CHAPTER ONE

INTRODUCTION

This chapter contains:

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1.1 General

Advanced transportation systems are a key characteristic of modern-day society. It affects the lifestyle of individuals, the structure of the society, and gives people convenience and freedom. However, it also poses a problem of frustrating congestion and delays, especially in most metropolitan areas, where traffic demand is steadily increasing and the transportation infrastructure, on the other hand, has been unable to expand at the same pace. These facts lead to the so-called traffic congestion problem.

Traffic congestion itself has directly cost millions of dollars of wasted fuel and millions of hours of delayed man-power, and has also resulted in increase accidents, which in turn increase congestion, and aggravate the problem of environmental pollution. This problem costs heavily and deserves serious attention.

The magnitude and seriousness of traffic congestion problems have been noticed by authorities, society, as well as different research agencies. Some assessment studies on this problem have been conducted by many transportation professionals.

The management of road transport, since it is the only used mode of transport in Palestine, plays an important factor in the country's development. The transport sector in Palestine contributes significantly to the economic growth and poverty eradication in the country through various ways, especially, through trade and tourism.

Dimitriou and Banjo (1990) discuss transport problems of third world cities. They include traffic congestion, impacts to the environment, and high road accidents. Even today, Palestine still faces problems of traffic congestion, high road accidents, weak institutional support leading to poor definition of the problem at hand and differing technology transfer priorities in problem resolution.

Nowadays, however, the need for preventive maintenance is being appreciated in Palestine. For that, Palestinian Ministry of Public Work and Housing (MOPWH), indicated that roads maintenance needs are based on road inventory, condition and traffic data, all of which can be effectively collected and managed using Geographical Information System (GIS).

As a transportation professional, you need the most cost-effective tools to manage physical assets, human resources, and office and field operations. GIS can help you plan, monitor, and manage strategic infrastructure more effectively. Use the location power of your data to determine capacity enhancements, improve operations, and identify the most strategic investments for maintaining your transportation infrastructure. GIS can make your stand-alone systems work smarter by connecting them, allowing you to unlock the power of your information systems. Plan a smarter infrastructure today.

1.2 Problem definition

There have been many cases of poor transport services in Palestine. The road infrastructure was developed in a chaotic manner, with no plan for a coordinated and rationalized use of modes and routes. As a result, it has suffered from negligence leading to road infrastructure failure. Attempts to maintain roads have frustrated users as they (the roads) almost immediately develop pot holes after repair. Worse still, road maintenance has proven ad hoc, thus making the transport system unsatisfactory.

Also, in Palestinian cities, such as Hebron City, the decision to perform maintenance works on a road is initially based on; records of past expenditures on the road sections in question, availability of resources and traffic levels along these roads. However, most of the data required for road maintenance is spatial in nature. This makes Linear Referenced GIS Method relevant for the purpose.

1.3 Project area

Hebron City is located in the southern West Bank, 30 km south of Jerusalem, figure (1.1). It lays 930 meters above sea level. It is locally well known for its grapes, figs, limestone, pottery workshops and glassblowing factories, and is the location of the major dairy product manufacturer.

Hebron City is considered to be one of the largest municipalities in West Bank with 48 Km^2 municipal area, and 250,000 inhabitants, (Palestinian Bureau of Statistic, 2017). Its services vary from constructing new roads, maintaining old ones, supplying fresh water, managing wastewater, collecting solid waste and supplying electrical power, and many other services.

Figure (1.1): Hebron City, Location Map

Abu Ktelah Street is located at the north-western part of Hebron city, as is shown in figure(1.2); it's almost 2 km length. It's one of the main street's that serves Al Ahli Hospital and consider as a vital main street which links Al Salam Street with the north western entrance of Hebron City.

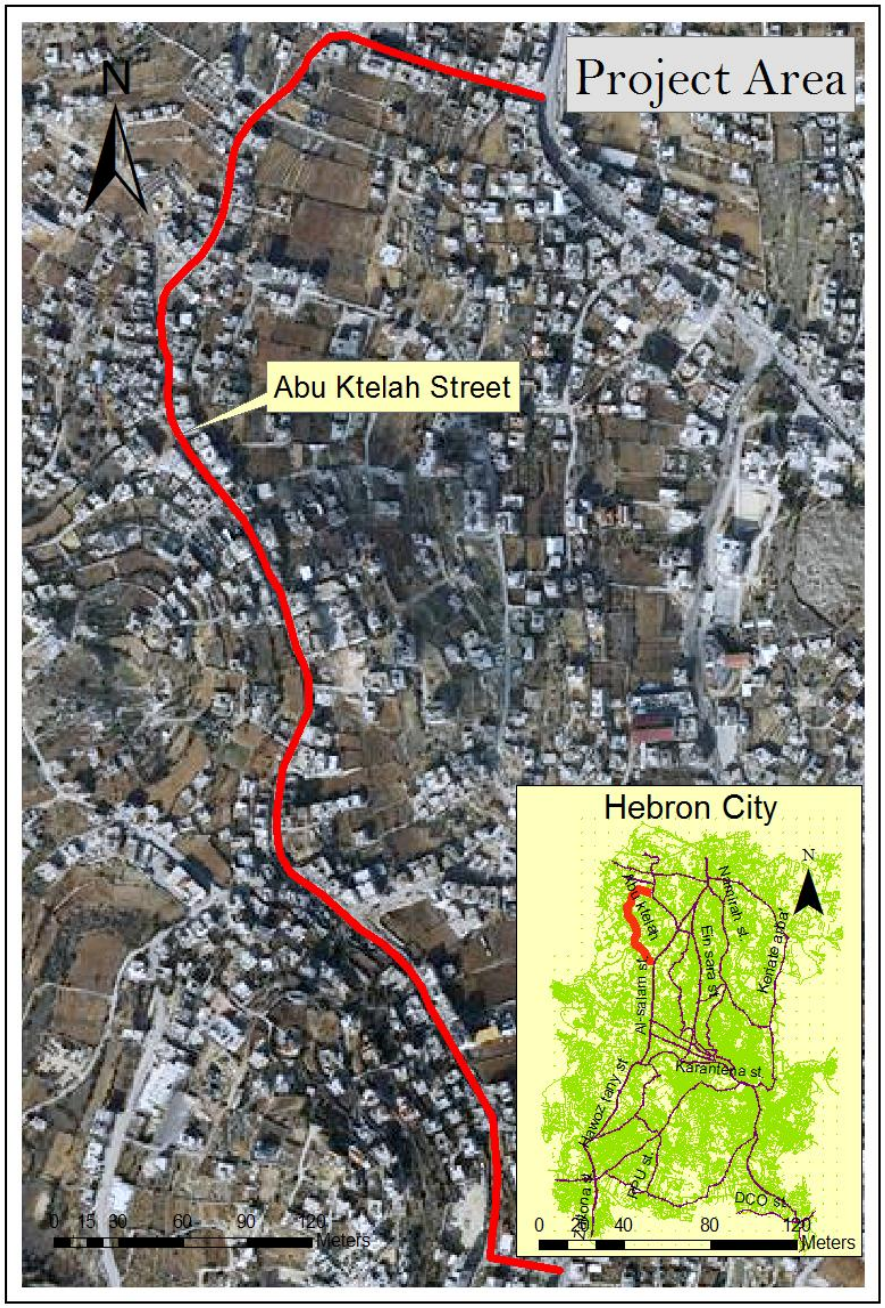

Figure (1.2): Location Map of Abu Ktelah Street

1.4 Objectives and advantages

The overall objective of this project is to serve Hebron Municipality with GIS Linear Referencing Method as a tool for street rehabilitation. More specifically the objectives of this study may be summarized as:

1. Identifying the location of different street events of Abu Ktelah, such as streets centerline trenches, street cracks, painting, and many others.
2. Using Linear referencing as a tool to associate multiple sets of attributes of Abu Ktelah Street to portions of linear features without requiring that underlying lines be segmented (split) each time that attribute values change.
3. Using Linear referencing as a tool to find the rehabilitation need's for streets.
4. calculate quantities for rehabilitation of this street by using " GIS Linear Referencing and GPS system "
5. Identifying of different surveying elements. This may include;

Culvert	Patch	Pole	Sign	Manhole
Ditch	Guardrail	Pavement	Paint	Wall
shoulder	Cat Eye	Jubbah	Along Track Crack	

Table (1.1): Different Surveying Elements

1.5 Methodology of the work

The project consists of three phases, which is designed to be completed in according with schedule in table (1.2). The description of each of the three phases of the project tasks involved are listed below:

PHASE NO.	TITLE	DURATION (2017&2018)						
		10/2017	11/2017	12/2017	1/2018	2/2018	3/2018	4/2018
One	Data Collection And Survey.							
Two	Road Surveying.							
Three	Writing the report and Building Liner Referencing Model and Other related jobs.							

Table (1.2): Phases of the Project with their Expected Duration

1.5.1 First phase: data collection and surveying.

During this phase, available data and information will be collected from different source. Moreover, many site visits to both project area and the related local organization will be conducted. First phase included the following tasks:

1. Collection of aerial topographical maps for the study area.
2. Using the tutorial and to get trained with the method of Linear Referencing.
3. Analyze the work.

1.5.2 Second phase: road surveying.

During second phase, the necessary survey will be conducted using the Linear Referencing Methods. This will include:

1. Surveying of Linear Referencing Events using traditional methods and or GPS.

2. Establish Entering the event data and attribute data to the GIS

3. Building Linear Referencing Model and analyses, which include:

    • Determining Route structure

    • Determining Measures

    • Create Events

    • Display Event Data, Cartographic Output

4. Construct the Roads GIS Maintenance Management Support System and prepare them to be used.

5. Preparing the final map.

1.5.3 Third phase: Writing the report and Building Liner Referencing Model and Other related jobs.

After finishing the construction of Roads GIS Maintenance Management Support System using Linear Referencing Method, the research team will prepare a dynamic map of street route and events that need to be maintained. The System will be a dynamic and the map feature will be changed automatically according to maintenance situation. A cost estimate of each modeled event as well as the overall budget will be estimated.

The project will be prepared and submitted to the Department of Civil and Architectural Engineering of Palestine University.

1.6 Definitions of Terms

This document introduces some vocabulary that is essential to understanding the linear referencing. Some definitions are related to documents with thorough descriptions, table (1.3);

Term	Description
Route	A route is any line feature, such as a street, highway, river, or pipe, that has a unique identifier and a system of measurement. Routes are stored in a route feature class.
Route feature class	A route feature class is a collection of routes with a common system of measurement stored in a single feature class (for example, a set of all highways in a county). A route feature class differs from a standard line feature class in that, along with x- and y-coordinates, it also stores an m-coordinate (x, y, h).
Measure	A value stored along a linear feature that represents a location relative to the beginning of the feature, or some point along it, rather than as an x, y coordinate. Measures are stored as m-values on route vertices. Measures can be any unit of measurement, such as miles, meters, and time.
M-value	A measure that is added to a line feature. M-values are stored in the m-coordinate of each vertex on a route feature. M-values are used to measure the distance along a line feature.
Events	An event is a linear, continuous, or point feature that occurs along a route feature. Anything that occurs on or describes a route feature can be an event. In the transportation field, examples of events might include pavement quality, accident sites, and speed limits. Events are stored in event tables.
Event tables	Event tables contain information about assets, conditions, and events that can be located along route features. Each row in the table references an event, and its location is expressed as measurements along a route feature. There are two types of route event tables: point event tables and line event tables.
Dynamic segmentation	Dynamic segmentation is the process of computing the map locations of events stored and managed in an event table along route features and displaying them on a map. The term dynamic segmentation is derived from the concept that line features need not be split (in other words, "segmented") each time an attribute value changes—you can "dynamically" locate the segment.

Table (1.3): Definitions of Terms

1.7 Organization of the project

The study report is prepared in according with the objectives, and scope of the work. The report consists of four chapters as:

Chapter one: Entitled (introduction), outline the problem, projects objective and phases of the projects.

Chapter two: Entitled (Geographic Information System (GIS) And Linear referencing) , this chapter covers how we deal with (GIS) to carry out the projects, how it works, the importance of these software and Linear Referencing Method definition, relation with GIS, and also Its importance in transportation.

Chapter three: Entitled (Data Collection and Preparation), this chapter describes the field work procedures, Linear measurement and surveying of different street events.

Chapter four: Entitled (Construction of Roads Maintenance Management Support System using Linear Referencing Method).

Chapter five: Entitled (Conclusions and Recommendations).