CHARACTERISTICS OF THE TRAFFIC FLOW ON THE EGYPTIAN HIGHWAYS

By

RASHA OMAR ABOU BAKER.

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements of the Degree of
MASTER OF SCIENCE
In
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Table of content

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

The geometric road design is one of the issues in the road design that takes a lot of argument specially those items related to the capacity and the level at which the road user is expecting and that the responsible authority can provide. It is known that the volume of the traffic on the road is changing all over the hours of the day and days of the week all over the year. Here is a question that still needs an answer, what the volume that the responsible authority should serve to satisfy the user and give a service with an economic cost. The answer for this question has local factors that must be considered either in the volume of the traffic for each hour or the distribution of that along the time of the year and from year to year. The needed answer is known as the design hourly volume for a specific road.

Consequently the objective of this thesis was chosen to try to determine a suitable design hourly volume for the Egyptian highways. The going on practice in Egypt is to use the American experiences which recommend 30^{th} highest hourly volume.

Available Traffic data was secured from the Roads and Bridges Authority and Land Transport (GARBLT) using the output of the national Traffic Count Project which started in 1988 and continued till now. One of the main outputs is the hourly traffic volume 24 hours per day, seven days per week for the entire year. This data is available for 15 continuous count stations covering most of the Egyptian road network.

An analysis of the secured traffic volumes for year 2010 was performed to get a representative design hour and test the validity of using the 30^{th} highest hour. Different procedures have been tested such as the Knee approach and previously defined Level of Service volume requirements in addition to assign different percentages of the Annual Average Daily Traffic (AADT) Volumes for each road and the volume corresponding to these ratios.

Different Statistical packages were used in the analysis and neither the knee point approach nor the predefined Level of Service procedure gave results that can cover a reasonable number of the studied locations. However the percentage of the AADT between the 10^{th} hour rank volume and the 50^{th} hour rank volume gave narrow range of variation percentagewise and consequently the 50^{th} hourly volume was recommend for the geometric road design capacity in Egypt.

CHAPTER (1)

INTRODUCTION

1.1 Background:

The transportation services are considered a major item in any development plans or projects either in their early stages or later (after being implemented) to help in transferring the products to the consumers or help people to move around. Based upon this considering the availability of this service must have high priority with the planning for development. This can be done by either upgrading the existing facilities or constructing new facilities to be added to the existing ones [4].

In many highway construction or reconstruction projects, one of the important decisions is the number of lanes required to serve the demand on these highways. Procedure used to determine the lane requirements are normally based on identification of a single design hour within which the anticipated demand volume is balanced against supply volume (capacity) for alternative highway size (number of lanes) to be constructed. To determine this design hour, it is found that average daily traffic throughout the year doesn't give the number of vehicles that should be provided for, due the seasonal and hourly variation in traffic volumes. A road must carry in a comfortable manner the usual increase over the average traffic that comes regularly at certain hour of each day. On the other hand it is found that, it was not economical to design road widths and intersections to serve a free flow of traffic during those extreme peaks that occur once or twice a year. Therefore, a design hour rather than the average hour or the maximum hour should be obtained [1].

To get the appropriate design hour, two approaches are generally used, the first one is "the knee approach" which focuses on the facility, i.e. the selection of the design hour will depend on that, the facility will experience traffic volume exceeding the design level less than a specified number of hours. The second is "percent user congestion" approach which focuses on the road user, i.e. the selection of the design hour depending on that, the typical user will experience traffic volume exceeding a specified design level less than a specified percentage of travel time [1].

For design purposes in Egypt, the first approach described above is usually used for determining the design hourly volume (DHV). The second approach was not used in Egypt before even for research purposes. There was a pervious study done by Abd El Fattah [1], in 1992 to obtain the value of the design hour volume for the Egyptian rural typical highways. There was no previous research about determination of DHV for Egyptian rural highways. It was only possible after starting applying the continuous count program in Egypt in 1988 by the General Authority for Roads, Bridges and Land Transport (GARBLT).

Since 1992 no revision was done to check what Abd El Fattah [1], concluded in his work. Therefore, the main objective of this research work is to reach an hour that its volume can be considered as the design hourly volume for rural highways in Egypt.

1.2 Problem Statement

The average daily traffic throughout the year doesn't give the number of vehicles that should be served by the road, due to the seasonal and hourly variations in the volume of traffic. A road must carry comfortably the usual increase over the average traffic that comes regularly at certain seasons and during certain hours of each day. On the other hand, it is not economical to design road widths and intersections for free flow of traffic during those extreme peaks that occur once or twice a year. At such times some sacrifice must be made in the freedom of flow to accommodate the increase [1].

Therefore, Traffic volume during an interval of time shorter than a day more appropriately reflects the operating condition that should be used for design if traffic is to be properly served. The brief but frequently repeated peak–hour periods are significant in this regard. In nearly all cases a practical and adequate time period is one hour [3].

The traffic pattern on any highway shows considerable variation in traffic volume during the different hours of the day and in traffic volume throughout the years. It must be determined which of these hourly traffic volumes should be used in design. It would be a waste to predicate the design on the maximum peak–hour traffic of the year, yet the use of the average hourly traffic would result in an inadequate design. The

hourly traffic volume used in design shouldn't be exceeded very often or very much. On the other hand, it shouldn't be so high that traffic would rarely be great enough to make full use of resulting facility [3].

1.3 Objectives:

The main objectives of this thesis are:

i. Study the knee approach for determining "DHV".
ii. Determine the design hour for Egyptian rural highways based on any other suitable approach considering using the 30^{th} highest hour as design hour.
iii. Evaluate the traffic flow characteristics on the Egyptian road highways and their reflections on the choice of the design hourly volume.

1.4 Scope of the Research Work:

For the analysis purpose of this thesis, the "Egyptian National Count Program" data is used which maintains a steady traffic volume count on rural highways supervised by the General Authority for Roads, Bridges and Land Transport (GARBLT).

1.5 Research Methodology:

The methodology for this research study is shown in Figure (1-1). During initial stage, work planning processes were done to specify the problem that will be investigated as well as collection and management of data.

Based on this problem definition, method of analysis is to be planned and listed. Then, a plan to identify the related data and information needed for this research is done. This is to ensure the smooth process in digging all possible sources.

The next step is to analyze the data and information that will be collected from GARBLT. Then the databases will be presented, analyzed and tested using suitable software such as Microsoft office (Excel 2010) and IBM SPSS Statistic 20. Finally, the conclusions and recommendations are drawn from this research effort based upon the results that will be achieved from the analysis.

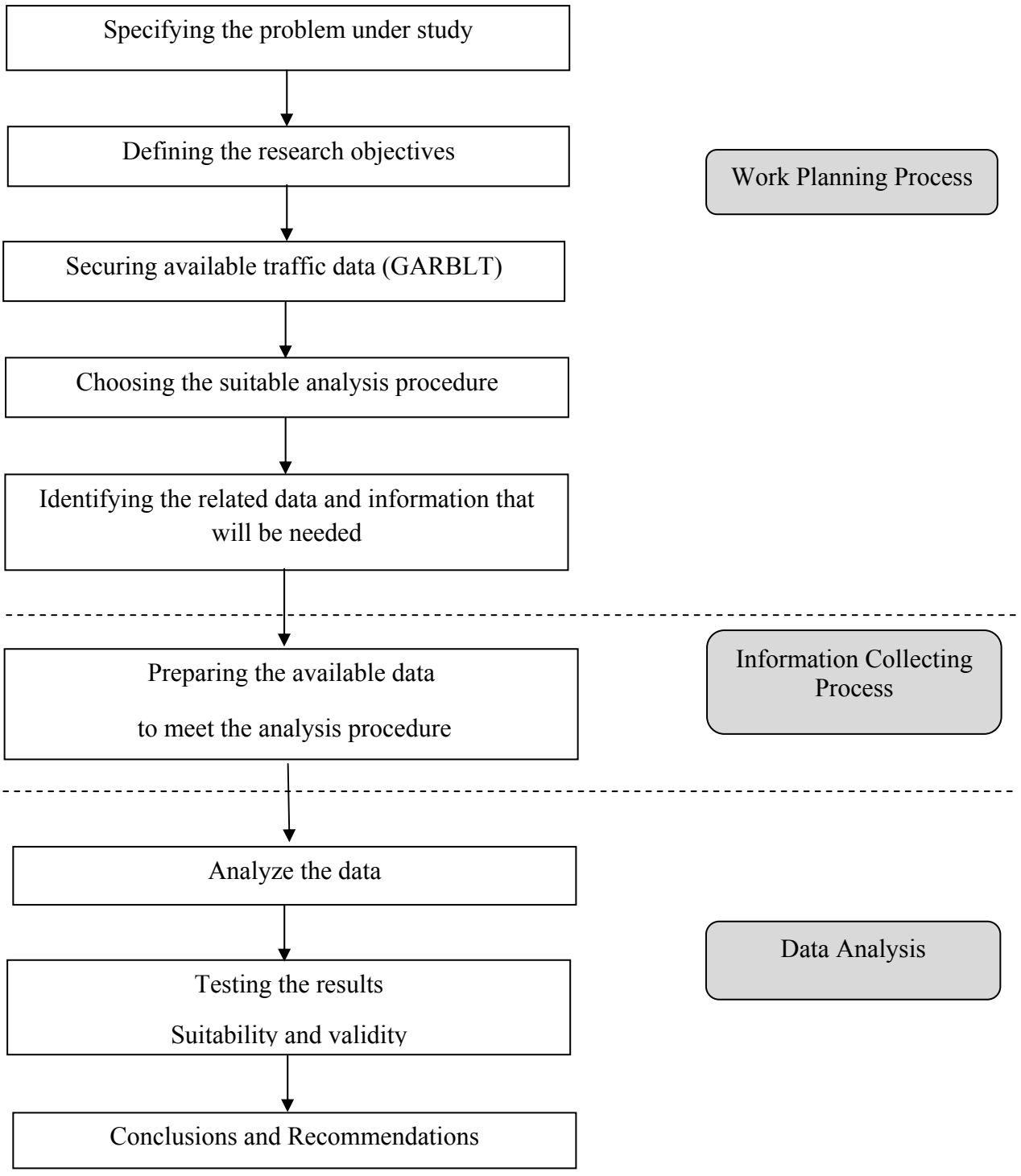

Figure 1.1: Research Framework