities. U-Plan, Artificial Neural Network, Multi Agents and Cellular Automata are urban models implemented in the GIS environment.

The GIS 3d analyzer makes urban planners ' manipulative tasks much more convenient.

On the other hand, the interpolation capabilities of GIS make it easy to create Noise maps, pollution maps and solar energy maps which are important for urban life and urban planning.

The main steps to make GIS part of a successful American smart city:

The report posted on the American ***smartcitiesdive*** website (https://www.smartcitiesdive.com) indicated that, Many American municipal government agencies are still unable to obtain and retain their own GIS data or to provide this information to others. It ensured that, allowing individuals to explore their own information using GIS offers data and resources within their daily workflows. Citizens can also access applications to be better informed about land, company, transportation, tax, leisure and more facilities and events.

The report indicated that, the American model for smart cities accompanied with open and linked spatial data enables everyone to know what needs to be accomplished, and to access the right instruments and resources to attain those objectives. But it begins with three easy upgrades a community needs to create: organize and geo-enable information, activate and connect sensor networks, and facilitate cross-organization:

Geo-enabling data:

A photograph says a thousand words. So it can be simpler with data-driven maps and animated graphics to convey complicated data to individuals who may not have a profound or professional knowledge of it. One instance of this approach is a comprehensive report of elevators produced by the Department of Buildings (DOB) in New York City. It demonstrates on maps a clear and

understandable image of where the problems were and where specific solutions required to be targeted.

connecting sensor networks:

In the field of predictive data analysis, smart capacities and emergency reaction intersect. The report indicated that, If the data can be used to understand how future events will unfold, the response can be in a more informed way and can save more lives. The Storm Sense Project at Virginia Beach is an initiative that takes part in the Global City Team Challenge, using such predictive capacities. In the same context, the scope of the Storm Sense initiative included the interests of local coastal governments with Internet of Things (IoT)-enabled sea level sensor networks to improve their emergency preparedness.

Enabling collaboration:

One of the most common problems in a smart city government is the civic departments which work as silos and cut off from efficient workflows as they don't have simple access to the same data. GIS helps to collaborate with real-time location-based instruments to keep everyone in the same organization linked to the same up-to-date data. With the use of GIS, Sectors of urban planning, local government, utilities, infrastructure, safety, security, environment, cultural heritage, public health, business and education share their spatial data with one another to facilitate the use of location intelligence among government agencies and other stakeholders.

Thus, the report states that GIS can provide a scalable way for government to easily collect, maintain and share their spatial data.

A GIS CityEngine for the Smart City:

City Engine is a (3D) modeling software developed by Esri for urban planning specially. It was created to facilitate professional users in GIS, CAD, and 3D to quickly generate 3D cities from existing 2D GIS data. The model introduces a three-dimensional platform helps in creation of 3D urban environments. The visual and geometric advantages of the model in simulating the real geographic phenomenon resulted its broadly usages in studies and research of the smart cites management , e.g., urban planning, architecture, , game development, entertainment, GIS, archeology, and cultural heritage to build virtual environments.

The model supports the creation of detailed large-scale 3D city models similar to the procedural modeling approach. It works with the design and arrangement of architectural images in the same way of managing the terrain, ecosystems and atmosphere mapping.

Although there are a lot of 3D modeling software, City Engine is different from others because it has a different methodology depends on the shape enhancement via the rule-based system like the geo-data bases similar to the Geographic Information System (GIS) data base. It uses A shape grammar consists of shape rules and a generation engine that selects and processes rules. Furthermore, Users can alter or attach the grammar structure as much as they need to make space for fresh models. The concept of

grammar-based modeling is to identify rules by generating more and more details that iteratively improve a model (fig.2).

Figure 2. grammar-based modeling identifying rules by generating more and more details that iteratively improve a model.

City Engine can be integrated with a the Building Information Model (BIM) software for visualizing the data of buildings in a larger urban context. The BIM is a software depends on various groups of tools and files for digital representations of physical and functional characteristics of places. these groups can be extracted, exchanged or networked to support decision-making regarding a built asset.

Why A GIS CityEngine is different

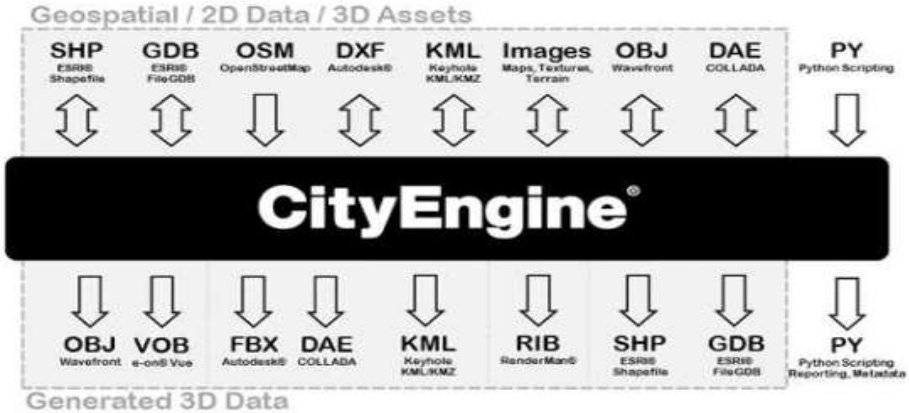
There are several methods to create 3D city models. It depends on the Level of Detail you would like to obtain. There are semi-automatic methods and manual methods as well as different data source.

it’s no doubt that terrestrial LiDAR would be the best choice to have the 3d city today, However 3d-Laser scanners are quite expensive and in many case not affordable for studies and researches. Another cheaper solution could be using 3d-reconstruction based on optical devices and stereo pairs.

As it's known that Building an industrial 3D atmosphere is traditionally a very time-consuming as a result of the countless structures and the huge amounts of the city information. CAD software was used by designers to produce forms one by one. urban planners evaluated cities by processing 2D data in GIS (GIS allows only restricted 3D form creation).

On the other hand, City Engine does not improve the urban design or planning interface and integrates into a unique area of called Geodesign (using geospatial data to design a city) only , but also simulates the real geographical characteristics of the city.

The most important features of CityEngine is that the model supports most types of digital map files, GIS, databases and engineering programs. It does not have to generate all of the three-dimensional objects represented. while they can be imported from other software with various extensions. However, it is possible to edit and upgrade only the geometry of objects (fig. 3).



(Source: City Engine help)

Figure 3. City Engine imports/exports several file format.

The model can use a single rule to create many 3D models considering that the 3D object is resulted from a 2D shape with applying a rule known as the "CGA rule" which is a programming language indicated to generate architectural 3D content. (Müller, P., etal. 2006).

For example, it can use the urban data of the Arc Map attribute table (number of floors, floor height, roof type, wall material type) for generating some 3D models.

CityEngine bringing The 3d city in steps:

For the creation of a massive city all at once, The CityEngine powers rapid adjustments to the architectural style or other features of the 2d city so it can be easily create multiple design scenarios. Starting with the designing the urban environments by trying more designs with 3D representations of regulatory and land use conditions. Then to create the 3d content through the integration of the CityEngine smoothly with other pre constructed features.

In the following there are the five steps of applying CityEngine to build a 3d city:

The 1st step: Finding the determined city area. Use 'Get Map Data' to import basemap and terrain data from various sources (fig. 4).

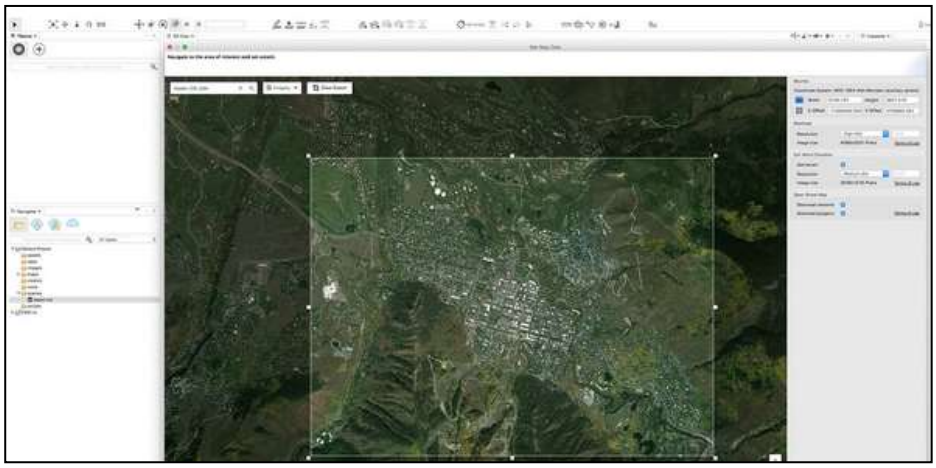


Figure 4. Finding the determined city area in CityEngine

The 2nd step: Sketching of roads, blocks of towns and plots (fig. 5).

Figure 5. Sketching the city features in CityEngine

The 3d step: Switching 2D data to 3D models. Add trees, rooftops and other 3D resources (fig. 6).

The 4th step: Texturizing the buildings and adding more details to the 3D models (fig. 7).

The 5th step: Exporting the finished 3D city to the web, or a geodatabase (fig. 8).

Figure 6. Switching 2D data to 3D models in CityEngine

Figure 7. Texturizing the buildings and adding more details to the 3D models in CityEngine

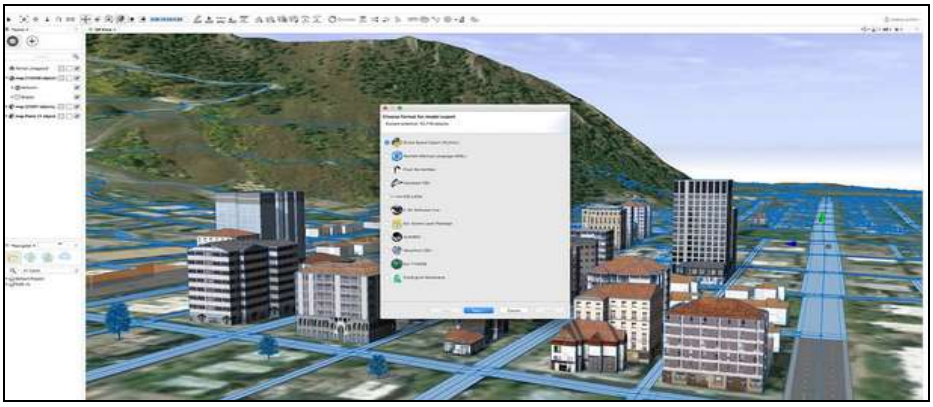


Figure 8. Exporting the finished 3D city

Some studies suggest that smart cities strategy should include a sustainable, dynamic and participatory solution that depends upon GIS in criating land cover, land use maps, population density maps, predictive land use change modeling and population dynamics, and risk assessment plans.(N. Stephenne2016).

CONCLUSIONS:

With complex problems in Egyptian cities, as a result of population growth and successive migratory currents from the countryside to the city, like most countries of the world, coinciding with the Egyptian government's approach to turning some Egyptian cities into smart cities. This paper examines the using of GIS to transform cities into smart ones.

The paper examines some of the characteristics of the Egyptian cities and the constraints of transformation while reviewing the most important GIS applications of the transition to a smart city, as well as the mechanisms of transformation in some international successful models of smart cities.

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