INTERACTIVE TRANSPORTING AND ACCESSIBILITY PLANNING OF SPORTS EVENTS' CITIES IN EGYPT, PORT SAID CITY AS A MODEL

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ABSTRACT:

INTRODUCTION: Global sports events witness progress in their organization and in their public and tourist turnout for their host country and require developing its infrastructure. Due to the huge presence of athletes and public and tourist masses, transportation networks of sports cities face hard challenges of achieving the ease of accessibility within a short period of time during the opening and closing seasons of sports events.

OBJECTIVES: presenting a proposal for facilitating tourist and public arrivals to the sports, archaeological, and tourist sites, developing sports cities and transforming them to smart cities via interactive and electronic management of traffic.

METHODOLOGY: The study is analytic in its approach and has used the modeling of Network Analyst in the environment of GIS. The study is applied to Port Said city due to its small area that fits precisely with the objective of the study.

RESULTS: The study presented interactive modeling that enables electronic guidance for vehicles, interactive display of the map of street directions, traffic fluidity to reduce the rates of congestions, interactively limiting speeds on the highways, providing fans with queries regarding the accessibility to sports, archaeological, and tourist sites in addition to providing expeditions, facilitating and securing their movements inside Port Said city.

CONCLUSION: Implementing interactive transportation systems is considered an initiative that depends on digital and spatial management of sports events in light of the state's orientation towards digital transformation. With its results, the study draws the attention of officials to Port Said city so as to pay attention to the city's transportation systems to qualify her to be among the international smart cities, and hopefully, the scope of this study will include all sports cities.

Keywords: *Interactive transportation, Accessibility, Sports events cities, Port Said City.*

INTRODUCTION:

Sports events are regarded to be contemporary tourism and are multi-dimensional social and cultural phenomena that impose a huge economic and organizing effort the host cities endure (Gonz´alez, 2018); and it requires improving the infrastructure systems such as transportations, residency, sports facilities to enhance urban development of the hosting cities by developing their local economies and increasing their investments (Rafael, 2018). In addition, it has positive impacts on the image of the hosting country and on promoting tourism in it (José, 2019).

Global countries and cities compete to host these events and work in advance to develop their cities' attractiveness as a tourist destination and to enhance their cities' foreign affairs' image in order to reach the rank of "global cities" that set strategies for hosting mega-events (Chen & Liying, 2021).

A small city might have appropriate environmental conditions suitable for setting up sports events but has insufficient infrastructure to host them (Jinwoo, et al,. 2021). In such cases, the state might coerce to build all the necessary facilities in a new fashion. Hence, sports events are unique opportunities for transformation and restoration, especially in such cities (Mundina and Calabuig, 2011) where developing them could take years more than it requires while setting up sports events. Therefore, hosting sports mega-events is strong performance and a strategy for speeding up urban development of cities (José, 2019).

World Tourism Organization affirms that tourism and sports are really two powerful tools of increasing investments in infrastructure projects and represent complementary activities for the promotion and sustainable economic growth of tourist destinations (WTO, 2001). Sports and tourism researches indicate that the global tourism industry requires improving sports and tourist cities and transforming them into smart cities (Rubens and João, 2010).

Attending sports events is a significant recreational means of achieving mega incomes for sports events cities (John et al., 2010). Therefore, some studies deal with exploring and analyzing the various motivations of attending sports events among which the most important motivation is the ease of accessing sports and recreational locations of the hosting cities (Heather, et al., 2012).

Transportation systems are considered crucial to tourism development. Accessibility or the transportation infrastructure is one of the major factors that motivates and guides tourists (Weimin, 2020). Despite the essential roles the transport systems play in both urban tourism and in contributing to the tourist city's development and economy, urban destinations all over the world face numerous problems such as traffic bunching (Jurij, 2017) that make it difficult for tourists to fully enjoy what cities have to offer.

Therefore, city planners and researchers specializing in tourism and sports largely invest in smart and interactive transport systems, which represent a challenge in front of tourists in the urban destination, and is a crucial factor in the competitive capacity of the city as a tourist destination (Hu Dujuan, 2021). There exists an increasing conceptual awareness of smart tourism cities and of the concerned strategies for enhancing and improving the eco-friendly development trends especially in those cities that face problems affecting their capacity of attracting tourists (Mingjun, et al,. 2008).

CITIES OF MAJOR SPORTS EVENTS IN EGYPT:

Sports events have no longer become group gatherings but become a global industry that has its direct impact on urban renewal (Burbank et al, 2002),

tourism (Degen, 2004), and the international status (Ahlert, 2006) of the hosting states(∗).

Football is the first most popular game in Egypt, has its widest audience, and receives a great deal of attention from the boards of club directors and youth centers. Huge financial sums are allocated to prepare sports teams in order to compete in international and local tournaments. African Nations Cup is one of the largest sports tournaments in Africa and Egypt is one of the most African countries to host these tournaments. Hosting this sports event requires Egypt to set integrated strategies by the various bodies responsible for organizing such an event.

According to the Egyptian Football Confederation report about the proposed work plan among the ministries during the African Nations Championship 2019 in which numerous ministries and bodies have participated with assigned tasks, the Ministry of Tourism materially supported the Tournament Organizational Committee provided that the ministry should be one of the promoters and sponsors of the tournament externally and provides help in

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(∗)The 2006 World Cup Finals have made Germany gain more than five million global visitors, 18 million fans, $26 billion the total sum of TV broadcasting all over the world, an increase of $12.5 billion of its national economy (*Hall, 2006*). World Cup organizers estimated the economic returns of Russia's organization of World Cup in 2018 with around $31 billion in compared to expenditures of $11 billion. The general budget of expenses for organizing African Nations Cup in Egypt in 2019 is estimated at about $24 billion inclusive of $6.9 billion for residencies, $3.4 billion airline tickets, $3.6 for transportations, and $1 billion for emergency services (*Egyptian Football Confederation, 2019*).

establishing contracts of the organizing committee with the accommodation hotels for the official delegations. In addition, the Ministry of Aviation took care of promoting the championship on all the international flights and preparing the itineraries of the tournament guests in travel and arrival halls. Moreover, the Ministry of Foreign Affairs took care of granting entrance visas to official delegations. On the other hand, the governorates, in which the tournament took place, took the burden of qualifying their road networks and garnishing all the residence paths and the stadium perimeter in each governorate in addition to setting festive programs, ensuring the safety of public and private transportations of masses, and allocating areas for the masses of the participating countries (Egyptian Football Confederation, 2019). Major sports events took place just in four urban governorates: Cairo, Alexandria, Port Said, Suez, and Ismailia city in Ismailia governorate.

The sports events cities in Egypt include 512 sports facilities allocated between clubs and youth centers and represent 10% of the total sports facilities in the republic. These cities have a good road network whose total lengths reach around 45 thousand kilometers, 27.6% of the total road network of the whole republic, and these governorates have 55673 touring buses, 44.4% of the total touring buses in the republic. In these governorates, there are 357 tourist residential hotels well qualified to accommodate touring delegations, 35 museums, 57 public gardens, 44 archaeological areas, and three protected natural reserves. Therefore, these

governorates have the good infrastructure to host major sports events and are capable to satisfy the needs of touring and public

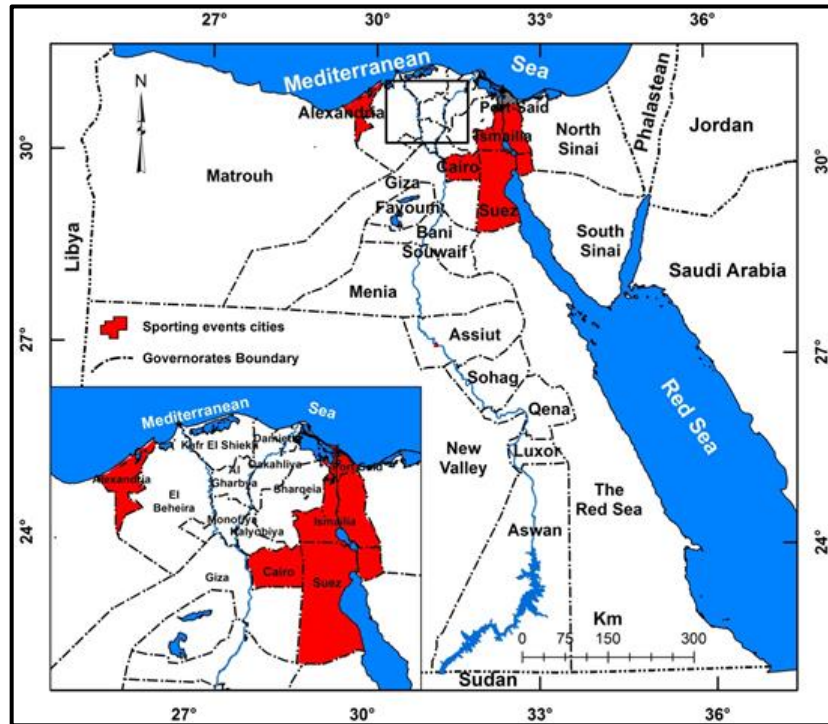delegations during the organization of sports events (CAPMS, 2019).

Figure (1) shows sports events cities in Egypt

THE STUDY AREA:

Port Said city is situated in the northern part of the Suez Canal and is located at the intersection points of the latitude (32°18') in the north and the longitude (31°16') in the east. Since Port Said was first initiated, her name is linked with the beginning of digging of the Suez Canal. The first population census of 1882 determined the population of Port Said and the Canal to be 21216 persons including the original residents, Arabs, and foreigners. In March 1883, khedive issued an ordinance of establishing Suez Canal governorate to include Port Said, Ismailia and Al-Kantara, and its capital is Ismailia. In August 1896, Port Said became the capital of the Canal governorate. Then it became an independent governorate in 1959. In the

population census of 2017 its population reaches 191423 persons.

Port Said governorate's area is 1345 Km sq. and represents 0.13 of the total area of the republic. The governorate includes a part of Lake Manzala, about 279 Km sq. which is 20% of the governorate's area. It extends about 96 km along the coast of the Mediterranean Sea and has common borders with other four governorates where it is bordered by Dakahlia Governorate to the west, Sharqia Governorate to the southwest, Ismailia to the south, and the governorate of North Sinai to the eastern north. The Suez Canal divides the governorate into two parts: the eastern part with about 41.7% of the total governorate's area and the western part with a 58.3 of the governorate's total area. Administratively,

the governorate includes eleven administrative districts: Al Sharq, Al Arab, Al Monakh, Al-Dawahi, Al- Zuhur, Al Manasrah, Firest Eganobe, Second Eganobe, Firest Port Fuad, Second Port Fuad, Edart surtet Port Said, and Mubarak "Sarrq el Tafariya" (CAPMS, 2017).
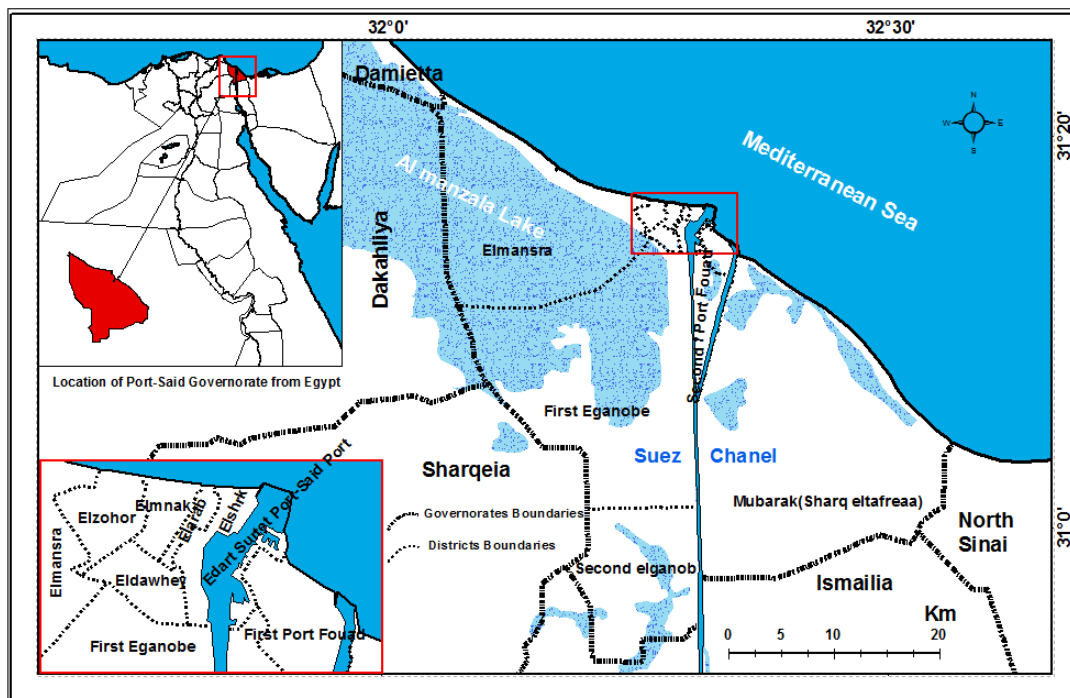

Figure (2) shows the administrative divisions of Port Said city

The study was first proposed and applied on Port Said city which is one of the Egyptian sports events cities and has geographic, environmental, and climatic advantages qualifies Port Said city to be among the most important attractive cities for hosting sports events. Regarding research and application aspects, Port Said city has a small area that enables us to create a database about its road network much easier than other major cities of wider land area.

PROBLEM OF THE STUDY:

In cities, urban transport issues are complicated and multidimensional that may change the model of urban planning from traveling by car to interactive planning for ensuring arrival and facilitating it. Ensuring the arrival of tournament participating athletes and their assistants in addition to touring and public masses by transport means in a small area within a short period of time is one of the hardest challenges that face transport services during the opening and closing seasons of international sports games and tournaments. Organizing major sports events requires highly efficient traffic management due to the presence of highly significant figures, officials, athletes, technicians, and fans from all over the world. Moreover, advance planning requires evaluating and analyzing the suitability and efficiency of traffic operating plans in different places as well as evaluating the various action plans of traffic management in light of the changing traffic volume and providing alternatives during the occurrence of problems or emergencies.

The research problem is set on questioning the ability of interactive transport and smart traffic systems to facilitate the accessibility of the various transport means to move during periods of organizing sports tournaments. From the main question arise other sub-questions:

1) What are the accessible components of the infrastructure of sports tourism in Port Said city and to what extent does its infrastructure qualify it to host major sports events?

2) How is it to facilitate tourists' and fans' movements from their residential areas to the sites of sports events in Port Said city?

3) How could geographic information systems organize and manage traffic during major sports events and matches?

4) How could sports events be exploited to promote tourism by facilitating and securing tourist access to touristic sites? Could spatial modeling play a potential role in choosing the would-be next city to host sports tournaments?

OBJECTIVES:

▪ Presenting a proposal of achieving easy access for public masses and tourist delegations to the sports, archaeological, and tourist sites in Port Said city during the organization of sports tournaments.

▪ Employing GIS technologies with its programs in traffic management and presenting a proposal for controlling traffic and setting a strategy for managing and regulating traffic during major sports tournaments.

▪ Defining and analyzing geographic, tourist, and sports sites of Port Said city that are easy to access by tourists and fans.

▪ Drawing the officials' attention to Port Said's distinctive location for the sake of developing the governorate and looking after its transport systems to transform the city into one of the global smart cities for hosting sports events and in order to reduce the burden loaded over the governorates of Cairo and Alexandria which are crowded with people.

LITERATURE REVIEW:

In its approach, the study is descriptive research, in which many scientific branches overlap where there are studies of urban geography, geography of sports tourism, urban tourism, and smart cities tourism, in addition to studies that deal with the geography of touristic transport and studies concerned with transport, traffic systems and the organization of sports events.

These studies are: Sports and Tourism (WTO, 2001), Tourist Movement Modeling (Lew and McKerche, 2006), Regulating Traffic during Beijing Olympics (Chunquan and Zhou, 2008), The Factors of Attending Major Sports Events: An Empirical Study (John, et al,. 2010), Sports Events Tourism on a Small Scale: A Case Study of Sustainable Tourism (Heather, et al., 2012), Mobility and Urban Transportation during Sports Events (Rubens and João, 2014), Wheelchair Users' Access to Sports Events (Lorena, 2014),

Affecting Factor on Tourists' use of Public Transport and on their Visited Touristic Destinations (Le-Klahn et al., 2015), Smart Tourism Concept (Li et al., 2017), Modeling Geographic Information Systems of Complicated Road Network and its Multimedia & Regulating its Traffic (Jurij, 2017), Modeling as a Safety Procedure Improvement on the Roads to Mass Events (Irina, et al, 2017), Transport Legacy from Major Events to Redistributing Accessibilities to Urban Destinations (Rafael, 2018), Interpreting Mixed Results of Hosting Major Sports Events for Tourism Promotion (José, 2019), Social Capital Cities for Touristic Running Sports Event (Jonas, et al,. 2019), Navigating through Complex Transportation System: A Guided Approach Recommended for City Tourism (Weimin, 2020), Tourism and Mobility Sustainable Development in Natural Protected Reserves (Alessandro and Mario, 2020), Urbanization Impact on Mega-Sports Events: PyeongChang Olympic Case (Jinwoo et al., 2021), Management of Sports Events (Antonio et al., 2021), Mobile Communication Technology for Sports Events in its Fifth Generation Era (Hu Dujuan, 2021), and Tourism Sports Integration in Smart City Based on G5 Network and the Internet of Things which is the latest up-to-date study relevant to our study.

METHODOLOGY:

In its methodology, the research relies on spatial analysis which includes three basic axes: location, Interaction, and region for the sake of analyzing the locations of Sports, archaeological, touristic facilities, and the accessibilities to these

facilities by analyzing road networks by using GIS which programming environments that pose certain questions to be answered:

- How long is the total distance the teams travel to throughout the season?
- What is the best traffic direction for the players and masses to arrive to the playgrounds?
- How could cars and bikes be regulated and how is road management controlled during the times of sports games match?
- How could a site be chosen for establishing sports facilities? Where are these sites located?

DISCUSSION AND RESULTS:

1 **Analyzing Road network reality in Port Said city.**

1.1 **Regional External Roads**:

Port Said city has a regional road network of 1234 km in length and represents 4.3% of the total length of the republic road network whose length is 28566 km (CAPMS, 2020; General Authority for Roads and Bridges, 2020). It extends to the east to link Port Said with Sinai through marine ferries controlled by Suez Canal Authority and extends to the west to link Port Said city with the northern governorates and Central Delta in addition to roads extending from north to the south that links the governorate with the other two Canal governorates: Ismailia and Suez Canal. The main regional roads in the governorate are:

- **Port Said-Ismailia-Cairo Road**

The road's length is 245 km and is one of the longest roads. It consists of two

lanes that link Port Said with the east of Cairo and the east of Delta as well as the other governorates of the republic. At the same time, the road is considered part of the international coastal road and branches off to other secondary roads such as Al-Salhia road, which extends to a length of 60 km, and it links Port Said and Ismailia with the east of the Delta starting from Abu Kabir - Sinbillawin - Mansoura and then Zagazig to reach the middle of the Delta to Tanta and Banha, and this road starts about 3 km north of Ismailia.

- **Port Said-Damietta Road:**

It is a transverse road that extends from the east to the west with a length of 70 km and was extending along the coastline in a zigzag course. It connects Port Said governorate to Damietta governorate and the north of Delta and also extends along the coastline that separates Lake Manzala in the south from the Mediterranean Sea in the north. The road passes through Lake Manzala in-between Al-Diba and Damietta, and this road is the lifeline for the tourist villages of Al-Jamil, Al-Jarba'a, Al-Manasra, Al-Diba and Shatta.

- **The International Northern Coastal Road:**

It connects Port Said city to all coastal governorates situated in the west of Port Said city. These governorates are Damietta, Dakahlia, Beheira, Kafr El-Sheikh, Alexandria, and Matrouh Governorate. The length of this road is 70 km within the governorate circumference to the north-west and then to the west to pass through Lake Manzala.

- **Port Said - Bahr El Baqar Road:**

Bahr El Baqar district is 37 kilometers afar the southwest of Port Said and is 21 kilometers afar Bahr El Kab. This road is perpendicular to Suez Canal at the area of EL-Kab south of Port Said. It is also perpendicular to Almueahada Road (Port Said – Ismailia).

1.2 Means of Sea, Air and Rail Transportation in Port Said city.

Port Said city is unique for it has two seaports. The first seaport is Port Said which is on Africa and the second seaport is the Eastern Port Said Seaport (Port Fouad). Port Said city is one of the public vital ports for tourism because of its unique location. Three new passengers' terminals have been established and a new modern building contains reception halls that provide different services to tourists. The fence of the touristic port have been upgraded and transformed into a path way for the passing of tourists along Palestine Road, about 720 meters long, in collaboration with Port Said city as a new urban restoration for the area. Besides Port Said there is Marina Port for yachts and ferries' lines used to connect Port Said with Port Fouad and the new shunt.

Regarding air transport in Port Said city, there is an airport in the west of the town along Port Said-Damietta road along the Mediterranean Sea. The airport has been planned to serve Canal Suez County in addition to the other neighboring counties located in Delta East and North of Sinai. The airport location qualifies it to be one of the international airports due to its proximity to the countries of the Mediterranean Sea.

Port Said city is linked to the national railway network by the Ismailia-Port Said railroad, 78 km long, which is considered to be complementary to Cairo-Ismailia railroad, 242 km long along the middle of the Delta (Banha and Tanta). In 1890, the Suez Canal Company has been granted the privilege of constructing a narrow railway, 80 km long, between Port Said and Ismailia to serve the company's facilities and to serve the ships that were supplied by the canal stations. The line was inaugurated on the 15th of January 1893 and the railway authority controlled the Ismailia-Port Said railway. In 1904, the authority replaced the narrow rails (78 km) with wide rails that helped connecting Port Said with Cairo/Ismailia/Suez line. This line further conncets other counties it passes through such as Ismailia, Sharkia, and Qalyubia Governorate.
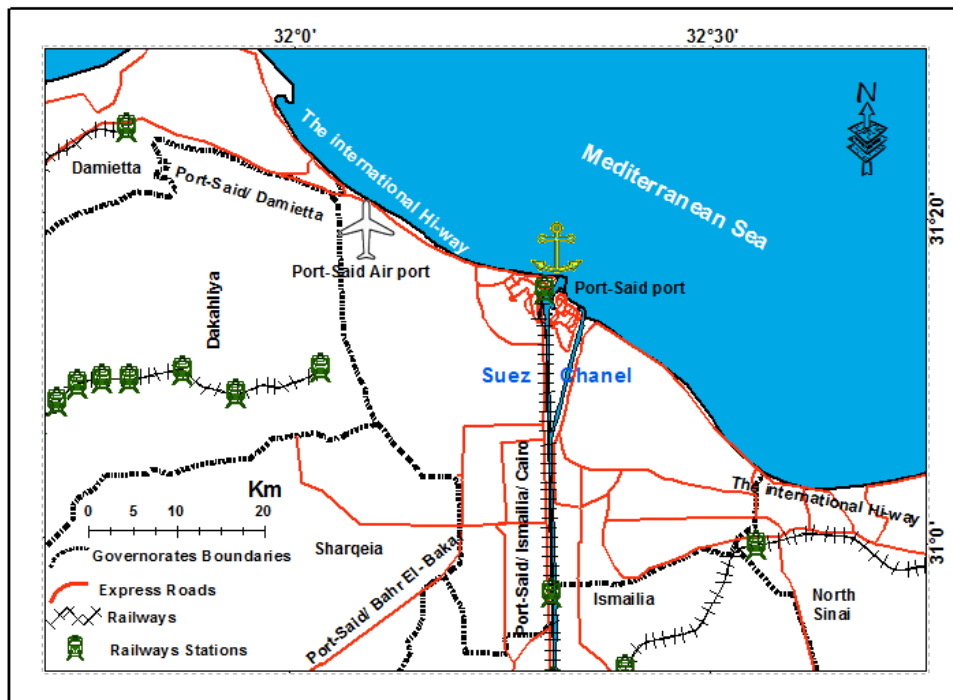
Figure (3) shows main transportations and regional roads in Port Said city

Port Said-Luxur line is the longest railway, 908 km long, a fourteen-hour flight. Port Said-Alexandria line is the second longest line, 355 km long, a six-hour flight, while Port Said-Cairo takes only four hour flight by train, 236 km long. Port Said-Alqantara, 46 km long, and Port Said-Ismailia, 78 km long, are the shortest rail lines.

1.3   Interior Roads Network

Port Said City has a local road network extending longitudinally from north to south and transversally from east to west. These roads have topographic characteristics that enable different type of vehicles to move on. The road's length reaches up to five kilometers and its width is between 10 to 14 meters. By examining Port Said's local road network, 95% of the asphalted roads whereas 5% are dirt roads.

- **Street Longitudinal Axes:**

Mohammed Ali Street is one of the longitudinal axes as it is the main entrance of the city starting from Al-Raswa Bridge to Al-Masala Square. The second axis is Azmi

Street starting from Al-Jomruk to Al-Nasr Bridge, and the third axis is trucks' road starts from Al-Jumrok to Uboor-el-Shahinat till it reaches to Abdulrahman Shukri Street.

▪ **Street Transverse Axes:**

Transverse axes are based on Suez Canal, the starting point is situated east of Port Said City and from which other longitudinal axes run to the west. The most important transverse axes are 23rd December Street which starts from the

seaport passengers' terminal along the Arab to cross Al-Masala Square and the Egyptian Club Stadium till it reaches Jumrok Jameel to the Damietta Road. This axis is the main and only gate of West Port Said and there are other sub transverse axes such as Tarah-el-Bahr Street that starts from the east of the Fishing Port to the Stadium, Ogeny Street, Al-Thalathiny Street; and it is significantly the main entrance to Port Fouad.
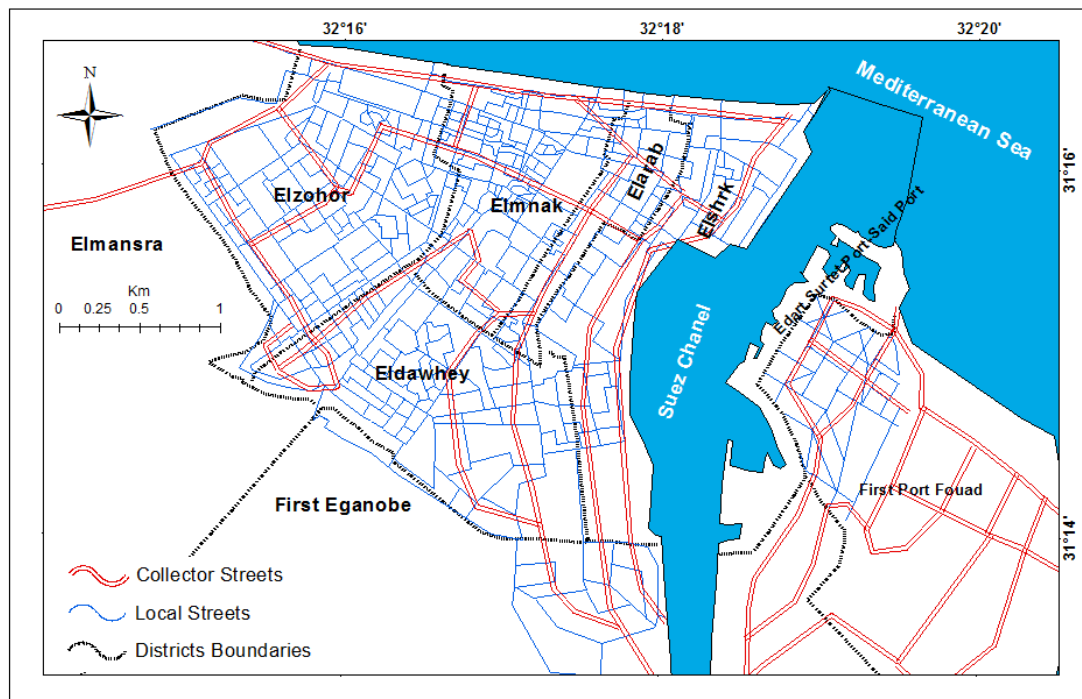
Figure (4) shows street network and its main axes inside Port Said city

2 Geographical Sites and Monuments that Require Ease of Accessibility to and fro.

2.1 Sports Events' Facilities in Port Said City:

In Port Said city, there are 43 sports facilities of which 22 are youth centers and 21 sports clubs. The clubs are distributed as follows: 5 clubs belong to the government sector, 7 clubs belong to the public and business sector and 9 clubs belong to the

private sector. These facilities have 73 playing grounds with terraces. The total number of the republic playgrounds is 1216. Therefore, Port Said is ranked fourth and comes after Cairo, Alexandria, and Giza respectively in terms of the number of stadiums with terraces. However, Port Said is ranked the second sports city in Egypt, after Cairo, in terms of the number of stadium chairs, 78000 chairs. (CAPMS, 2019).

There are a number of sports facilities in Port Said City, such as the Al-Masry Club Stadium, Al-Marikh Club, Ghazl Port Said Club, and indoor halls in Al-Zohour neighborhood, Port Fouad and Al-Dhwahi.

2.2 Tourist Sites and Monuments in Port Said City.

In Port Said city, there are a number of tourist sites such as Tell Al Farama in the southwest of Port Said, Bahr El-Bashtiel in Lake Manzala, Al Farama town which is 30 km east of Port Said city, and Belous city which was built by the Greek as suburban of Al-Farama town. There are many museums in the governorate such as the National Port Said Museum which is in a distinguished position on the meeting point of the Suez Canal with the Mediterranean Sea and was built in 1986, Nasser National Museum which contains artworks pertaining to the digging of Suez Canal, and the Military Museum which was built in 1964 and is in 26th July Street and contains war weapons. In addition, there is the statue of De Lesseps made of bronze and is located in the western barrier of the Suez Canal's entrance. In the city, there is also the old lighthouse as was called by the foreigners and was built in 1869. The new lighthouse has been built on the coast of the Mediterranean Sea to provide ships with guidance to Port Said seaport. And the Building of the Suez Canal, which is on the extension of Palestine Street, is one of the most beautifully well-designed tourist sightseeing monuments of the governorate and where tourists from all over the world come to visit.

In Port Said city, there are many tourist villages and recreational areas such as the tourist village of Al-Nawras, Al-Nawras floating boat and the suburban of Port Fouad which is characterized by its tranquility and natural beauty. In addition, there are areas for fishing and hunting birds in Lake Manzala and Port Fouad branch. There is also the famous Ashtoum Al-Gamil Reserve, located 7 km west of Port Said, and the Tanis Island Reserve, located 7 km to the southwest of Port Said within Lake Manzala. It includes the archaeological hill of Tanis, and there is the Port Said Tourist Park, which is located at the entrance to the Suez Canal.

The governorate has many beaches such as the beaches of the Arab Neighborhood which extends to the west from the sports stadium of Port Said for a distance of one kilometer, Al-Manakh neighborhood beach, and the beach of Port Fouad neighborhood. The most important tourist villages in the governorate are Marhaba village in Al Arab neighborhood, Al Ferdous village in Al Manakh neighborhood, Al Karawan village, Al Canary village, Al Nawras village, and Jannah Al Nawras village.
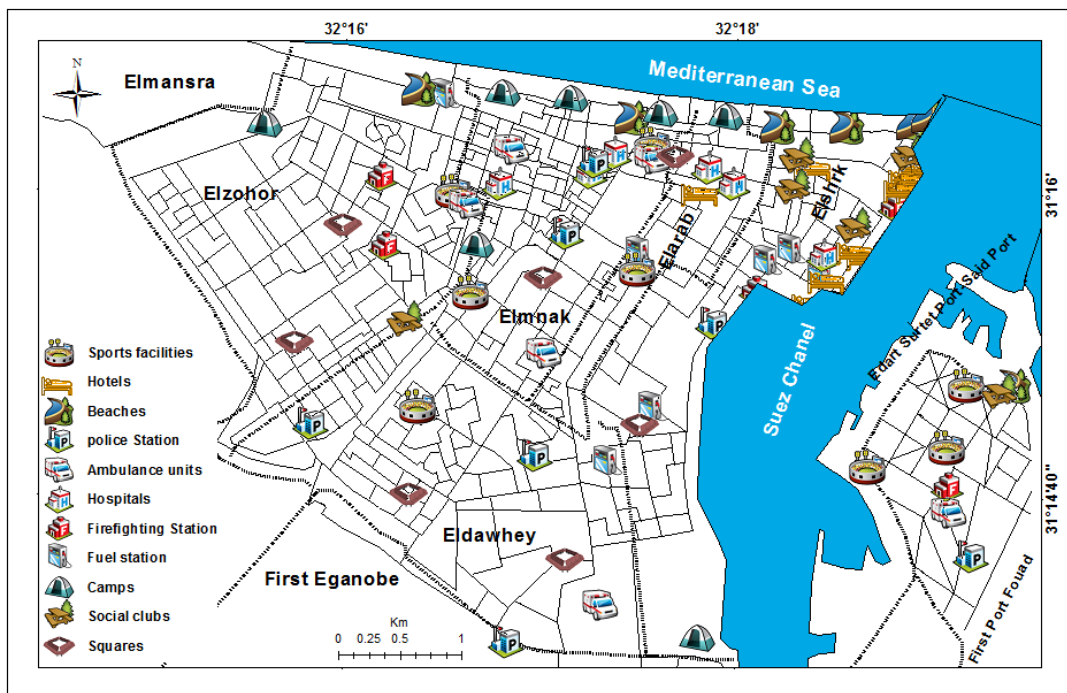
Figure (5) shows geographic sites and monuments that requires ease of accessibility to and from during sports events.

3 Analyzing Accessibility Map in Port Said City:

Accessibility is the key element in geography transport within the cities where the most efficient and developed transport systems provide high levels of accessibility. (Grégory, 2009) Accessibility between nodes is indicative of defining the geographical relationships within the region; has become essential in planning land use and making transportation decisions, and is considered an easy tool to guide planning decisions (Halden, 2005).

Accessing sport facilities means that the individual have been granted easy access to these sites and represents the relative chance of interactively and communicatively arriving at these facilities. Accessing sports facilities means that the individual has been granted easy access to these sites and represents the relative chance of interactively and communicatively arriving at these facilities.

The availability of granting easy access to sports facilities is one of the main factors of enabling people to actively and continuously arrive at athletic activities. It depends on numerous factors of which the most important factor is transportation system and traffic fluidity. The study achieved by (Samjhana, et al., 2009) dealt with the accessibility of sports facilities and its relationship with practicing sports on one hand, and on the other, with its relationship with public health. It has proved that easy access contributed to the continuity of practicing athletic activities and contributed to maintaining physical fitness and health. The study affirms that the hardship of accessing sports facilities has led to a reduction of physical activity that led to the deterioration of the health status of the population.

Quick Access to the city emergency services is very crucial because the security of sports facilities is the cornerstone of the

safety of practicing any athletic activity. The concerned authority for providing urgent emergency services is in continuous and deliberate search for new techniques and ways to develop the qualities of its services in addition to providing protection to its citizens. There is a need to concentrate on upgrading the level of rapid response and on continually making urgent changes in accordance with the needs of these facilities.

Arriving at an emergency site on the medically acceptable period is the main cornerstone that should be taken into consideration when planning emergency so that the medic help will arrive before the golden minutes (6 to 8 minutes), the period after which the neurons will die. There is a global unified standard of time response and is equal to six minutes in open areas and ten minutes in urban areas.

Officials of medic emergency service are concerned with providing the maximum

emergency services to the different areas. When the management system is notified, some ambulances become unavailable. The dynamic transfer of the available ambulances addresses the loss in coverage due to the busyness of the other ambulances. Therefore, reallocating and redistributing of ambulance points of services would reduce the burden and unnecessary fatigue upon the ambulance service management system.

Depending on the road network built for Port Said and by using network analysis in the programming environment of Arc GIS 10.5, accessibility maps were created using the time factor to and fro some sites and monuments that require eases of access during sports events. By spatially analyzing the map, the accessibility of the city neighborhoods could be described accordingly.

Figure (6) shows the accessibility of sports facilities in Port Said city according to the time factor.

Figure (7) shows the accessibility of hotels in Port Said city according to the time factor.

Figure (8) shows the accessibility of beaches and tourist villages in Port Said city according to the time factor

Figure (9) shows the accessibility of emergency services in Port Said according to the time factor

4   Modeling road network to reduce traffic congestions during Sports Events:

Sometimes the causes of traffic congestions are attributed to random factors such as accidents and emergencies. Systematic traffic congestion is characterized by periodic recurrence at certain times and in certain directions within the traffic network. Modern traffic control systems help in predicting and eliminating early failure in traffic as well as preventing the occurrence of congestions and traffic accidents.

Modern traffic management systems are characterized by their ability to access and process data in real-time via different means of communication and by using information technologies, sensors, and radars. Evaluating traffic flow by obtaining data may become the most important for such systems in addition to the rate of traffic flow, speed, density and length of the lines, and time consumed for traveling in traffic. All these are factors potent for monitoring the condition of transport in accordance with the current systems.

Modern Information and communication technology plays a significant role in creating sustainable transport systems that contribute to smooth traffic flow and in meeting the current needs of mobility and transportation. Geographic information systems contribute to the development and enhancement of road networks, thus facilitating the availability of ambulance services in different areas. The study provides certain proposals that can be applied in Port Said city and in all other major cities of the republic in case of the availability of potentialities. In order to achieve the plan, the following steps are to be followed.

Road networks, traffic density, rush hours are to be studied and analyzed in addition to creating an electronic database for them so as to overcome traffic congestion besides putting display screens on the entrances of the cities and connecting these screens to the internet to live-show road networks map of the cities so that the traffic fluidity and congestions are to be shown as well as showing the easies accessible road, not the shortest, throughout the day because shortest streets may be jammed in contrary to other roads of possible less traffic flow.

Display screens, which are to be put at the road entrances, are to show traffic on the roads and streets of the city. Roads and

streets have to be displayed in different colors according to their degrees of congestion. It is also possible to increase their efficiency by linking them to traffic signs inside the city in order to control traffic, improve its condition and reduce traffic congestion within the city.

Traffic management center could help raise the level of this project by making a study for determining specific lanes of traffic for public transport (services), taxies, and private cars, in addition to converting some streets to pedestrian-only streets, redistributing traffic signs, and changing waiting periods by either increasing or reducing them in the different areas according to necessity in order to reduce congestion and to facilitate traffic flow as well.

Besides traffic lights, specific parking stations inside the city should be allocated for public and mass transport in order to prevent repetitive stops everywhere in addition to controlling the exiting of these cars from their parking station and organizing their traffic which in turn helps reduce traffic congestion rates.

Inside Port Said there are stops, squares, and crossroads which are traffic congestion hotspots inside the city unless traffic control is to be imposed from the very beginning time the car leaves its spot.

From the above, it can be stated that it is a must to prevent transport trucks from passing in certain times and also to set specific traffic lanes for services taxies in addition to allocating specific parks for the waiting of services vehicles at the beginning and end of streets by putting traffic guiding signs to prevent repetitive stops in the streets where many traffic problems occur due to the unavailability of specific parking spots in number and area that covers the real needs of its residents.

For implementing the aforementioned in Port Said on the basis of correct scientific discipline, the traffic authorities have to oblige vehicle drivers to have GPS devices, to download a mobile application, or to have a special phone chip to help track the vehicle inside cities and crowded areas. The traffic should be auto-displayed on the electronic map shown on display screens so that every driver, who has not entered the city yet, could have prior knowledge of the conditions of the streets inside the city and determine his route according to a mental map to avoid entering into jammed areas. Traffic authorities should set a radical solution by controlling the electronic system by directing cars and determining inside and outside the city. Traffic authorities could also close or prevent automotive traffic in certain streets, change automotive traffic to other alternative roads in order to prevent the occurrence of traffic congestions and to achieve traffic fluidity.
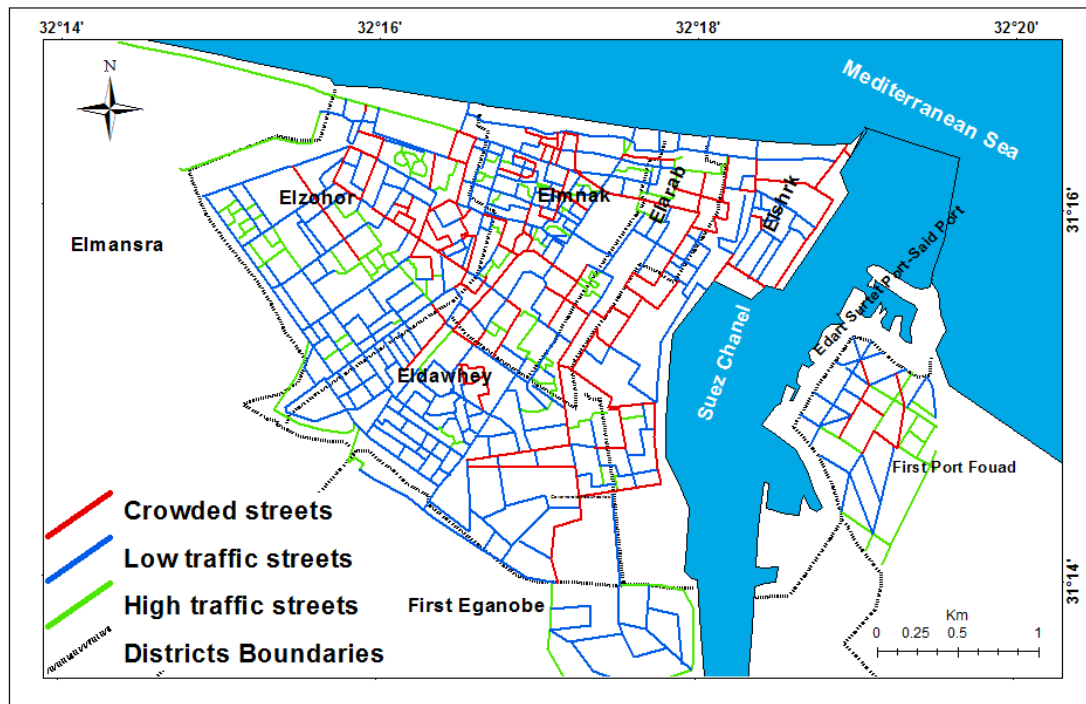
Figure (10) shows modeling a map of the city's traffic.

5   Modeling Highways for Reducing Accidents and Speed Control:

Traffic safety is the most important issue as well and identifying areas that suffer a reduction of traffic safety and needs preventive measures to be taken by the traffic officials and researchers by road analysis and by analyzing road dangers to reduce dangers and to take appropriate precautions prior to accidents' occurrence in addition to reducing loses.

The project is an attempt to present a proposal that seeks to prevent the occurrence of problematic issues of traffic safety and to reduce traffic accidents rates during the period of organizing sports events. This proposal has been applied to the governorate of Port Said and on its main roads and highways.

The work on this project begins with creating an electronic database for road networks in addition to determining traffic directions, density, the approximate time based on the speed schedule for using roads, flight-time, flight cost, etc.

Creating an electronic database helps road networks to overcome many problems in the shortest possible time due to the easiness of processing data in its digital format as well as obtaining results quickly in the form of maps and immediate reports. The system can be used to control road networks in the city and reduce traffic accidents or intercept accidents in a very short time if they occurred for the sake of reducing dangers.

In addition to the already built road networks, an electronic system is to be created to show (1) the coordinates of dangerous areas on the road, (2) artificial bumps, (3) curved roads, and (4) areas of traffic accidents and determining its coordinates by providing GIS coordinates for the location of accident in addition to linking the system to web network where a GIS web application is created to make the

best use of the electronic database already created by using Arc GIS, Server 10.1, or by using a mobile application that shows road networks and database to let the driver get certain warning signals that he is approaching these areas so as to prevent the occurrence of these accidents.

The system is concerned with the appropriate track positioning on the road networks where the point of start is defined, accessed, and has its entry on the system upon which the calculation of road length is based according to the linking of the starting and ending points of the road. Thereafter, the choice of the most appropriate route is chosen according to distance and time calculated and is thus drawn on the map which in turn helps in choosing proper paths for quick access to various areas and to accident locations in order to reduce human losses.

In case a traffic accident occurs, the system locates the nearest emergency center to the accident location as soon as the system is informed. It determines the shortest and quickest path of accessing that location and draws it on the map to facilitate tracking the location and to quickly provide necessary services. If it is a traffic accident, it determines its spot, searches for the nearest ambulance center from that spot, provides quick services to move to the defined spot and to the nearest hospital. It calculates the shortest path through which the ambulance passes in the shortest time to the accident location and to the nearest hospital by determining the approximate time taken from the speed schedule of the used roads to define the fastest time the ambulance reaches the accident location.

A website is to be created on the web by using Arc GIS Server 10.1 to make good use of the already created electronic database. Besides, there is a need to get the assistance of programming specialists in creating a mobile application that makes the electronic database available to drivers while driving.

Traffic authorities could use the electronic database for road management and for concluding the final results of road analysis such as setting warnings on traffic bumps and dangerous areas as well as setting light signals indicating specific speed-limit traffic lanes and putting warnings on the road. Regarding the organization of major sports events, it is possible to initiate special companies for transferring athletes and public masses from one position to the various locations of stadiums provided that these companies should adhere to follow traffic safety instructions, track their transport vehicles, provides warnings, and exchange reports between its headquarter and their drivers according to the traffic system.

Besides the number of accidents which is considered to be one of the indicators of road risks, the second important indicator of road risks is speed. Interest in speed control has started since the spread of automotive vehicles in the fifties and has increased with the increase of vehicles numbers and use in addition to the occurrence of automotive incidents that becomes the concern of everyone alike. Studies have proved that the main reason behind traffic accidents is over speed.

Traditional means of restraining drivers from over speeding their vehicles proved to be useless.

It is proved that any increase of speed corresponds to an increase of the collision, especially, on the bodies of the pedestrians. A series of tests have been carried out to measure the impact of speed on the different categories of accidents. It is possible to analogize the collision of the bodies of the passengers, who mounted a car, with the body of the car to the collision force of the falling bodies from above four stories of a building to the earth. Therefore, passengers' attempts to avoid collision are desperate. Exceeding the speed limit set for roads is considered an unsafe procedure. Because traffic safety procedures designed for roads are the safest procedures within the scale of the allowed speed. Therefore, choosing a speed to be written on traffic road boards is less than the designed speed to give the vehicles, which exceed the speed limit, a chance to bypass other vehicles though this chance is limited and may be risky.

In the light of the aforementioned, a spatial road networks' database could be created for Port Said City inclusive of speed limiting for every part of the road according to its type whether it is a highway or a sub-road or other, calculating the time to pass through the road, choosing the best route to pass through according to distance and time between two points, and may give a signal to exceed the speed limit or determine speed limit for every part of the road in order to reduce traffic accidents.
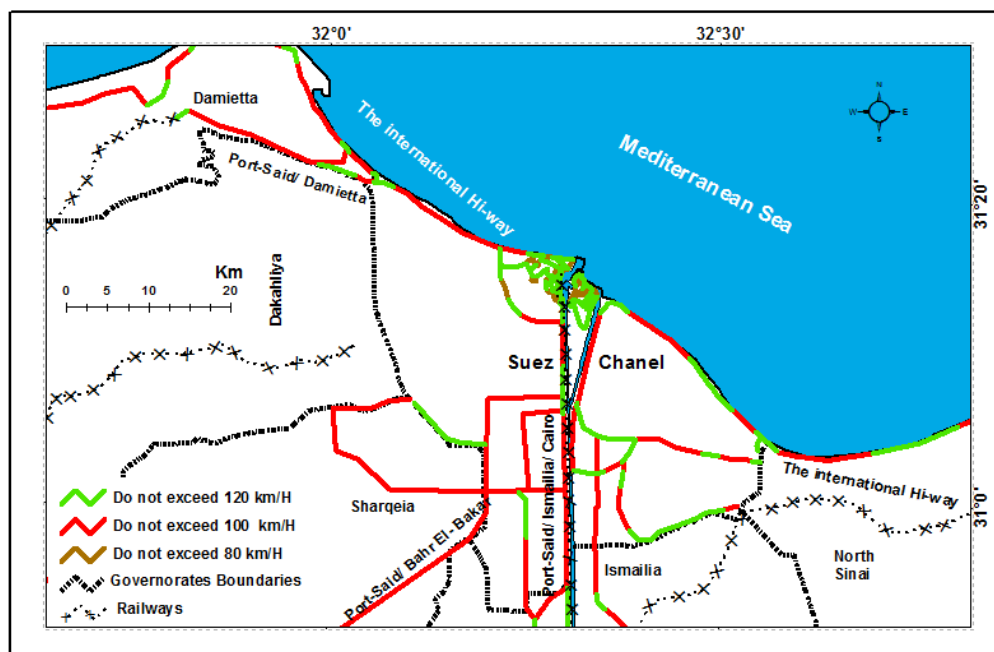
Figure (11) shows modeling a map of adjusting speed limits on the main roads.

6 Inquiries and Spatial Management of Road Networks during Sports Events.

The organization of tourists' expedition and movement is one of the challenges that face tourists during the organization of sports events inside their destination cities (Albalate & Bel, 2010). Duration of stay, expedition budget, and the available means of transportation are the

main determinants of decision-making for selecting the sites to be visited from their residential areas (Lew and McKerche, 2006, Nishio et al., 2016). The touristic features of the city and the trip affect the choice of transport means that led to various time and spatial tourist movements. These factors could also have an impact on planning the decisions of transportations in the city (Le-Klahn et al., 2015), therefore, using modern techniques in the field of transportations inside the cities largely enhances the tourist experience of attendance and enhances the cities as tourist destination selection (Li et al., 2017).

Intelligent transportation system contributes greatly to the increase of the efficiency of transport networks, ensure sustainable development within the field of transportation, and reduce the negative effect of the transportation complex on the environment. It also reduces energy consumption. I.T.S. is a tool for planning transportation and can be applied for implementing inspection on traffic problems (Chen and Liying, 2021). It helps reduce traffic congestions and set secure plans for trips in addition to assessing the environmental emissions and pollution (Pavel et al., 2017). ITS also assist in creating applications and systems for traffic management as well as enhancing traffic flow and contingency plans to address peak congestion (Irina et al., 2017), and also reduces the driver's workload, which prevents his fatigue, and reduces accidents' rates which in turn ensures traffic safety (Jurij, 2017). It could provide drivers with information about road conditions in terms of selecting a better route, and help saving

fuel and avoiding delays as well as providing key information identification and planning in road infrastructure (Alexandr et al., 2017).

Accordingly, tendencies to manage current traffic systems have increased instead of building new transportation facilities as traffic systems management is lower in cost than building new transportation facilities which may be restrained by space and financial resources (Irina et al., 2017). Based on the research context that aims to present a proposal of proper traffic control and setting a strategy for properly managing and controlling traffic during the organization of major sports events. By analyzing road networks and their findings it is possible to use road networks to achieve the following goals:

▪ **Defining the shortest path to the site of sports facilities (Short route):**

Network analyst achieves many functions of which the most important is finding the path that connects between two or more locations. The vehicle driver usually wants to take the shortest or the best way but the best way may means different things on different times. It may be the quickest, the shortest, or the most garnished. By using GIS the shortest path between two points could be defined.

Network Analyst defines the shortest path between two points from the Network Analyst toolbar by choosing the command New Route, and by defining the two points, then, choose the command Solve upon which Route Analysis Layer is created. Route Analysis Layer is a compound layer in which all the data of the path are stored. The analysis is useful in setting a future

vision of routes' change to accord with the current traffic conditions in each region.

The Network Analyst defines the route that connects two or more locations. It is known that a vehicle driver wants to take the shortest or the best way. The program provides a detailed description of the path through the Direction Window which enables the user to follow the directions to reach to his destination.

The chosen path between two different locations may have an obstacle, a traffic accident, or another problem that prevents passing through, therefore, the Network Analyst provides solutions to such problems. By entering the data of the locations of obstacles, these locations will be avoided and the road will not be chosen as the best path that links between two points.

- **Services area in the sports facility (Service Area).**

  Network Analyst App could define services area in any site of the sports facilities on the road networks. The serviced area will be part of the territory that includes all the available roads within a limited distance or time defined by the user. It is useful in defining the territorial area of accessible roads to the services area within a specific time or distance. When defining the territory it may be possible that the program will show the territory's area and population as well. It is possible to make

good use of it in defining the facilities that provide emergency services in the area.

Network Analyst program could spot the location of services by using the Network Analyst toolbar's submenu (New Service Area) and then the user defines two points and after that the user presses the command Solve to let the program creates Service Area Analysis Layer which is a composite layer of all stored services data, the scope of services, barricades, and locations. The application is also used to define the territory's authority around the sports facilities. It also contributes to determining services area spots and solving transport issues such as the ability to access a place in the fastest time and at the lowest cost.

- **Closest Spots to Sports Facilities (Closest Facility).**

  The Network Analyst defines the nearest services spot from Network Analyst toolbar by choosing the command New Closest Facility, then defining two points and pressing the command Solve to create the Closest Facility Analysis Layer which includes the stored data of the sports facilities in the city, the routes that have been taken to access services areas. Figure (12) shows the findings of road networks analysis in Port Said and how to make good use it in developing spatial management of the sports facilities.
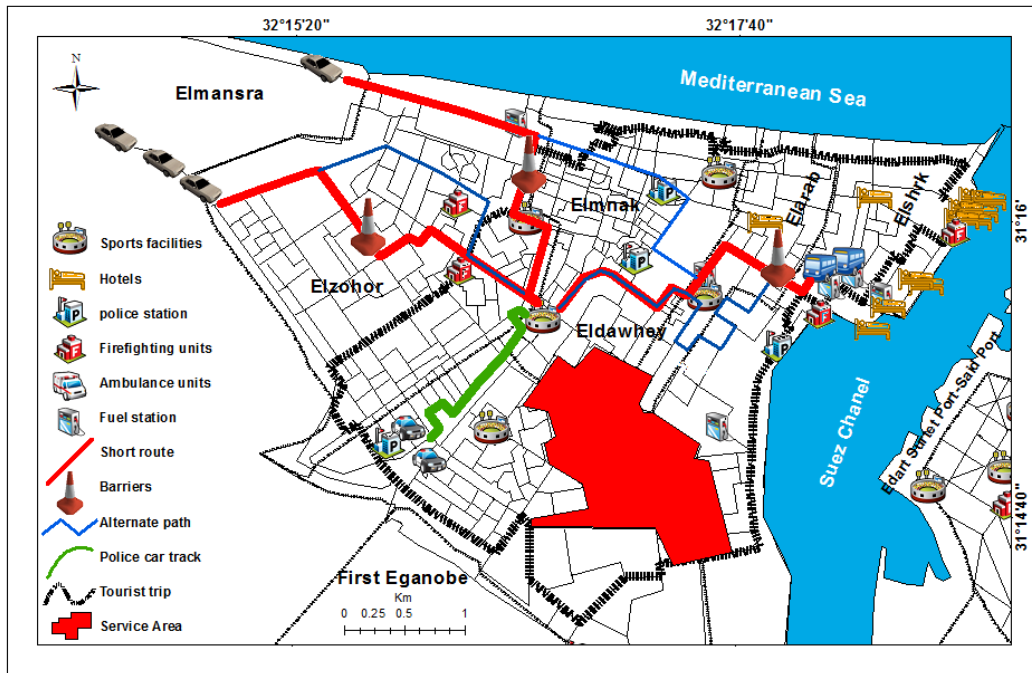
Figure (12) shows the findings of road analysis in Port Said city

7   Creating   an   Application   for Interactive Transportation Map on the Web

After both building road networks and locating the facilities and monuments that require accessing during sports events in Port Said, it is possible to use the program Arc GIS Server 10.5 to create a GIS web application to provide an accessible electronic database provide by the spatial management of the transportation system of Port Said.
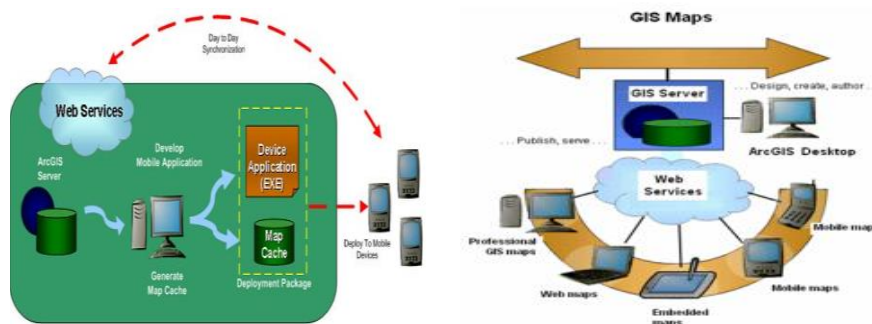
Source: Arc GIS Desktop Help.

Figure (13) shows stages of creating the websites on the web network
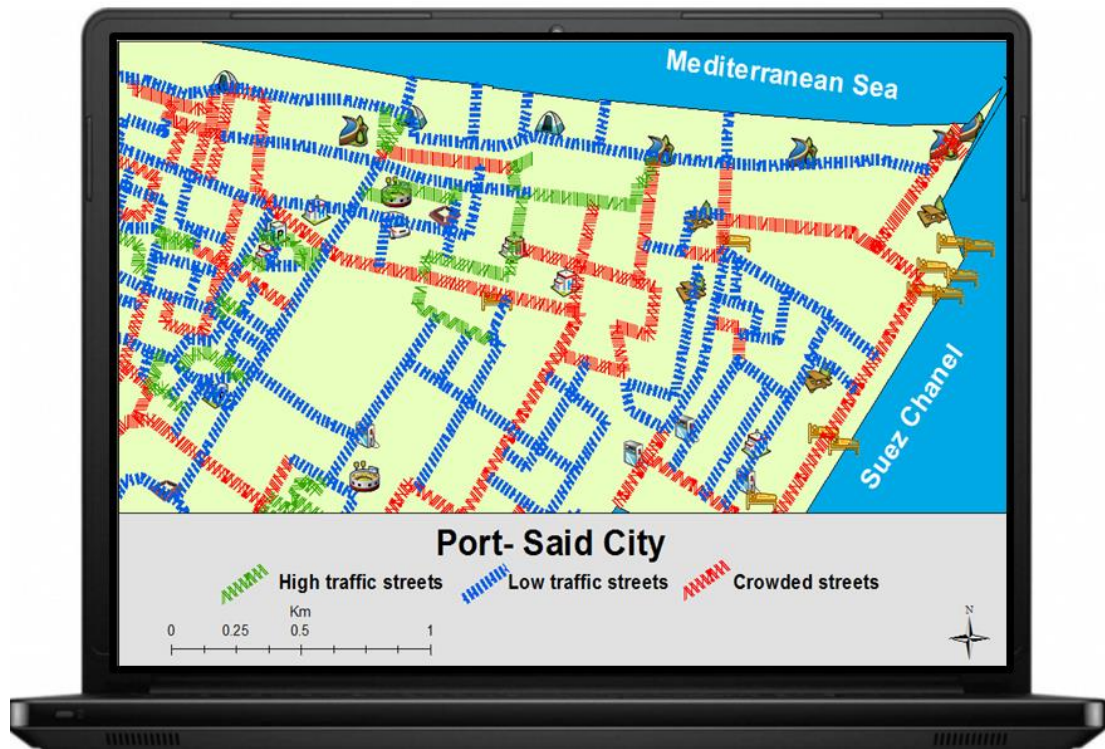
Figure (14) shows the interactive map of street networks management during sports events in Port Said city.

8   Procedures   for   implementing Interactive transport system in Port Said city.

- **Traffic authorities should create an electronic database for road networks of the city, create an electronic system to achieve proper management of road networks, analyze and plan methods of overcoming problems, and reduce the negative findings of traffic congestions and accidents.**

- **Traffic authorities should raise the traffic awareness of vehicles' drivers and urge them to possess tracking devices permitted by the traffic authorities and contain chips connected to the electronic traffic system of road management, or urges vehicles' driver to download a mobile app permitted by both the ministry of interior and traffic authorities. The app should be linked with the electronic system of the web.**

- **Making good use of the electronic system of the road networks in a precise way by precisely tracking automotive movement on the road networks so as to conduct studies that help manage these efforts, propose solutions in times of crisis, and provide radical solutions for traffic congestions and accidents.**

- **Placing display screen on the entrances of the city and on their main squares to show the city map, state of the roads, automotive traffic of the cars that use tracking devices or mobile app, the direct monitoring of congested roads and controlling the traffic flow inside the cities.**

- **Placing display screens and traffic lights on highways on different**

elevations and also on long bridges so that these could be seen from a long distance and could be used to alert drivers about the traffic conditions which in turn could help them be cautious and reduce speed or avoid congestions.

- By implementing the aforementioned proposals and recommendations it is possible to cope with the technical development by enhancing the traffic system to electronically auto record traffic violations and to create an electronic database for speeds, areas where vehicles are not allowed to stop on, opposite directions, and any other item defined by the traffic systems in addition to defining the code of the violating car and issuing it a traffic violation ticket by using the electronic chips authorized by the ministry of the interior. It is also possible to immediately inform drivers of their committed traffic violations by sending them an SMS message including the time of recording the violation and the amount of fine to be paid.

- Establishing electronic operational room for exchanging information between roads and management center, between electronic management room and the traffic lights on the streets, and between the electronic operation room and vehicles. This electronic operation room could also control traffic lights inside the city.

- The project could be upgraded from another perspective to support traffic awareness campaigns via radio while drivers are driving their cars, or via the displayed screens on the streets for the pedestrians. This project can also be supported by some businesses such as paid advertisements and could deliver important news to drivers whenever possible.

- In cooperation with the Ministry of Transport, the traffic authorities should establish a governmental or non-governmental company (government/private sector) for creating an electronic system and for providing the electronic devices. In addition, the traffic authorities should seek the assistance of the expert in the fields of traffic management, road engineering, urban planning, and should also seek the assistance of the investors who invest in the project in return for a percentage of the profit obtained from the operation of the commercial project.

Conclusion and Recommendations

The study presents a proposal for organizing transport and for the proper control of traffic in addition to setting a strategy for managing and regulating traffic during the period of organizing major sports events. The proposal is set and applied for Port Said city, and it concludes with creating an electronic management system to control all the pillars of transportation in the cities that hosts sports events.

The study affirms the role of geography and GIS in improving the administrative aspects of sports facilities by analyzing road networks and by spotting the shortest accessible way to the sites of sports events, setting services areas of the

sports facilities, and its nearest location from the facility itself.

On the basis of the above mentioned, the study recommends the following

- Creating a geographical database for road networks that lead to the different locations of stadiums and applying smart transport systems to reduce the rate of traffic congestions and traffic accidents in these areas by electronically managing road networks and streets in those areas.

- Creating a geographic database for tourist and archaeological areas and for natural protected reserves in Egypt and showing them on the mobile app during the period of organizing sports events in addition to showing and organizing tourist programs and trips.

- Analyzing variables of fans' accessibility to the various sports facilities, especially sports stadiums, during the different times of sports matches and spotting the best accessible routes that lead to the sports facilities.

- Analyzing the intensity of practicing athletic activities and the role of electronic guidance in regulating sports matches in Egypt in specific stadiums and for specific matches.

- Building geographic model and using GIS in picking up the best city for the sports teams to be located in addition to analyzing the total distance travelled by the sports teams during the season or during the period of sports tournament in order to achieve justice and satisfaction for the different teams during their sports expeditions.

- Creating spatial models on GIS programs by entering planning standards and rates and drawing out their findings to evaluate the recent sites of sports facilities in order to specify the best location for building new sports facilities in Egypt.

- Creating and implementing a mobile application during the organization of the events to provide different services and queries for foreign fans by establishing an operations room affiliated to the Ministry of Youth and Sports, or by creating a geographic database for sports activities in Egypt that seek to answer all fans' queries about the way to access the various stadiums, the schedules of matches and their results, and to answer other queries regarding tourist places and the prospects of showing tourist trips in Egypt.

- A specific code should be made available for every fan and should be linked to the fans' databases in order to trace their spots and facilitate ease of access to provide them with different services during sports events. The code may be made available to all the Egyptian and foreign fans to spot their locations and to organize their entering and exiting to and from the different stadiums.

- Making good use of GIS in analyzing the area where the delegations travel to, making the cartographical representation or diagrams for it, and examining its geographical dimensions, and in the end, creating a database about the fans' journey and the areas

they visited during the different sports events.

- Incorporating new specialized companies for transporting athletes and masses from specific locations to the locations of the different stadiums. These companies should adhere to follow traffic safety procedures, track their transportation means, set warnings, and exchange reports between these companies and their vehicles' drivers in accordance with the traffic regulations such as speed limits of every type of road whether the road is a highway, or a sub road, etc., the length of the road for calculating the time the vehicle takes to pass through, and choosing the most proper route the vehicle could pass through in the shortest time between two points. It is possible to provide a signal for allowing exceed speed limit or specify different speed limits for every part of the road in order to reduce traffic accidents.

- The study urges the concerned authorities to begin implementing the "National Digital Atlas of Egypt" to achieve the above mentioned recommendation for the sake of upgrading the sports system.

- The organization of sports events and festivals could encourage attracting lots of local and foreign tourists to visit the governorate in addition it could fill the shortcomings of sports tourism programs to include all sports activities and overcome the obstacles of sports tourism.

- It is recommended to start implementing initiatives based on technology and on digital and spatial management of tourism and sports events to upgrade the development of tourism in Port Said city. These initiatives, which were applied by global tourist cities, are: smart tourist, smart destination, Tourist Street, smart sports city, interactive traffic, green road, ease of access, historic market, electronic tour.

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النقل التفاعلي وتخطيط إمكانية الوصول في مدن الأحداث الرياضية
في مصر، مدينة بورسعيد إنموذجاً

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ملخص البحث:

مقدمة: تشهد الأحداث الرياضية العالمية تقدماً في تنظيمها وإقبالاً جماهيرياً وسياحياً على البلاد المضيفة لها، وتتطلب تطويرا لبنية التحتية بها، ونظراً لما تتمتع به من حضور كبير للرياضيين والكتل الجماهيرية والسياحية تواجه شبكات النقل تحدياً صعباً يتمثل في تحقيق سهولة الوصول في فترة زمنية قصيرة خلال مواسم الافتتاح والختام للأحداث الرياضية.

أهداف الدراسة: تقديم مقترح لتسهيل حركة الوفود السياحية والجماهيرية إلى المواقع الرياضية والأثرية والسياحية وتطوير المدن الرياضية وتحولها إلى مدن ذكية بإدارة وتنظيم مروري إلكتروني تفاعلي.

منهجية الدراسة: انتهجت الدراسة المنهج التحليلي وإستعانت بنمذجة محلل الشبكات في بيئة نظم المعلومات الجغرافية، وقد تم تطبيق هذه الدراسة علي مدينة بورسعيد لصغر مساحتها مما يساعد في دقة النمذجة وتطبيق هدف الدراسة.

النتائج: قدمت الدراسة نمذجة تفاعلية تمكن من التوجيه الإلكتروني للمركبات، والعرض التفاعلي لخريطة إتجاهات الشوارع، والسيولة المرورية لخفض معدلات الاختناقات، وضبط السرعات على الطرق الرئيسية والتفاعل معها، وتقديم الاستفسارات للمشجعين لإمكانية الوصول إلى المواقع الرياضية والسياحية والأثرية وعرض الرحلات وتسهيل وتأمين التحركات داخل مدينة بورسعيد.

الخلاصة: يعد تنفيذ أنظمة النقل التفاعلية بمثابة مبادرة معتمدة على الإدارة الرقمية والمكانية للحدث الرياضي في ظل توجه الدولة نحو التحول الرقمي وتوجه الدراسة بنتائجها أنظار المسئولين إلى مدينة بورسعيد للاهتمام بأنظمة النقل بها لكي تصبح من المدن الذكية العالمية، وتأمل الدراسة أن يتم توسيع نطاقها لتشمل كل المدن الرياضية.

الكلمات المفتاحية: النقل التفاعلي، إمكانية الوصول، مدن الأحداث الرياضية، مدينة بورسعيد.