Routing of Public Transportation on Rural Road Network (A Case Study of Visavadar Taluka)

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Abstract— For efficient transportation network plays an important role in the overall development of country's economy. The development of rural infrastructure is essential for the sustainable development of rural economy and also welfare of the rural poor. A number of recent studies indicated that the rate of growth of rural incomes and reduction in rural poverty are strongly influenced by the provision of rural road connectivity. Road is the dominant mode of transportation in the nation in view of its flexibility, service provide as door to door, speed of delivery and being open to public and private mode of transportation. The rural population is completely dependent on the available bus transportation system, creating a important role for rural bus service in the economic growth and development of the country. The bus transit is cheaper in terms of fuel consumption, emission caused per person-km and road space utilization. It generates employment opportunities for transport sector. Therefore by keeping basic needs like schools, hospitals, post offices, etc. in order to develop the economy status and to provide the basic needs to village, population within accessible distance, it is the time to develop a new planning of rural roads to connect all the villages. The scope of study includes the literature review and various types of survey used in Transportation Planning. The area to be covered in the study of above transportation problem should be Visavadar town and its surrounding area. The Origin Destination, Traffic Volume, Road Side Interview and other surveys are to be carried out. As the database is essential part in decision making, Characteristics of road side interview survey such as trip duration, number of trips, purpose of trip and pavement condition are used to determine the requirement of public transportation. At the end of this study, routing of public transportation at Visavadar Taluka and surrounding areas are given according to the analysis of the survey results mentioned above.

Key words: Rural Infrastructure, O & D Survey, Road Side Interview Survey, Traffic Volume Survey, Routing of Public Transportation

I. INTRODUCTION

An efficient transportation network plays an important role in the overall development of a country's economy. Whenever an organization, in the business for providing mobility, is entrusted with moving goods and peoples a natural question that arises is how efficiently that organization can provide the services. This basic requirement of efficient mobility of goods and passengers gives rise to, among many other things, the subject areas of optimal routing. Rural road connectivity is a critical component of our overall development of rural infrastructure. It promotes access to economic and social services and facilitates the growth processes in our rural economy. Recent studies have indicated that spending to improve rural roads has a greater impact on poverty reduction than expenditure on agricultural research, irrigation, power, health, water, and even education.

Transit agencies are providing services to passengers within town and their suburbs through different modes such as buses, trains, cars etc. Although these transit agencies are major contributors to any economy, they operate under severe operating constraints and it would seem reasonable to believe that this can be attributed to inefficient use of resources. Transportation planning involves generally four – step regional travel forecasting planning model as shown below:

II. PRESENT SCENARIO OF RURAL ROAD TRANSPORTATION IN INDIA

In India, rural roads are defined as the roads with low traffic volumes, low geometric and construction standards, and also passing through rural areas. In India there are about 6 lakh villages spread over 3.28 million square kilometres area. According to the recent study by Planning Commission, only three-fifths of the nearly 6 lakh villages are known to be connected by all weather roads. Considerable length of rural roads has been constructed under a host of rural development programmes, especially for Community Development Programmes for Rural Roads, Food for Work Programme, Minimum Needs Programme (MNP), etc. (Lakshmana Rao and Jayasree, 2005).

III. IMPORTANCE OF BUS ROUTING

The transit routing problem is quite distinct from the vehicle routing problems. The purpose of transit routing is to determine a good set of routes. Transit routing is different from the vehicle routing problems because of (i) the vehicle being routed, in this case a bus, does not have to visit the actual points of demand (i.e., the points where the demand arises), rather the points of demand re-adjust themselves (by gathering at a bus stop) to avail of the services; (ii) the demand need not be satisfied using one route, one can transfer (from one route to another) in order to reach ones final destination; and (iii) it is not necessary that all demand for travel be met. Given these differences, the criteria which define a good route, or more correctly, a good set of routes are different from the vehicle routing problems. The problem of designing a good or efficient route set (or route network) for a transit system is a difficult optimization problem which does not lend itself readily to mathematical programming formulations and solutions using traditional techniques (Chakroborty, 1995).

Routing is the process for selecting paths in a network along which to send network traffic. And also The need for bus route evaluation standards is universal. Even in

the most organized and well-run bus operations, services and routes exist that are seriously out of conformance with the rest of the system. Having standards for bus route evaluation provides an objective basis for the requisite decisions for sustained operation.

IV. BASIC CONCEPT OF RURAL ROAD TRANSPORT PLANNING

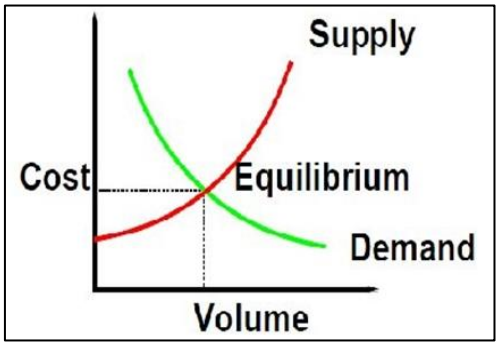
Mode Choice problem has been approached by transportation planners in many different ways. The vehicle routing problem (VRP) is the combinatorial optimization and integer programming problem seeking to service a number of customers with a fleet of vehicles. The literature in performance measurement of Public Transit Systems is reviewed in this chapter, specifically speaking the case of bus transit networks.

V. TRANSPORT MODELING

Transportation planning essentially involves the development for the transport model which will accurately represent both the current as well as future transportation system. Modelling is an important part of any large scale decision making process in any system. There are large numbers of factors that affect the performance of the system. Modelling can be physical, symbolic, or mathematical in physical model one would make physical representation of the reality. For example, drawing time-space diagram of vehicle movement is the good example of symbolic models. Mathematical model is most common type when with the help of variables, parameters, and equations one could represent highly complex relations. Newton's equations of motion or Einstein's equation $E = m*c^2$ can be considered as examples of mathematical model. No model is a perfect representation of the reality. Transport modelling is the study of the behaviour of individuals in making decisions regarding the provision and use of transport. Therefore, unlike other engineering models, transport modelling tools have evolved from many disciplines like economics, psychology, geography, sociology, and statistics (Mathew and Rao, 2007).

VI. TRANSPORT DEMAND & SUPPLY

The concept of demand and supply is fundamental to economic theory and it is widely applied in the field to transport economics. In the area of travel demand and the associated supply of transport infrastructure, the notions of demand and supply could be applied. However, we must be aware of the fact that the transport demand is a derived demand, and not a need in itself.



VII. TRAVEL DEMAND MODELING

Travel demand modelling aims to establish the spatial distribution of travel explicitly by means of an appropriate system of zones. Modelling of demand thus implies the procedure for predicting what travel decisions people would like to make given the generalized travel cost of each alternatives. The base decisions include the choice of destination, the choice of mode, and the choice of route. Although various modelling approaches are adopted (Mathew and Rao, 2007).Basically travel demand modelling consist trip generation, trip distribution, model split and traffic assignment. An integrated transit-oriented travel demand modelling procedure within the framework of GIS has been done by Choi and Jang (2000). Focusing on transit network development, this paper presents both the procedure and algorithm for automatic generation of both link and line data for transit demand modelling from the conventional street network data using spatial analysis and dynamic segmentation.

VIII. DATA COLLECTION & ANALYSIS

Data Collection and Analysis process is most important part of the thesis to accomplice the objectives with proper effectiveness. For providing public transport facility various surveys has carried out such as classified volume count and road side interview survey and collect the data for the same. Data analysis portion is give the idea about the traffic pattern, traffic characteristics, and actual traffic flow.

IX. ANALYSIS OF STUDY AREA

The study area need not be confirmed by political boundaries, but bounded by the area influenced by the transportation systems. The boundary of the study area is defined by what is called as external cordon or simply the cordon line. It is a sample of the zoning of a study area. Interactions with the area outside the cordon are defined via external stations which effectively serve as doorways to trips, into, out of, and through the study area. In short, study area should be defined such that majority of trips have their origin and destination in the study area and should be bigger than the area-of-interest covering the transportation project (Mathew and Rao, 2007).

Visavadar is a Taluka in junagadh District of Gujarat state, india. It is located at 21.38°N 70.68°E. It has an average elevation of 91 metres (298 feet). As of 2001 India census, Total population of visavadar taluka is 132,835 living in 24,597 houses spread across total 91 villages and 77 panchayats. Visavadar town had a population of 18,048. Males constitute 51% of the population and females 49%. Visavadar has an average literacy rate of 71%, higher than the national average of 59.5%: male literacy is 77%, and female literacy is 65%. In Visavadar, 12% of the population is under 6 years of age. It is in the 144 m elevation (altitude).

Zone- 1	Zone- 2	Zone- 3	Zone- 4
KUBA	VEKARIYA	PREMPARA	SARSAI
DHEBAR	KALSARI	PIYAVA GIR	TIMBO KINJARDA
JAMBUDI	KALAVAD	JALWADI	DADAR
NANI	LILAPUR	DUDHALA	BARADIY

PINDAKHAI			A
BHALGAM	BHUTADI	RAJPARA	JAMBALA
CHHELANKA	AMBALA	-	-
MOTA KOTDA	-	-	-

X. DATA COLLECTION

Villages of visavadar taluka where no any public transport facility are divided in four zones. Zone-1 includes villages such kuba, dheber, jambudi, nani pindakhai, bhalgam, chhelanka, and mota kotda. Zone-2 includes vekariya, kalsari, kalavad, lilapur, bhutdi, and ambala. Zone-3 includes prempara, piyavagir, jalwadi, dudhala, rajpara. Zone-4 includes sarsai, timbo kinjarda, moti monpar, dadar, baradiya, jambala. At particular location of visavadar town survey has carried out in which CVC and OD survey includes .shown in fig,

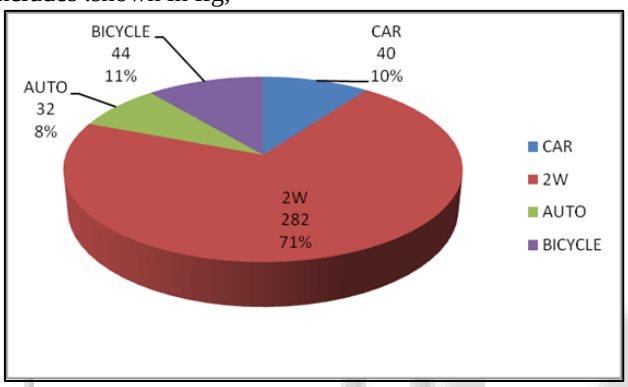


Fig. 1: Data Analysis for zone- 1

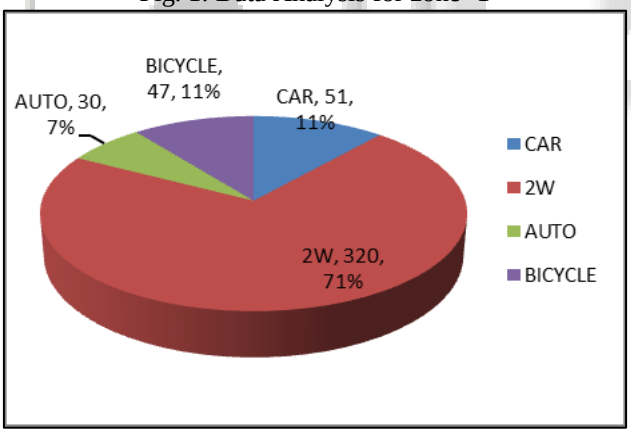


Fig. 2: Data Analysis for zone- 2

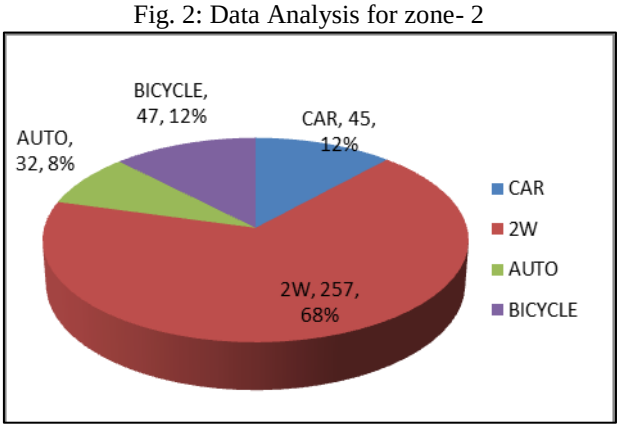


Fig. 3: Data Analysis for zone- 3

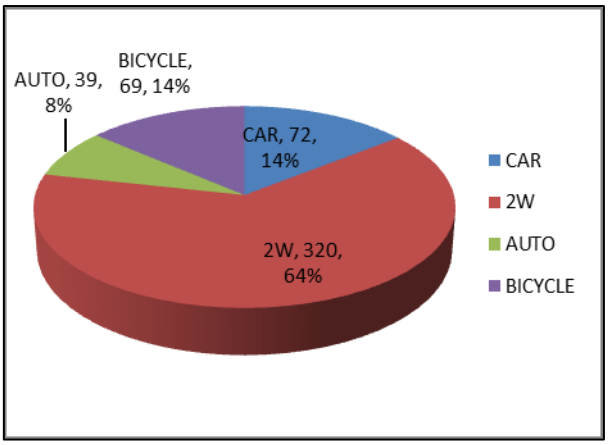


Fig. 4: Data Analysis for zone- 4

XI. SUMMARY & CONCLUSIONS

A. *Summary*

The provider provides transit services through the bus route, which is consumed by the passenger or the user who use that bus route. While providing services, the provider also impacts the society through these bus routes. As the bus route relates to the provider, the user and to society as well, it is used as the unit of analysis to measure performance of the Transit agency taking into account these perspectives.

In this research, a network of interlinked nodes is used to represent a bus route and this network represents the provider, passenger and societal perspectives. Performance is then evaluated for this network.

XII. CONCLUSIONS

The study area- visavadar taluka has been divided in to 4 transportation analysis zones based on population density.

The optimum bus routes to provide maximum service to selected zone wise villages such as, in zone-1inclides kuba, dheber, jambudi, nanipindakhai, bhalgam, chelanka, mota kotda. Zone-2 included vekariya, kalsari, kalawad, lilapur, bhutdi, ambala.zone-3 included prempara, jalwadi,piyava, dudhala, rajpara.zone-4 inclided sarsai, timbo kinjarda, motimonpari, dadar, bardiya, jambala.

And provide the effective and efficient public transportation facilities in visavadar taluka and surrounding area of its.

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REFERENCES

[1] Chakroboty, P., Deb, K., and Subramanyam, P. (1995), "Optimal Scheduling of Urban Transit System

Using Genetic Algorithms", ASCE Journal of Transportation Engineering, 121(6), 544-553.
[2] Daya Krishnankutty, "Rural Road Network Planning for Kasargod District", M.Tech thesis submitted to Calicut University, (1997).
[3] Denis Sipus, Borna Abramovic, "The possibility of using public transport in rural area" university of Zagreb,croatia (2017).

