



## Gravity Model Calibration and its use in Trip Distribution

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**Abstract**—Urbanization is a dominant process in the growth of nation's economy. Ahmedabad is a 7th largest metropolitan city in India. **AHMEDABAD** city is the administrative centre of Gujarat, India. Located at latitude 23.03° North and longitude 72.58° east. Ahmedabad city is the centre for social, educational, commercial, residential, cultural, political and economic activities. Due to the continuing expansion of cities with the development of societies and technology through the ages make the existing transportation systems are not sufficient to meet the increasing demands due to the difficulty and the complexity of the daily movements of people and goods. Traffic congestion is major problem for smooth flow of vehicles in city transportation network. With increasing in number of vehicles due to increasing of population in the city it may increase traffic problems, number of accidents, pedestrian safety, more fuel consumption, Air pollution etc. The scope of the study includes the literature review and Gravity model calibration used in Trip Distribution. As the database is essential part in decision making. The study will become base line study. The area to be covered in the study of above transportation problem should be **West zone of AHMEDABAD** and its surrounding urban areas. The area is to be divided into 9 zones based on ward boundaries. In this study mainly household survey is carried out. This paper consists only up to methodology. Household survey will be conducted in future.

**Keywords-component:** Gravity model calibration, trip distribution, house hold survey, methodology.

### I. INTRODUCTION

Transportation planning is the study of present transportation patterns in relation to present population, economy and land use of an area, the estimation of future transportation patterns related to prediction of future population, land use and economy, the design of alternative transportation networks and facilities, the evaluation of alternatives and the adoption of a transportation plan with proposals for its implementation, scheduling and financing. An efficient transportation network is necessary for healthy economy of the country. Good transportation is a fundamental requirement for society to achieve a better quality of life. To meet the demand of 21st century, transportation links need to be efficient, fast, people friendly and sensitive to the environment.

The problems of urban facility have increased in manifold proportions due to the rapid growth of population and economic activities in urban areas of Gujarat. **AHMEDABAD** city is the administrative centre of Gujarat. Use of Gravity Model Calibration in trip distribution will help us to know the future traffic condition. And according to that we can plane the transportation system such that it allows smooth flow to vehicle, reduce the delay time and safety to pedestrian.

It observed that from past few decades due to increasing in income and due to insufficient public transportation system more people are shifting to personal vehicle in most cities, which result in increasing in growth of personal vehicle in the city and result in traffic congestion problem in the city. It show that every year number of vehicle increasing with high rate. In the city it is not possible to stop traffic and it is very difficult to provide extra land as per traffic demand.

Due to the continuing expansion of cities with the development of societies and technology through the ages make the existing transportation systems are not sufficient to meet the increasing demands due to the difficulty and the complexity of the daily movements of people and goods. To provide the flow of traffic freely and safely from one place to another without encountering any congestion problem, it might be necessary to improve the existing transportation facilities or to provide new facilities.

The first thing that should be tried is to look for alternatives of improving the existing facilities. Second thing that should be focused on is the factor of economy. Construction of new facilities needs very large expenses. Construction of a new facility needs long span of time and generally, this type of improvement is included in the long-range plans. All these points show the necessity of a comprehensive transportation planning within a regional area. The society demands increasing care and professional competence in the planning and operation of all transportation systems.

### II. GLOBAL POPULATION SCENARIO

In 1901 the world population was 1.6 billion. By 1960, it became 3 billion, and by 1987, 5 billion and in 1999, 6 billion. Currently, one billion people are added every 12 - 13 years. During the last decade there has been substantial decline in birth rate. The reasons for decline vary from society to society; urbanization, rising educational attainment, increasing employment among women, lower infant mortality are some major factors responsible for growing desire for smaller families; increasing awareness and improved access to contraception have made it possible for the majority of the couple to achieve the desired family size.

### III. CITY SCENARIO

Ahmedabad is having population of about 56 lakhs (2011), highest in Gujarat and decade's growth is 20%. Traffic is increasing day by day. The city transportation is mainly dependent on roadway system. Vehicle growth has been rapid. The network is expressing heavy congestion. Consequently air pollution has become severe. Traffic chaos is the most obvious side effect of WEST Ahmedabad.

### IV. STUDY AREA

West Ahmedabad is separated from the other parts of the city by Sabarmati River. There are plenty of residential colonies located in this region. The place also boasts of housing some reputed colleges, which are world renowned. The region also flaunts good network of roads. Sardar Patel Stadium is housed here. This part of Ahmedabad is primarily a residential region with prominent educational institutes. Total area of West ahmedabad is 65.68 sqkm

- Navarangapura is a locality in Ahmedabad which houses various government offices like office of Tourism Corporation of Gujarat, High Court and Income Tax office.
- Sabarmati is a renowned place in northern part of Ahmedabad. Divided into two parts by National Highway No. 8A
- New wadaj is connected to other corners of the city by Vadaj Low Level Bridge. Ashram road and Dr. Chinubhai Patel Road are major connecting roads here. The airport is located at a distance of 25 kilometer from new wadaj.
- Naranpura is one of the oldest areas in the city. It is a residential locality. A railway line passes by this place to form its boundary.

### V. NEED OF THE STUDY

The Western part of the city has developed as a mainly residential area and the eastern part has the industrial estates. Because of this, the traffic flow is very heavy from west to east in the mornings and vice-versa in the evening, which causes serious traffic congestion and frequent traffic jams on the city roads during morning and evening peak periods.

In ahmedabad of every 100 amdavadis only 15 to 18 go for the existing public transport system, namely, rickshaw, old buses of ahmedabad municipal transport services. currently two mass transportation system is working now in west ahmedabad AMTS and BRTS, these two system will be not sufficient in nearby future, The rest rely on their personal two- and four-wheelers, far too many if you consider the ideal percentage of 55-60 per cent who should be using public transport mode in any city.

Also due to the continuing expansion of cities with the development of societies and technology through the ages make the existing transportation systems are not sufficient to meet the increasing demands. To provide the flow of traffic freely and safely from one place to another without encountering any congestion problem, it might be necessary to improve the existing transportation facilities or to provide new facilities. Also due to increasing number of vehicles around 10 to 15 per cent accidents took place on BRTS tracks

### VI. METHODOLOGY

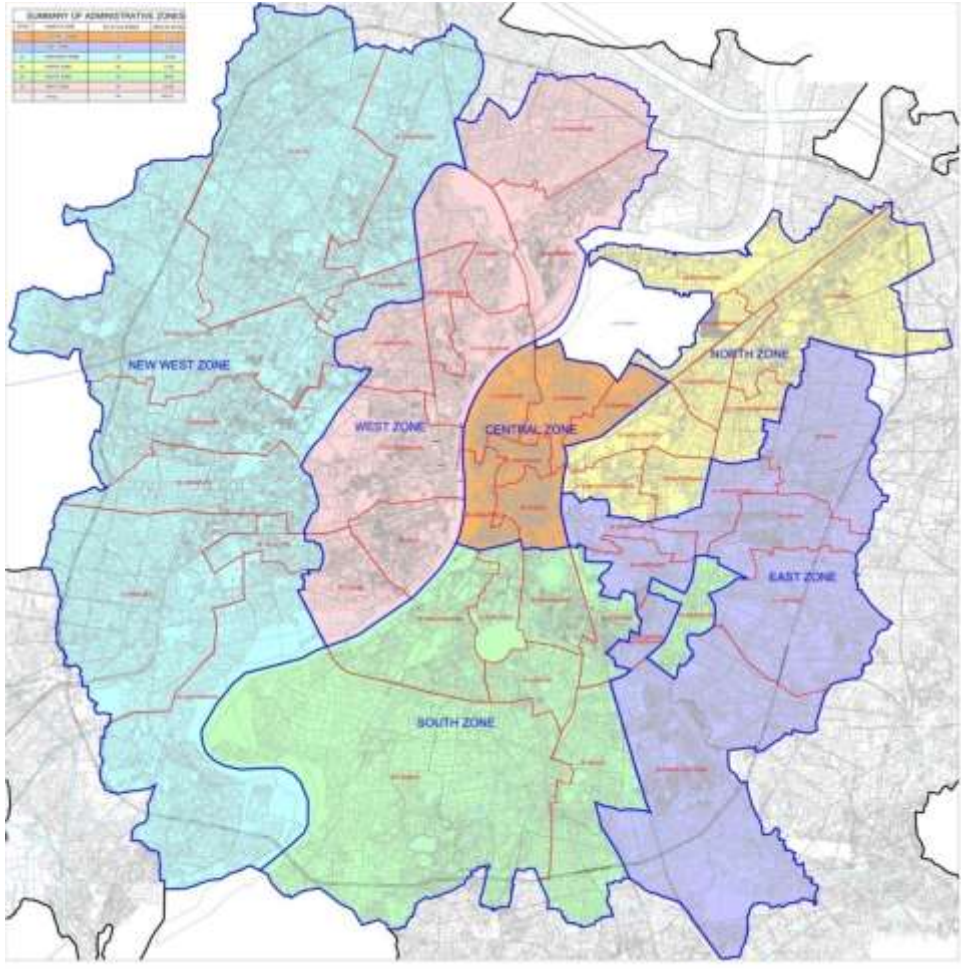
It is required to frame the methodology to be followed before starting the actual research work. For planning any transportation system for future traffic forecasting is very important, household survey is very important part here, data works as raw material for analysis, planner and design maker. Without qualitative and detail data, scientific analysis becomes difficult.

Whole west Ahmedabad will be divided in total 9 zones, zoning will be done as election wards. Zone detail is as under.

*Table 1 Zone names*

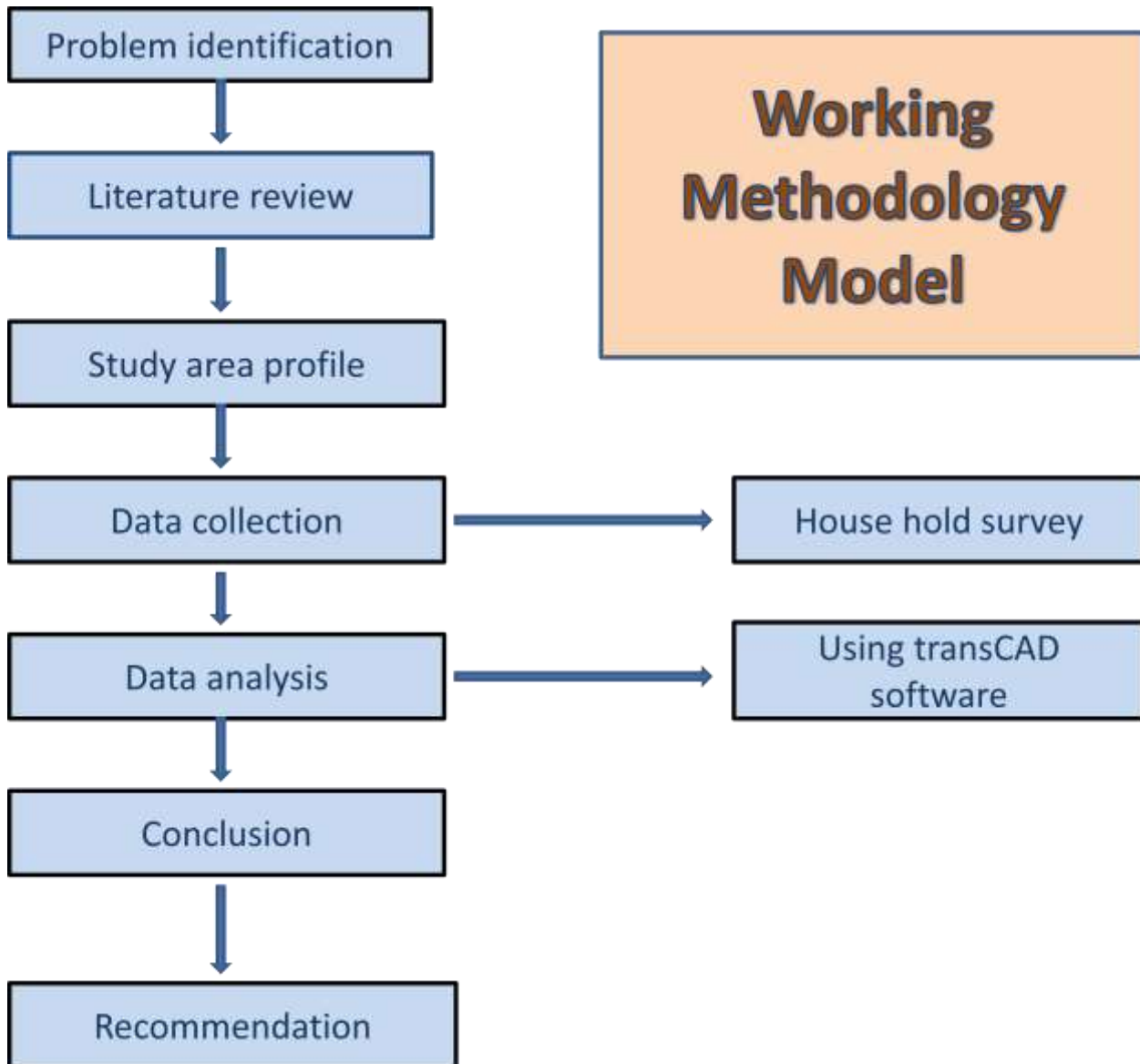
Zone no.	Zone name	Area (Sq.Km.)
3	Chandkheda	11.9
9	Naranpura	4.91
18	Navarangpura	11.98
6	nava vadaj	3.17
30	Paldi	5.58
5	Ranip	7.55
4	Sabarmati	9.78

10	Sardar patel stadium	5.24
31	Vasna	5.57
	Total	65.68



**Figure 1. Ahmedabad Map (Ward boundary)**

To achieve the objectives a methodology is framed. Complete flowchart of each activity showing various stages involved is shown in fig. For this work study area is to identified for collecting data. Main stretches of the study area identify the problems, such as delay in travel time, loss of fuel consumption, air pollution, noise pollution. Traffic data are collected from location and is used for analysis purpose. Economic evaluation is carried out for the traffic data to find travel time saving and fuel saving.



Forms for household survey are as under.

**APPENDIX A**  
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**HOME INTERVIEW SURVEY**

A Code      Z No.      HH No.

Form No :

Date :

Name of Interviewer : \_\_\_\_\_

Study area :

### A. Household Information

1. Interview Address : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. Total No. of Persons in House :

No. Of Male      No. Of Female

3. No. Of Floor In Building :

<input type="text"/>	<input type="text"/>
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4. No of employed :

5. No of students :

6. Vehicle Ownership :

Cycles

Cars

Bikes

Others

7. Land Use :

<b><u>B.House Hold Composition</u></b>																				
<b>House Hold composition</b>					<b>Occupation</b>					Income (Monthly)	Trip No./day	<b>Trip Time (0 - 24 Hrs)</b>		Length (km)	Mode Of Travel	Purpose	Origin	Destination	Route	Cost (Rs.)
Sr. No	Name	Relationship to Head of House	sex (M/ F)	Age	Service	Business	Workers	Education	Others			Starting Hours	Ending Hours							
1																				
2																				
3																				
Nearest Bus Stand :					Bus Stand Distance :							Distance From CBD :								

## **VII. CONCLUSION**

Following conclusion are made from the above study-

1. Numbers of vehicles are increasing day by day as personal vehicles in form of two wheelers and four wheelers.
2. Current mass transportation infrastructure will be not sufficient for future.
3. Household survey should be hold in west zone of Ahmedabad.
4. GIS database of waste ahmedabad will be prepare in TransCAD.

## **VIII. ACKNOWLEDGEMENT**

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