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Analysis on Road Safety in Relation to Urban Road type and Traffic Flow

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ABSTRACT

This presents an analysis of the relationship between road safety, urban road type and traffic flow. A suitable index for the evaluation of the Walkability level of an urban street is the pedestrian traffic flow and the Walking behavior.

After examined, six urban streets of various types, they collected data of the pedestrian traffic flow and their legal or illegal walking behavior for each road segment of the examined streets. Furthermore, they collected data of traffic flow in the same road segments of the streets in the study area. The combination of those data with the administrative ranking of each road can indicate a Walkability level of an examined street or a specific route and reveal pedestrians' mobility and safety issues. This study supports that walking behavior differs for various road types. Pedestrians with the highest rate of legal behavior were presented in main arterials (91.8%) and the lowest one in local streets (53.7%).

Low level of motorized flow in combination of pedestrian mobility emphasizing in safety issues can change the modal split in favor of vulnerable road users, increase the sustainability index of an urban area and improve the citizens' quality of life.

INTRODUCTION

Firstly we need to know about the road safety India ranks high when it comes to number of accidents on the road. However, in the recent years, improvement has been seen in this area. With the rapid increase in the number of vehicles on the road, the traffic conditions are under a lot of pressure. Therefore, road safety is one of the most serious public health issues in our country. It has an impact on everyone, whether one drives a vehicle, walks or rides a cycle. This presents an analysis of the relationship between road safety, urban road type and traffic flow.

Finally, the pedestrian urban infrastructure can be examined using Walkability indicators.

This type of indicators can help to find where the pedestrians face mobility problems across their desire route.

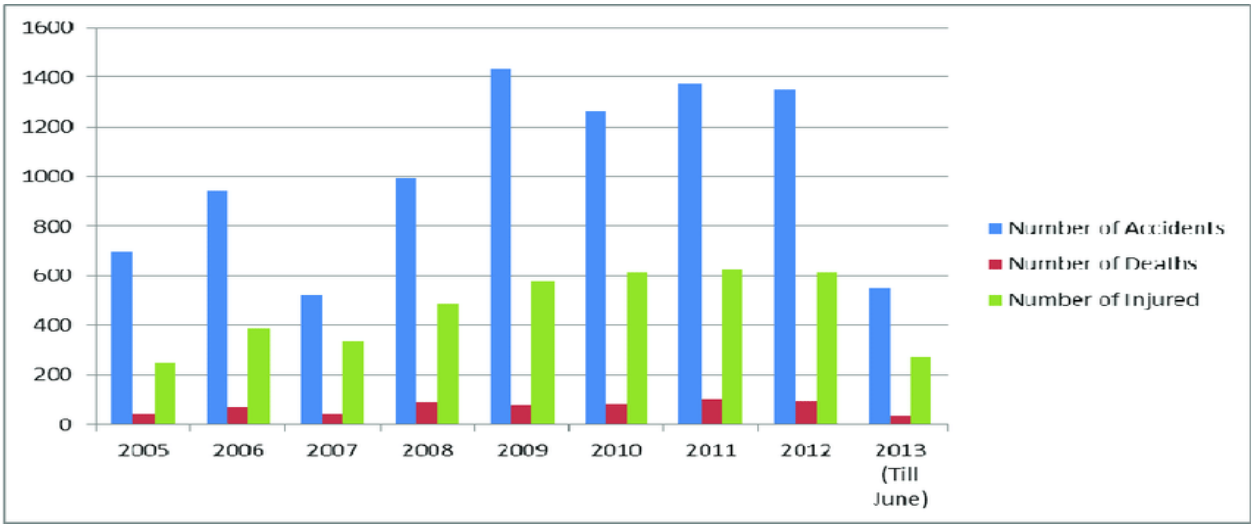
LITERATURE REVIEW

Gianluca Dell Acqua et al.(2003) illustrated road safety statistical models to predict injury accidents. Two accident prediction models one associated with two-lane rural roads and the other with multilane roadways were calibrated using procedure based on least squares method with a confidence level of 95%.

Tibebe Beshah et al.(2009) applied data mining technologies that linked recorded road characteristic data with accident severity in Ethiopia, and proposed certain rules that could be adopted by the Ethiopian Traffic Agency to improve safety. The Ethiopian traffic control system data on several facets of traffic system, like traffic volume, traffic concentration, and vehicular accidents. The study presumes that accidents are not randomly scattered by the side of road network, and that drivers are not involved in accidents at random.

Ahmad Hasan Nury et al.(2010) provided methodological analysis of accident prevalence and severity of traffic accident distributions in terms of locations, frequency, vehicles and duration. Poisson and negative binomial regression models are more appropriate tool in accident modeling.

Dinesh Mohan (2014) had demonstrated that information regarding road accidents is not reliable in few developed countries whereas a few developing countries have good data systems. This work had made a broad assessment of the status of road safety in 178 countries.



OBJECTIVES

The main objectives are to analyze and design of roads and highways based on the method of design. In addition to that, before start of the work I came with following objectives:

- To obtain the basic ideas of roads.
- To obtain the basic idea of highways.
- To know the traffic regulation and road safety signs
- To be familiar with the different types of roads and highways and its design principles.
- To be familiar with design of vehicles.

SCOPE AND WORK OF LIMITATIONS

- The Safe System goals and strategies focus on providing a road traffic system free from death and serious injury.
- The Safe System guides the planning, design, management, operation and use of the road traffic system so as to provide safety in spite of human fallibility. It places a shared accountability across all elements of the system.
- Death and serious injury from road crashes is preventable if crash energies are managed so that they do not exceed human tolerances for serious and fatal injury and this is accomplished with effective, results-focused and resourced road safety management.
- More than 1.24 million people die each year on the world's roads. Many more suffer permanent disability, and between 20 and 50 million suffer non-fatal injuries. These are mainly in LMICs (low and middle income countries, amongst vulnerable road users and involve the most socio-economically active citizens.

METHODOLOGY

The preliminary data needed was acquired after carrying out different survey:

A suitable index to evaluate the walkability level of an urban street is to examine pedestrians' use of the street. Improving the level of pedestrian safety, mobility and convenience is an important step for the promotion of sustainable mobility in urban areas.

In this study we examined three indexes:

· Pedestrian traffic flow.

· Walking behavior.

· Motorized traffic flow.

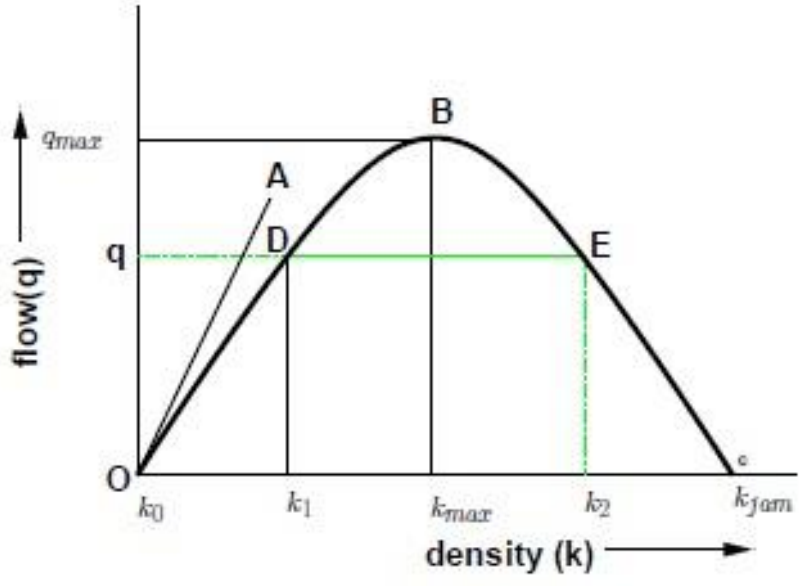
After research, this process was very important for the successfully completion of the project. The Guide explained the target of the study and the details of the data collection process to me.

The duration of the first step of the training process was no more than two hours. The second step of the training process was a pilot implementation of the data collection process in a typical road segment and crosswalk.

After this step, the Guide solved all the possible problems and misunderstanding for the data collection.

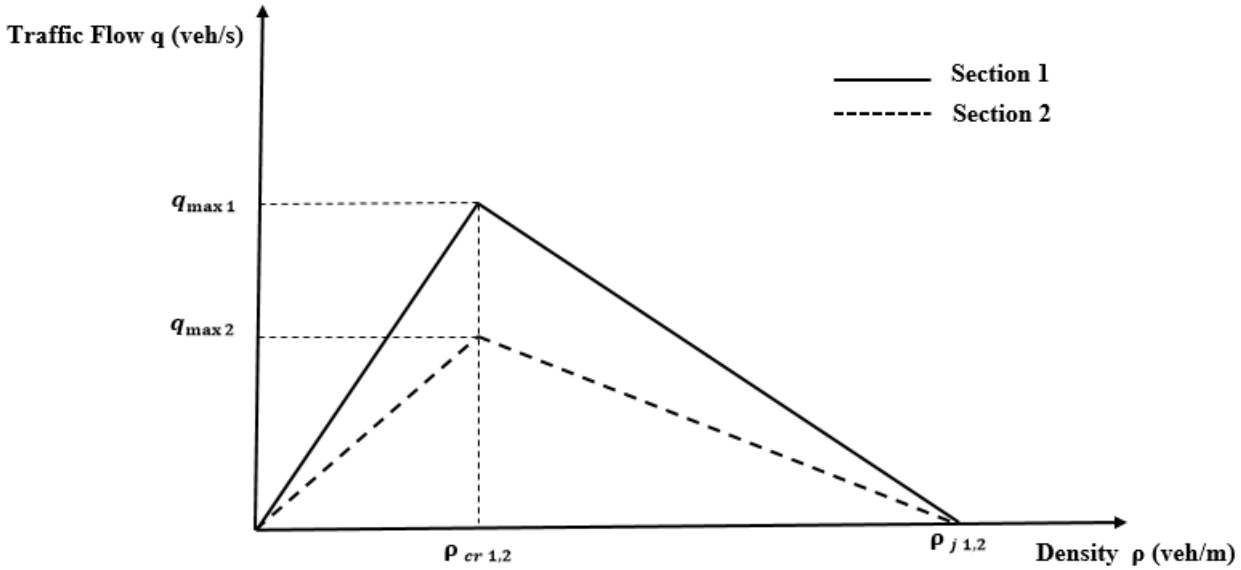
FLOW DENSITY GRAPHS OF TRAFFIC

There are two types of flow density graphs. The first is the parabolic shaped flow-density curve, and the second is the triangular shaped flow-density curve.



This graph indicates the macroscopic fundamental (is type of traffic flow that relates space-mean flow, density and speed) diagram of traffic flow is a diagram that gives a relation between road traffic and the traffic density.

A traffic model involving traffic flux, traffic density and velocity forms the basis of the fundamental graph. It can be used to predict the capability of a road system, or its behaviour when applying inflow regulation or speed limits.



This triangular curve consists of two vectors.

The first vector is the free flow side of the curve. This vector is created by placing the free flow velocity vector of a roadway at the origin of the flow-density graph.

TESTING

Each material was subjected to a range of testing including chemical and mineralogical analysis, laboratory testing using standard specified test methods, testing using methods that are non-specified but used periodically and other methods developed or adapted to stimulate the expected nature of deterioration of the materials.

DURABILITY TEST

Durability testing is an essential step in determining the expected life of a vehicle. It increases repeatability and reduces risk exposure by detecting defects at an earlier stage in the vehicle development process. Whether you test at the full-vehicle, subsystem, or component level, Element has the expertise and the equipment to provide testing solutions that enhance the sturdiness of your product.

DATA COLLECTION

The pedestrian traffic flow during normal day peak traffic hour 10:00–14:00 in each road segment and for each side for an interval of 15 minutes. The data collection process took place during summer.

We were equipped with a street map, a camera and reflecting jackets for their own road safety. After a short intermission (5minutes), started again in the following road segment. During one hour it was possible to register the pedestrian traffic flow for three road segments (only across one side).

Simultaneously, collected photos and registered the pedestrians' walking behavior, examining one legal and two illegal movements, as it follows:

- Pedestrians walking on the sidewalk for the entire length of the examined road segment (legal behavior).
- Pedestrians walking in the street for a short / entire length of the examined road segment (illegal behavior).
- Pedestrians crossing the street outside designated crosswalks of the examined road segment.

Table 1: Passenger Car Unit (PCU) values for various vehicle types.

Vehicle Type	PCU Value
Pedal Cycle	0.2
Motor Cycle	0.4
Passenger Car	1.0
Light Goods Vehicle (LGV)	1.0
Medium Goods Vehicle (MGV)	1.5
Buses & Coaches	2.0
Heavy Goods Vehicle (HGV)	2.3
Articulated Buses	3.2*

** Recent research conducted for TfL has suggested this to be an appropriate PCU value for articulated buses[36].*

Furthermore, the registered traffic flow of motorized vehicles (private vehicles, buses, trucks, power two vehicles) and bicyclists in each road segment across the street for the same interval of 15 minutes. The traffic flow was calculated using passenger car unit (PCU) according to the vehicles type (private vehicle=1.00 bus=2.25, truck= 1.75, power two vehicle= 0.33, bicycle= 0.20

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