Developing the Accessibility Levels of Rural Area

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Abstract:- The Rural public transportation is insufficient, accessibility is very much required in countries like India for the movement of passenger and goods .to nearby towns with in aspects of public participation, for overall development. Rural areas are suffering from transport problems such as inadequate transport facilities in terms of shortage of buses and non-availability of services. Present study focused to increase the public transport accessibility in safe and efficient way and also meeting future demand upto 2018 for study area

Keywords:- Rural regions, Accessibility, Public transport , Surveys, Quality data.

I. INTRODUCTION

Transportation has an important role to play in the conditions that affect global, national and regional economic entities. It is a strategic infrastructure that is so embedded in the socio-economic life of individuals, institutions and corporations that it is often invisible to the consumer, but always part of all economic and social functions. Transport routes are established to distribute resources between places where they are abundant and places where they are scarce, but only if the costs are lower than the benefits. Transportation studies are multidisciplinary that can involve engineering, behavioral, and economic aspects depending on the dimension being investigated such as operational management or planning. One of the current issues pertaining to rural traffic is the role of public transport. The recent studies says that the environmental quality of the roads and the lack of frequency of buses have brought the need for an efficient rural accessibility planning.

Rural Accessibility defines access needs of rural households in relation to the basic social and economic services a household requires with respect to mobility needs, it pays attention to: The purpose for which people travel, The availability of public transport services, The condition of the transport infrastructure, local level roads, footpaths, footbridges. The means by which people transport themselves and their goods, foot, bicycles, animals etc. The availability of social and economic services in relation to population density.

II. STUDY AREA

The area proposed for the study is within the srikakulam district. The study area is between Rajam – Srikakulam. It is located between latitudes and longitudes of (Rajam) 18.2800° N, 83.4000° E and(Srikakulam) 18.3000° N, 80.9000° E. The population of the study area is 7480 and people living in this area their major occupation is daily labour and farming. The small population and absence of major transport facilities made the Governments to pay little attention to the provision of public facilities in the area and particularly the development of modern transport network. As noted by accessibility levels are poor in zones.

III. DATA COLLECTION

Household survey questionnaire was designed to obtain information mainly about the trip details of the family members, the importance put on easy accessibility to different activity centers by the respondents and the satisfaction levels with the existing accessibility level.The on-board survey was conducted to assess customer travel behaviour. The surveyor will be asked customers to evaluate various elements of service as well as overall satisfaction, with the ultimate purpose of measuring the impact of the public transport on customer requirements compared to standard local bus service. Specific questions focused on customer behaviour, including trip origins and destinations and frequency of public transport use.

The villagers were asked to express their opinion in the form of satisfaction levels with the accessibility to various activities. The interview was conducted on one village at a time. At least one person from the research team was always present to guide the interviewers in case of any doubts and difficulties. At the end of a day, the data collected by different persons were checked. In case of some abnormal responses, the concerned interviewers were sent back the next day to verify

IV. SAMPLE SIZE AND CONDUCT OF THE SURVEY

The zones located for sample collection in the main route i.e. Rajam-Srikakulam corridor. For this study, a field work was carried out and household & onboard based surveys were conducted in the area along the route. For collecting the data, 7 enumerators were hired. After having them well trained, a pilot survey was conducted to study how people would respond to the questionnaire so that adjustments or change in the questionnaire is done, then the main survey was conducted.

For household survey sample size is taken as 435 for each and every village , for onboard survey sample size was taken as 200 for each zone, based on the sample questionnaires were distributed to the respondents and the details are shown in table 1.

Table .1 Village wise data collection as per bureau of public roads.

Name of Village	Population	Number of households	Number of households interviewed
Rajam	850	322	170
Antakapalli	252	110	22
Pogiri	485	307	62
Palakandyam	343	211	43
Santa Uriti	240	105	21
Anandapuram	235	95	19
Ponduru	647	412	83
Rapaka	657	462	93
Reddipeta	826	316	63
Lolugu	673	286	53
Chilakapalem	783	530	106
Echerla	542	218	44
Srikakulam	947	498	100

V. TRIP CHARACTERSTICS

A. Trip purpose

From the total trips was collected as a part of the travel characteristics of the users and this was segregated based on work trip, academic, shopping and entertainment etc. The trip purpose composition is as shown in Figure.1. Among all the trips office and college trips are more.
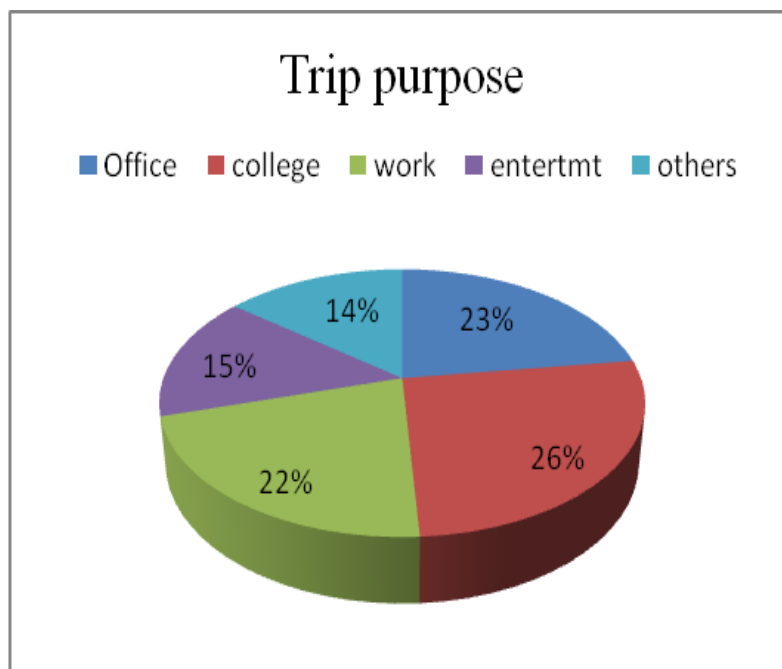

Fig 1 : shows trip purpose

B. Trip length

The trip lengths are collected from the onboard survey, the data obtained was presented in Figure 2. Among all trip lengths, it has been observed that more than 30 km trip lengths were high in number and less than 5 km trip lengths are low in number.
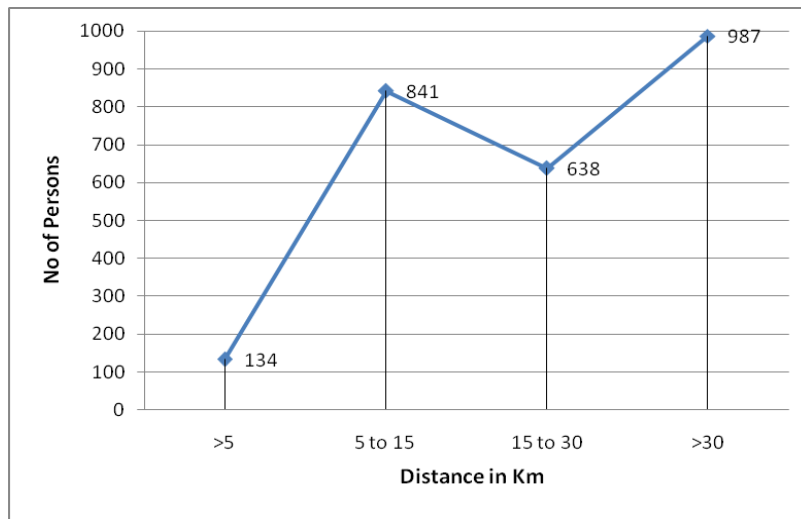

Fig 2 : shows trip length

C. Income ranges

The income of each group is categorized from the stated preference survey and the Figure 3 below indicates the income ranges of each individual group, 49% of the income group in the range between 10 to 15 thousand Indian rupees.
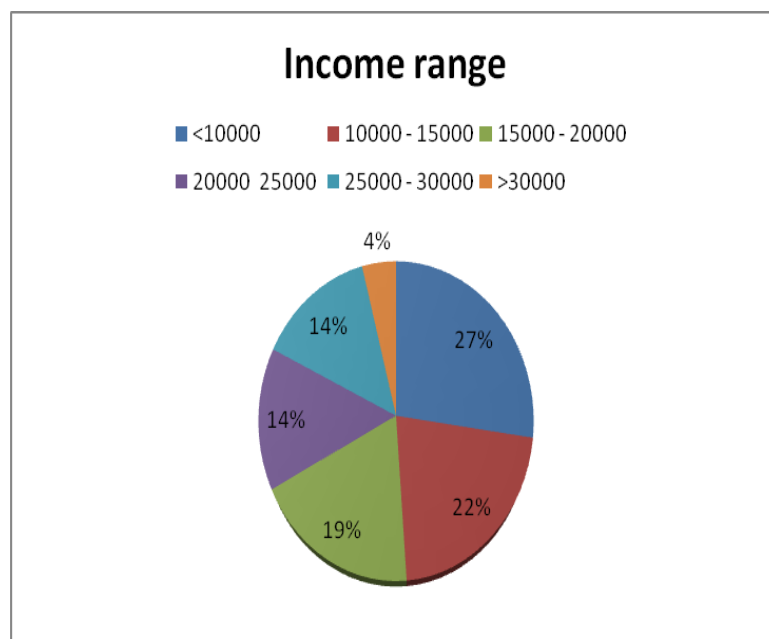

Fig 3 : shows the Income ranges

VI.   DETERMINING THE LEVELS OF ACCESSIBILITY

Accessibility is interpreted at the local scale and at a personal level in terms of people's ability to gain access to certain facilities relative to the ability of the prevailing transport system to overcome the distance barriers involved. In order to determine the weights of different activities the data collected through the household interview survey and onboard survey was utilized. By taking the sample size from each zone and they are divided by the total number of the questionnaires while doing the survey, from that we get the weightage of activities The analysis was carried out village-wise. It has already been mentioned that the respondents were asked to rate each activity.

Based on the weights and present accessibility to different activities obtained as shown in Table 2, the levels of accessibility are calculated for the 13 villages in the study area using equation . The results obtained are shown below

Overall accessibility levels are calculated by using the following equation

$$OAL = \sum_{i=1}^{n} W_i V_i$$

Where
N = Number of basic activities required by individuals in the study area as obtained by interviewing.
W_i = importance (weight) associated with the accessibility to the i th activity.
V_i = present level of accessibility to the i th activity

Table 2. shows the total trips of each activities

Activities	Total No of Trips
Office	593
Work	682
College	557
Entertainment	395
Others	373

After taking the sample size and separating trips from each and every village the weightage for each every activity is calculated by dividing the total trip by 2600(sample size)they are given below

W_i = Weightage for the each activities are taken as
Office = 0.22
College = 0.26
Work = 0.21
Entertainment = 0.15
Others =0.14

Based on the ranges accessibility levels are determined they are given below

Table 3. Shows the OAL ranges

Level	Range
Good	50
Moderate	45
Poor	40

(Source : Urban transportation planning by Dr.Thamiz Arasan)

After determining the OAL in the study area the following areas are having poor accessibility levels , comparing to the remaining areas.

Table 4. Shows the OAL

Palakandyam	Santa uriti	Reddipeta	Lolugu	Echrla
41.7	38.2	41.6	39	38.3

VII. MEASURES TO INCREASE THE ACCESSIBILITY LEVELS

a) It has already been shown (Table 6.3) that the overall accessibility levels of all the villages in the study area are poor. The methodology developed in this study helps to suggest the measures to be taken to increase the overall accessibility of a selected village or the study area as a whole.

b) It would be appropriate if the activities are considered one by one in descending order of their weights. The impact on overall accessibility level will be the highest with a unit increase in accessibility level to the activity with highest weight.

c) In this study the accessibility to college has been given the highest weight with a value of 0.26 by the respondents. However, the accessibility levels with existing levels have been found to be poor santa uriti, Reddipeta, Lolugu respectively.

d) One way to increase these values is to provide better accessibility to work and office activities , which can be achieved by providing a few more buses and bus stops in the villages or by providing better

transport facilities to the existing points. Better transport facilities may be provided by better roads and provision of motorized or non-motorized vehicles.

e) In this way, it is possible to identify the necessities in the villages against all the activities. Since the weights, and overall accessibility levels are expressed numerically, the methodology helps the policy and decision makers to numerically calculate the improvement in the study area.

VIII.   TRAVEL DEMAND MODELING

Travel demand modeling aims to establish the spatial distribution of travel by zones. This model implies a 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 the mode.

A.   Frater's Growth Factor Model

According to this method, the total trips for each zone are distributed to different activities, according to relative attractiveness of each movement. Thus, the future trips estimated for any zone would be distributed to the movements involving that zone in proportion to the existing trips between it and each other zone

B.   Assessment of growth factor

The assessment of growth factor is taken from the growth of population, here we are taken 5 years for future trip generation and the value is 4.9.% is the maximum growth in the past five years and in proportion to the expected growth of each other zone. it is calculated by using equation

$$T_{i-j} = t_{i-j} \times \frac{P_i}{p_i} \times \frac{A_j}{a_j} \times \frac{\sum\limits_{i-k}^{k} t_{i-k}}{\sum\limits^{k} \left[\dfrac{A_k}{a_k}\right] \times t_{i-k}}$$

Where

T_{i-j}	=	Future trips from zone i to zone j
t_{i-j}	=	Present trips from zone i to zone j
P_i	=	Future trips produced at zone i
p_i	=	Present trips attracted at zone i
A_i	=	Future trips attracted to zone j
a_j	=	Present trips attracted to j
k	=	Total numbers of zones

Table 5. Shows the future trips

Palakandyam	Santa Uriti	Reddipeta	Lolugu	Echerla
1042.3	1079.8	3551.7	3391.5	6430.5

C. Distinguishing of cost based on the mode choice

The given individual traveler offered by a given mode of choice (i.e., Trip , mode , route) measuring the preference the traveler attaches to that particular choice. Considering the trips generated from growth factor model and taking the vehicle operating costs(VOC) from the code IRC SP : 30. The cost of each mode (2W , 3W ,4W , Bus) per trip and the total cost of the trips were calculated. The following are the vehicle operating costs(VOC) taken from the IRC SP : 30 (Manual on Economic Evaluation of highway projects in india).

Table 6. Shows the vehicle operating costs

Mode	VOC
2W	1.31
3W	2.21
4W	3.44
Bus	9.89

Table 7 Shows the cost of each and total trips

Place		Type of Vechicle	Distance in Km	VOC	Cost of each trip	No. of trips	Total cost of the trip
From	To						
Rajam	Antakapalli	2W	4	1.31	5.24	15.2	79.648
		3W		2.21	8.84	28	247.52
		4W		3.44	13.76	8.4	115.584
		Bus		9.89	39.56	46	1819.76
Rajam	Pogiri	2W	10	1.31	13.1	18	235.8
		3W		2.21	22.1	19	419.9
		4W		3.44	34.4	14.2	488.48
		Bus		9.89	98.9	26	2571.4
Rajam	Palkanya	2W	12	1.31	15.72	9	141.48
		3W		2.21	26.52	14	371.28
		4W		3.44	41.28	8	330.24
		Bus		9.89	118.68	13	1542.84
Rajam	Santhavuriti	2W	18	1.31	23.58	16	377.28
		3W		2.21	39.78	19	755.82
		4W		3.44	61.92	18.2	1126.944
		Bus		9.89	178.02	24	4272.48
Rajam	Agraharam	2W	22	1.31	28.82	25	720.5
		3W		2.21	48.62	21	1021.02
		4W		3.44	75.68	9	681.12
		Bus		9.89	217.58	22	4786.76
Rajam	Ponduru	2W	30	1.31	39.3	21	825.3
		3W		2.21	66.3	19.2	1272.96
		4W		3.44	103.2	19	1960.8
		Bus		9.89	296.7	27.2	8070.24
Rajam	Rapaka	2W	32	1.31	41.92	27	1131.84
		3W		2.21	70.72	34	2404.48
		4W		3.44	110.08	24	2641.92
		Bus		9.89	316.48	46	14558.08
Rajam	Reddi Petta	2W	40	1.31	52.4	68	3563.2
		3W		2.21	88.4	65	5746
		4W		3.44	137.6	42	5779.2
		Bus		9.89	395.6	87	34417.2
Rajam	Lollugu	2W	50	1.31	65.5	84	5502
		3W		2.21	110.5	91	10055.5
		4W		3.44	172	39	6708
		Bus		9.89	494.5	122	60329
Rajam	Chilakapalem	2W	64	1.31	83.84	110	9222.4
		3W		2.21	141.44	113	15982.72
		4W		3.44	220.16	124	27299.84
		Bus		9.89	632.96	164	103805.44
Rajam	Echerla	2W	72	1.31	94.32	94	8866.08
		3W		2.21	159.12	94.4	15020.928
		4W		3.44	247.68	107	26501.76
		Bus		9.89	712.08	117.3	83526.984
Rajam	Srikakulam	2W	80	1.31	104.8	190	19912
		3W		2.21	176.8	138	24398.4
		4W		3.44	275.2	144	39628.8
		Bus		9.89	791.2	289	228656.8

IX.   CONCLUSION

This work quantified the travel characteristics of people and identified the choice of mode of commuters in Rajam - Srikakulam. The data is collected by means of a household survey and onboard survey along the study area, which provided the information about their economic status and travel behavior of a sample population.

The study showed that the accessibility to basic needs in the study area is highly inadequate.

1. The average household size was 6 and trip length were observed as 20 km from their origin to destination points from each village and the respondents in Santa Uriti , Ponduru , Rapaka , lologu indicated higher importance ratings on accessibility to work, , educational facilities office in the study.

2. In the study area, villages having the problems with lack of frequency and time maintenance comparing to the other areas. And the villages, palakan dyam(41.7) Santa uriti (38.2) , Lolugu (39) , Reddipeta(41.6) and Echerla (38.3) are having low accessibility levels comparing to the ranges given in table 5.1.3.

3. The future trip generation with growth factor method shown maximum increase comparing with the present trips , highest is lolugu 11.4 times comparing to the other areas here the trip generation is very high

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