

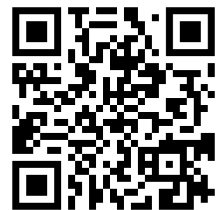
Analysis and Improvement of Geographic Information Systems for Problem Solving and Decision Making

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Abstract The complexity of our way of life has increased due to the numerous parts of life developing quickly, which results in ongoing issues. To address these issues and respond to these rapid changes in the environment, solutions that were practical, quick, and easy to implement were needed. The use of geographic information tools, a contemporary innovation, allows for the implementation of difficult issues by enhancing users' abilities to comprehend problems thoroughly through the analysis of spatial data and the creation of digital maps. This allows decision-makers to save time, effort, and money by making informed choices that will result in the best possible solution to the issue at hand. In addition to a significant urban expansion, an increase in the number of people using vehicles, and a significant emigration of people from rural and small towns, the traffic jams that have recently engulfed much of the world, particularly in the major capitals and cities, are a result of these factors for transportation, have contributed to a complex problem in modern times. The goal of this study is to examine proposed elements and gauge their impact on the issue of traffic bottlenecks. It then suggests both long- and short-term remedies for this issue based on the study's findings, which are generally not found in the pertinent departments. In order to create a unique surface for these components and provide a comprehensive picture of the research region, it also makes satellite photos of the area available. geographical database for each of them, evaluate each layer's influence on the traffic jam independently by analyzing it, and then merge these levels to create full map that shows their location and the extent to which they affect the study problems. This process was done in order to arrive at the aforementioned solution.



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1. INTRODUCTION

Traffic congestion is a big issue that needs to be addressed on a global scale. Common decision support tools include route planning and guide systems, especially when GIS is used. Vehicular traffic flow, which is defined as the number of vehicles crossing a particular place along a road within unit of time, is one of the most popular measuring tasks in the road network. Commonly used to gauge traffic flows is the Annual Average Daily Traffic (AADT). For as well as for the distribution of highways, different transport planning, design, operation, and maintenance responsibilities funding, AADT is crucial data.

In recent decades, a variety of techniques for detecting the AADT have been developed, including as well as for the distribution of highways, different transport planning, design, operation, and maintenance responsibilities. However, as this paper will argue, it is preferable and more practical to prevent traffic congestion than to find a solution to it.

Baghdad, the capital of the Republic of Iraq, is the second-largest metropolis in the Arab world with a population around seven million and a land area of 4,555 km². As illustrated in Figure 1, Baghdad is divided into 97 districts by 14 municipalities.



Figure 1. Baghdad Districts.

Al Karadah, which is referred to as a major city in Baghdad and contains many industrial buildings, 70% the Governmental agencies, commercial zones, the University of Baghdad, "the biggest University in Iraq," the green zone, and enormous apartment properties, all contributed to the creation of a significant traffic issue in this p the University of Baghdad, "the biggest University in Iraq," the commercial zones, the green zone, articular area. According to estimates from the 2010

census, Al Karadah has 279,311 residents living in 8 districts across 49 Km2. according to Figure 2. Al Historically, Karadah was an agricultural town region, particularly during the reign of Othman. However, after Iraq gained its independence and beginning in the middle of the 20th century, this region experienced surprising urban expansion compared to other regions in Iraq.



Figure 2. Displays aerial photos of Al Karadah City

2. STATEMENT OF PROBLEM.

Results for the Al Karadah district have been created using GIS technology and national studies. significant, congested, central is home to numerous governmental organizations, academic institutions, private sector businesses, the green zone and numerous more noteworthy attractions. Al Karadah also presents a significant challenge to the Iraqi government in terms of reducing traffic on it due to the absence of infrastructure and roads.

3. THIS ESSAY EXPLORES

the root reasons of traffic congestion in Al Karadah in depth and suggests remedies. This issue has a wide range of detrimental repercussions on several areas. The purpose of this research is to investigate the causes of the traffic jams Al Karadah and offer both immediate and long-term solutions utilizing cutting-edge technology, such as GIS and its related sciences.

4. SCIENTIFIC METHODOLOGY.

- The following constitutes the practical approach that will be used in the paper's recommended methodology:
- Evaluating each element in each category separately and evaluating its impact using GIS technology.
- Aggregate the analysis results for all factors in a category to create overlay analyses for each of the "factors" in each layer.
- A comprehensive study of all categories to produce a final picture of the causes of the traffic bottleneck.
- Based on the conclusions of the analysis of all the specified layers' "factors," a set of solutions will be presented and divided into two categories, strategic and tactical solutions. The layers "factors" that have less of an impact on the traffic jam in Al Karadah city will be addressed by tactical solutions, while the layers "factors" that have more of an impact will be addressed by strategic solutions biggest impact it.

5. PROPOSED DATA ANALYSIS WORKFLOW.

These days, GIS technology is regarded as the foundational technology that offers tools that support, aid, and help small- and medium-sized enterprises (SMEs) in their daily planning, decision-making, and analytic activities. A supplementary tool, the GIS can be used to store graphic characteristics, Data attributes and related patterns over time and space are shown.

GIS software will be utilized to use and evaluate several layers of geographical data, and each layer will "represent a reason for producing traffic jams" according to linked

classifications such street network structure, landmark distribution, and additional layer for statistical data.

The following tools are used in this project:

- ArcGIS Desktop, a piece of ESRI software that is regarded as one of the top GIS application providers globally.
- Images from the GeoEye satellite, 50 cm.
- Statistics from the last Iraqi National programs that are relevant to the work's scope.

6. THE IMPLEMENTATION.

This section goes through every step of the process in detail, starting with: a. Data collecting and gathering.

- The construction and conversion of layers.
- Developing a geodatabase.
- A fundamental layers analysis.
- A general evaluation.

We examined the data after gathering information for each factor (street network data, landmark data, and statistical data). The process of evaluating, data cleansing, manipulation, and modeling to highlight pertinent facts, draw conclusions, and support decision-making.

7. RESULTS.

This section will present a comprehensive analysis that seeks to balance the effects of the components combined and create a map that best represents the analysis's best traffic jam condition, which will then be compared to the actual situation. The analysis methods described in the preceding section were all created to assess each factor's individual impact on traffic congestion. factor. Analysis provides decision-makers with a rational, scientific, and technological description of the traffic jam situation in order to improve comprehension and future planning decisions.

The following layers need to be examined: the governmental; industrial; street network; bridges; junctions and circles, road obstacles; healthcare; entertainment; educational; and religious landmarks.

Using a providing a range that utilizes scale values and targets many layers were saved as a result of the single factor analysis portion will be used to conduct this overall study. All elements were given 10% impact in this overall analysis, which resulted in a map that can differ from if the effect level is altered, other maps. The layer

developed for the overall analysis is displayed in Figure 3.

Due to the influence values, the total study produced complicated map with moderate to heavy traffic congestion. As a result, this can be a tool to assess each factor's amount of influence. The data as a whole suggests that there is actually a serious issue with traffic bottlenecks. The following are some notes regarding the data, analysis, and results:

- a) Ta. The street network only contains a few major thoroughfares, which is what causes the area's congestion to concentrate on these routes because they are thought of as the area's backbone.
- b) Traffic congestion will become greater and more frequent due to the city's strategic location, particularly its proximity to the green zone, the presence of several government offices, its high

population, and other factors that make it a target for terrorist attacks.

- c) The breakdown of commercial websites quite poor because the majority them centered around just two streets, which adds to the already heavy traffic on those streets and in the city center.
- d) Because of the arbitrary and unplanned distribution of government, healthcare, and entertainment facilities, the facility is not distributed evenly. Additionally, the road that connects the two banks of the Tigris is the same one that goes to the university, which results in a complex traffic snarl in the university area. therefore, majority of traffic will pass through it.
- e) Since buses and other transportation providers occupy the majority of the street's lanes, there is a lot of traffic around the campus because of the bus station bottlenecks.

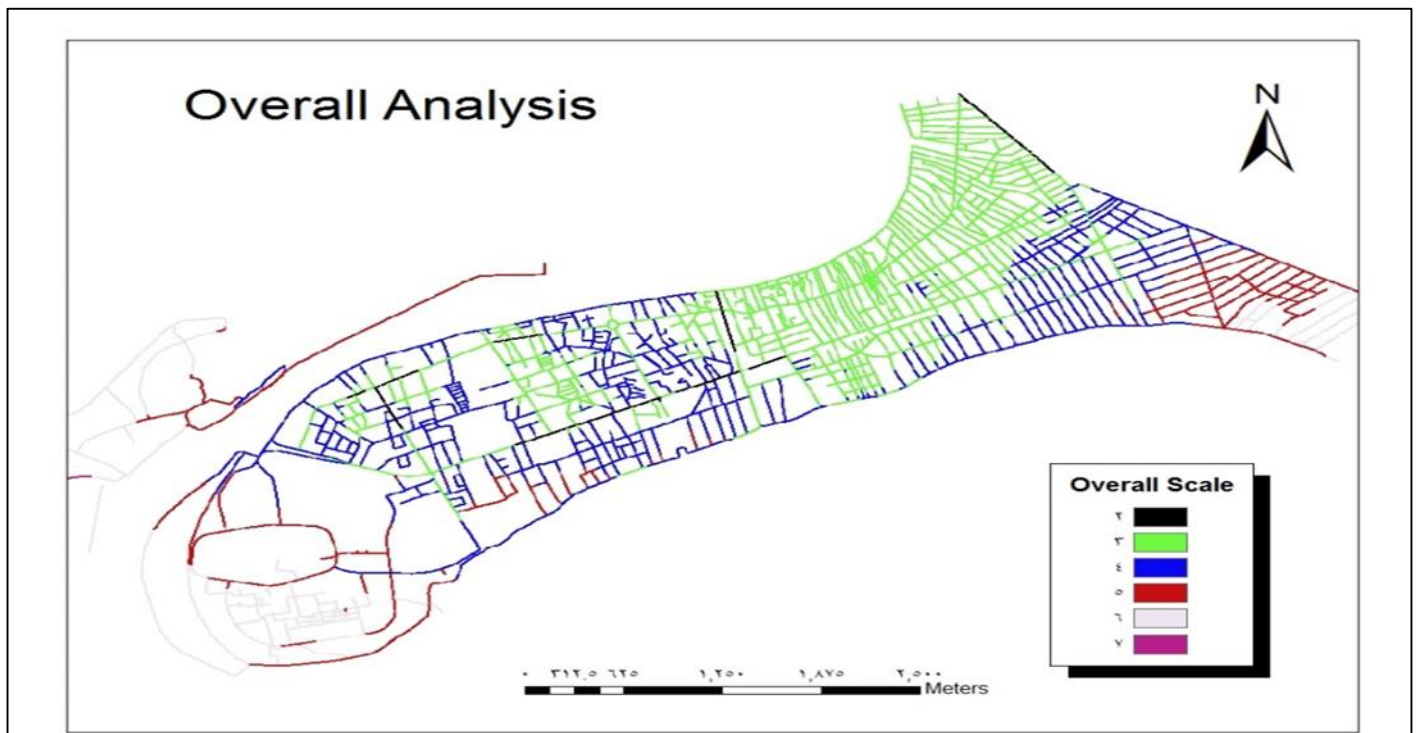


Figure 3. Overall Analysis Map

8. THE PROPOSED SOLUTION.

Long-term solutions and short-term solutions are the two categories into which the recommended solutions are separated.

8.1. Instantaneous Response.

Decision-makers can quickly put into action a number of practical remedies that will reduce traffic congestion to a quantifiable level. These quick fixes include the Tigris River

taxi (see Figure 4), the site appropriateness choice system for urban planners (see Figure 5),

and others. the university's parking lot, the bus and vehicle terminal as in Figure 6.

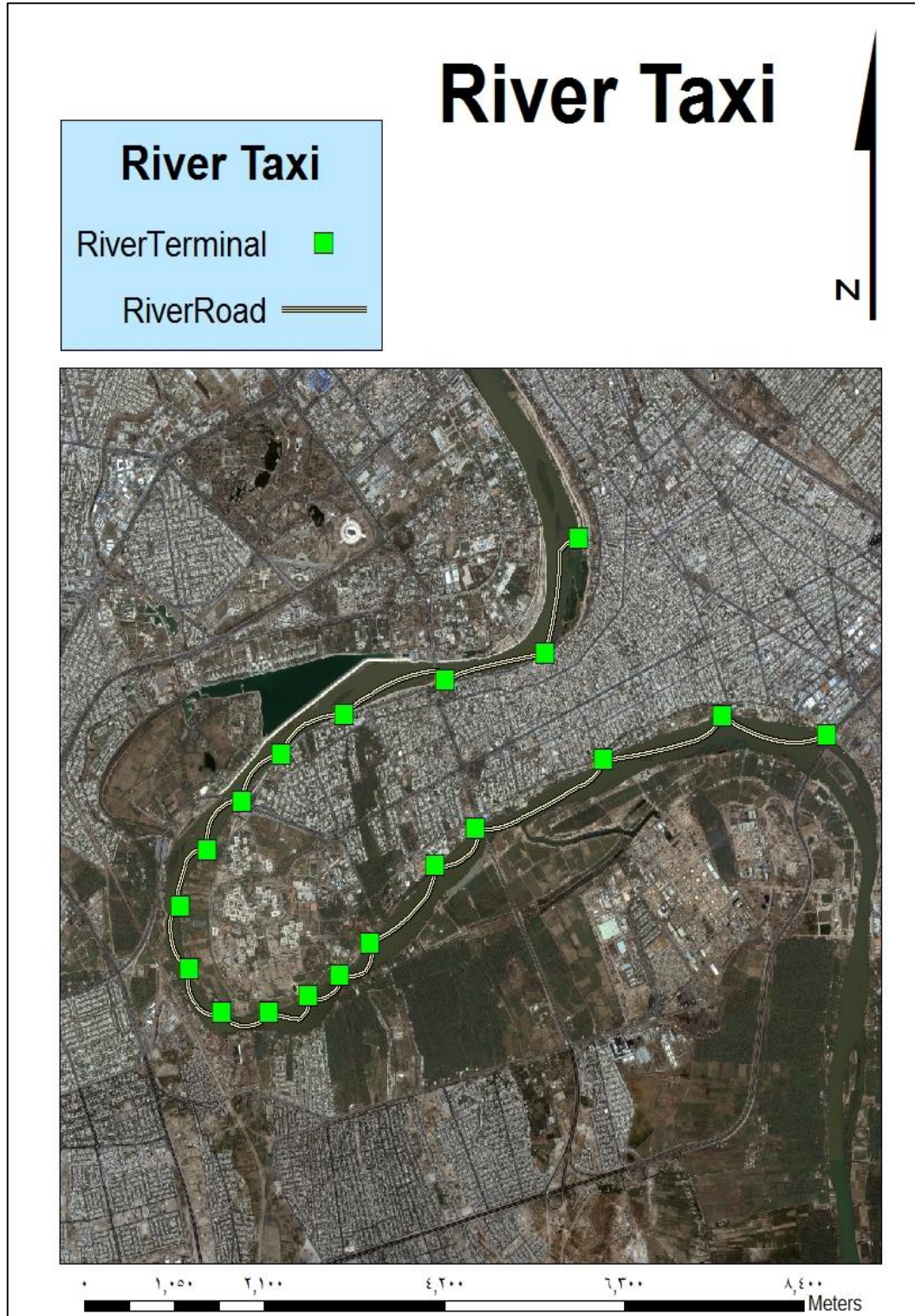


Figure 4. River taxi



Figure 5. Health Facilities Scale

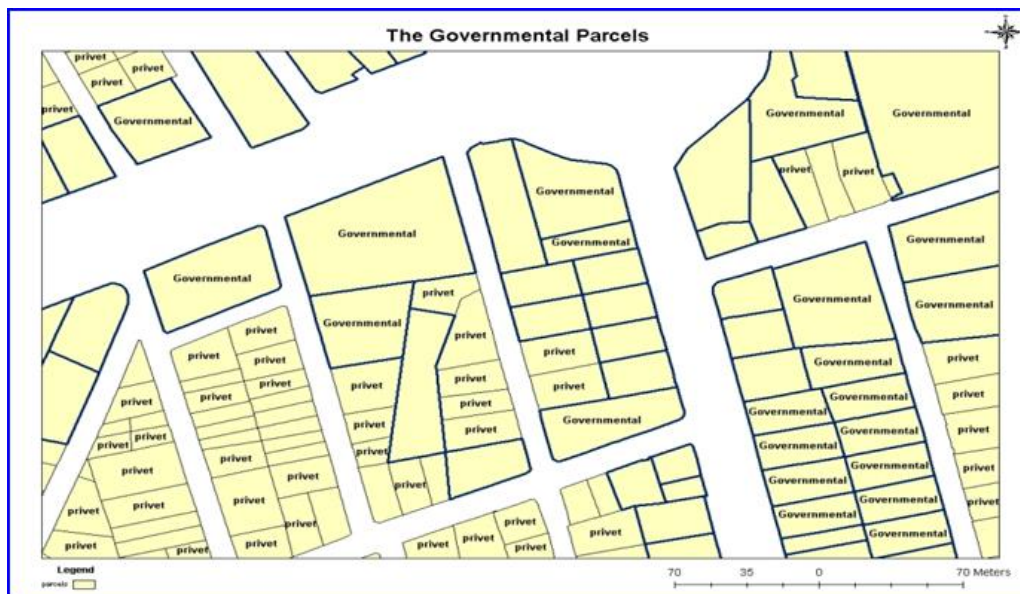


Figure 6. the Governmental Parcels in the study Area

The suggested methodology for data analysis is shown in Figure 7.

The following are the tools that will be utilized in the thesis:

- ArcGIS Desktop, a program from ESRI that is regarded as one of the top GIS application suppliers globally.

- Images from the GeoEye satellite, 50 cm.
- Statistic data from earlier Iraqi national initiatives that are relevant to the project's scope.

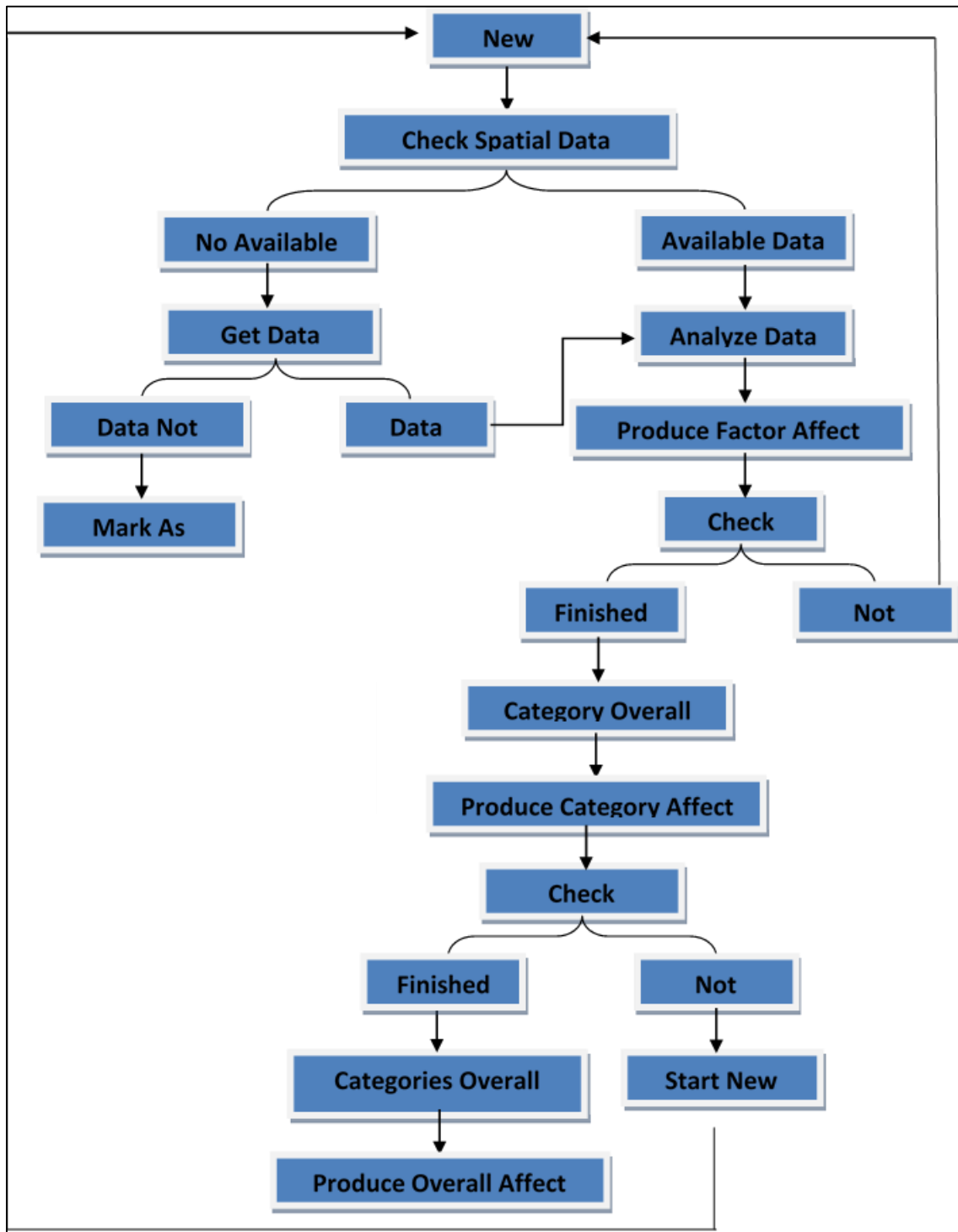


Figure 7. Walk way bridge

8.2. Long-Term Remedy Decision-Makers

in the future have a number of practical options at their disposal that could reduce traffic delays to a quantifiable level. These long-term fixes include the following: constructing bridges and tunnels like those in Figure 8, relocating and rezoning buildings, building multi-level parking garages like those in Figure 9, and creating an image classification system measure as in Figures 10&11,

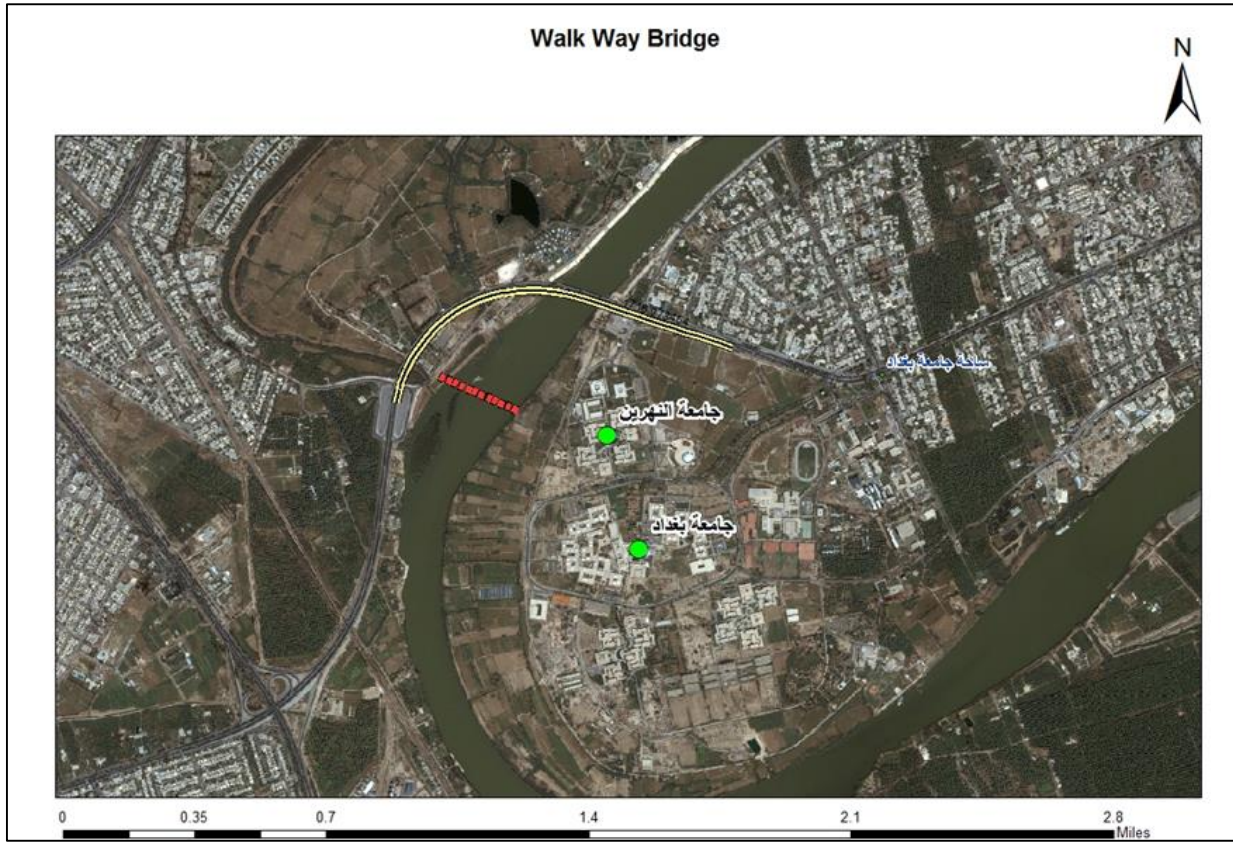


Figure 8. Walk Way Bridge

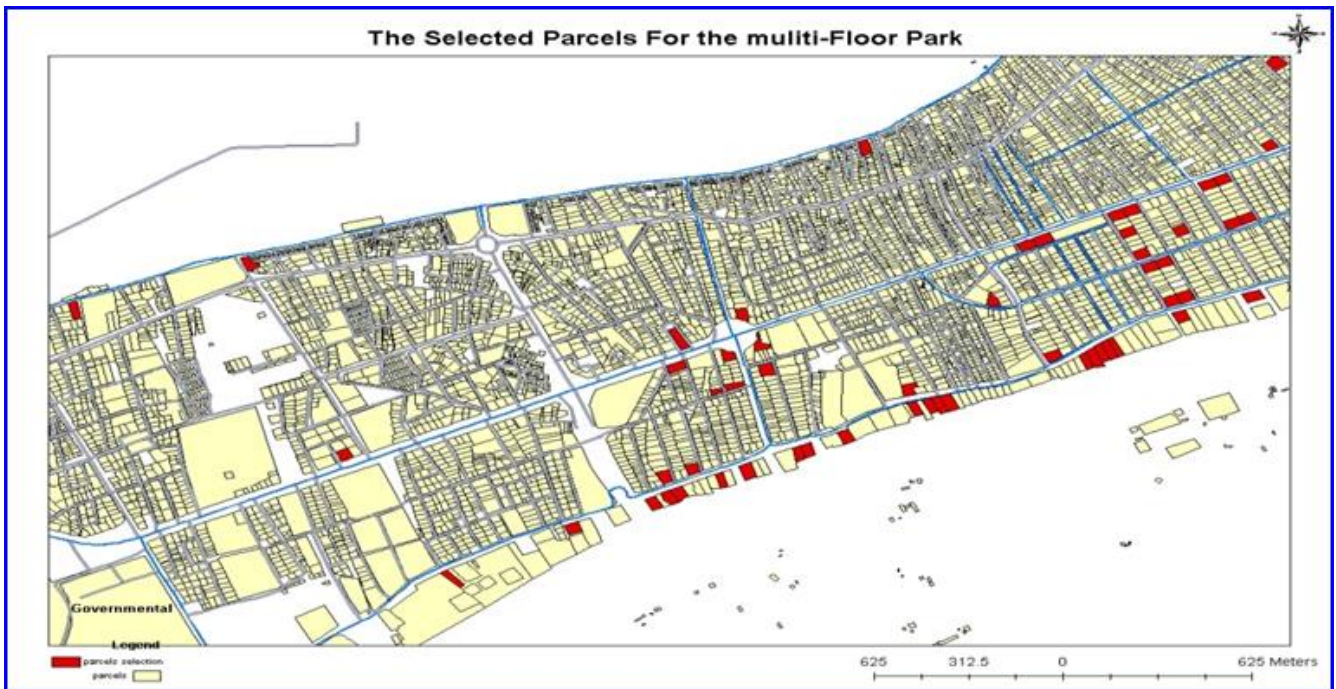


Figure 9. the selected Parcels for the multi-floor Park

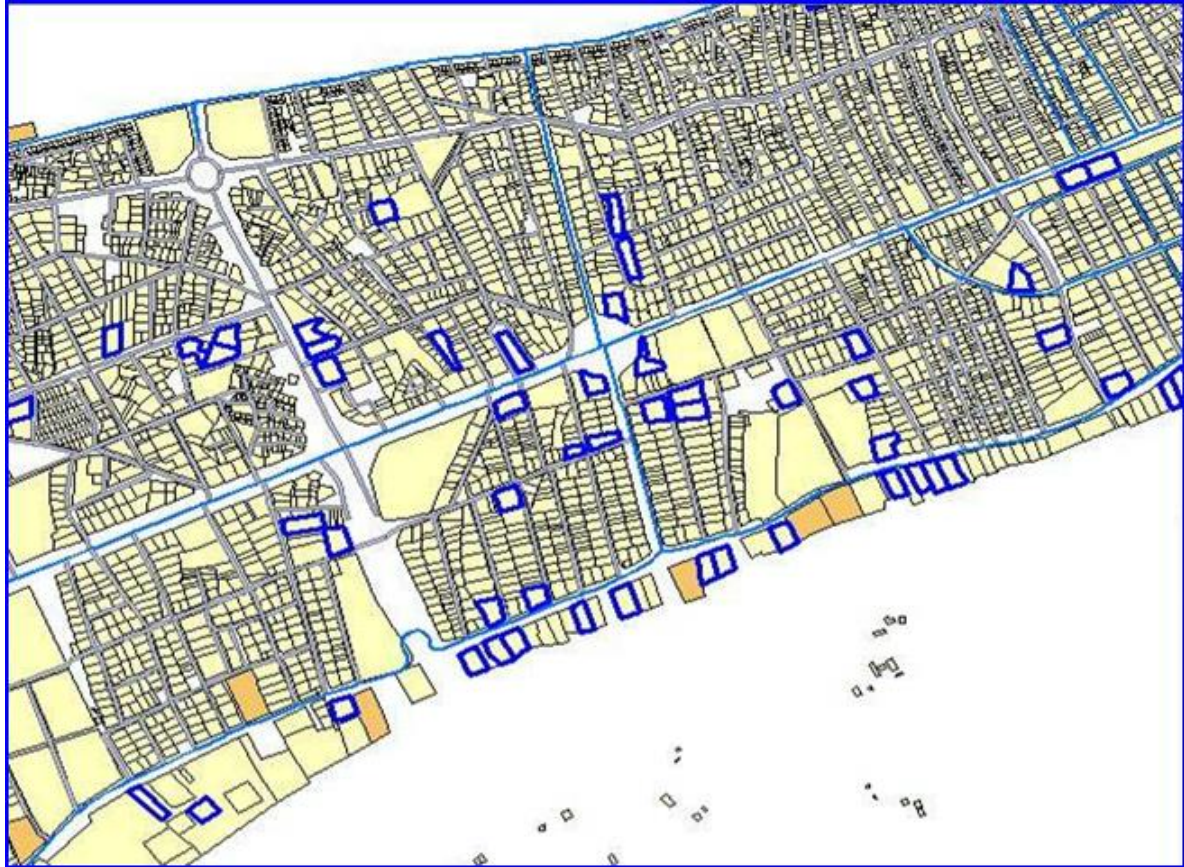


Image 10. Governmental parcels with a surface area of 2000 to 3000 square meters.



Figure 11. Original Image

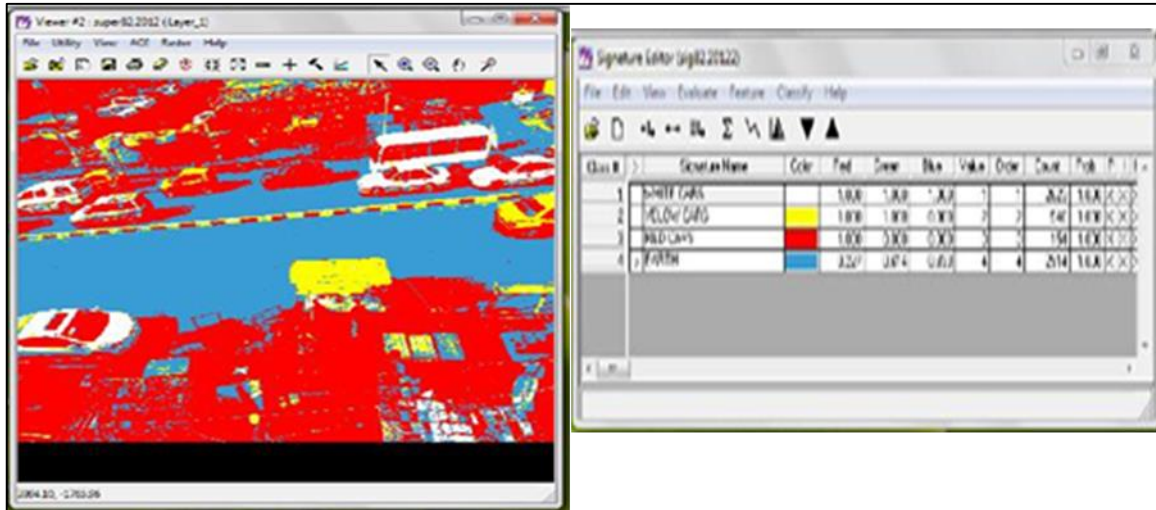


Figure 12. Supervised Classification

After doing supervised classification as shown in Figure 12, we may perform zooming as shown in Figure 13.

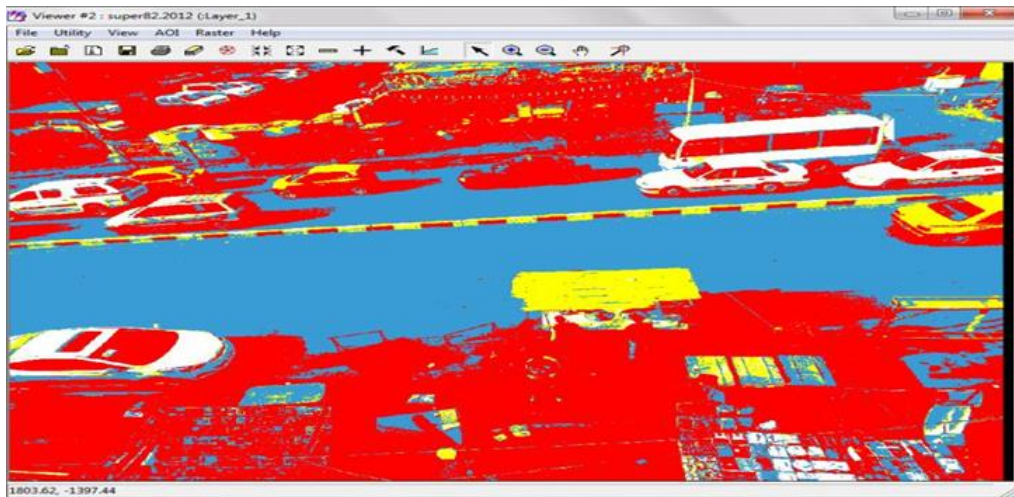


Figure 13. Zooming for Supervised Classification

9. CONCLUSIONS.

This study's primary goal was to examine traffic congestion issues from a novel angle by using geographic information systems (GIS) is the main tool for gathering, analyzing, and presenting data. Every single completed piece of work has a geospatial notation from start to finish.

What this study found was real; it is the actual scenario, which creates a sense of comfort. What helps these feelings grow stronger is the fact that the researcher employed GIS, an essential, precise, reliable, trusted, and cutting-edge instrument.

Every explanation put up for why there are traffic bottlenecks has been shown to be accurate. The researcher also had the

chance to learn more about how these elements could be reduced or eliminated from having an impact on traffic jams.

Once the researcher has removed the overall constraints, the problem can be resolved by resolving each individual component. The decision-makers with the authority to make this are left in charge.

For this study, the researchers formulated an analytic criterion that would examine the impact of a piece of geographical data on traffic congestion. The researcher then created maps to show the results, followed by a comprehensive analysis to present the big picture for all components gathered.

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