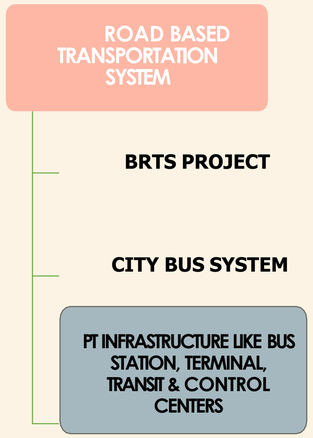
INTRODUCTION

- Public transportation includes all vehicle services designed to **transport commuters** on local and regional routes.
- Public transport systems will only include **rail,** or organized **bus based systems**.
- Public transport systems are characterized by **fixed origins** and **destinations**, **fixed routes** and **schedules, fixed stoppage points** and **fixed fares.**



ADVANTAGES OF PUBLIC TRANSPORT

Increased fuel efficiency

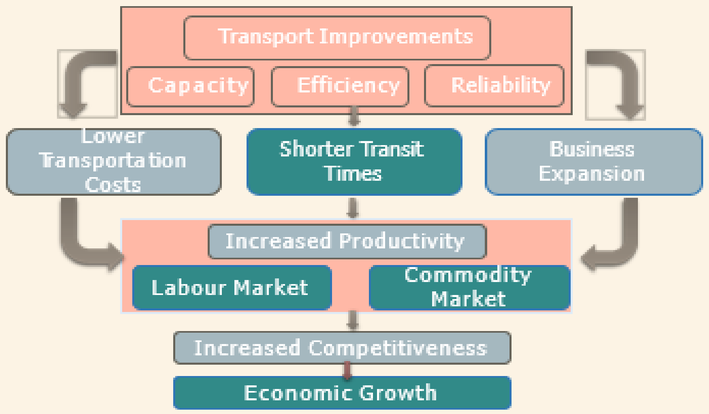
Less air pollution

Reduced traffic congestion

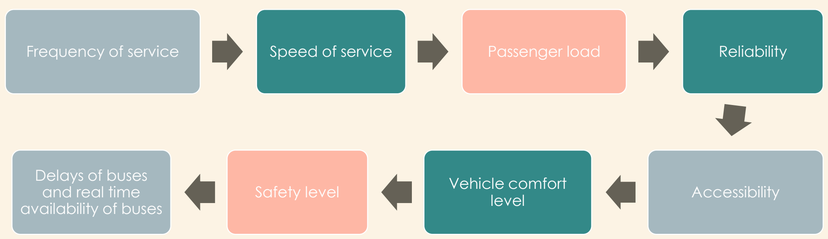
Saves money

Good alternatives for tourists

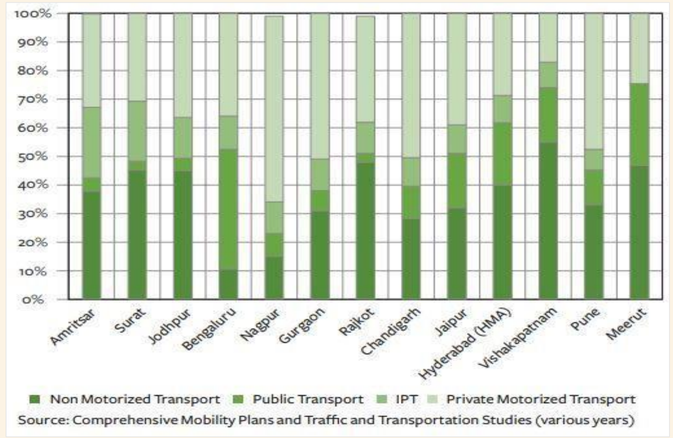
When transport systems are efficient, they provide **economic and social opportunities and benefits** that result in positive multiplier effects such as better accessibility to markets, employment, and additional investments.



FACTORS AFFECTING PUBLIC TRANSPORT



MODAL SHARE OF PT IN INDIAN CITIES:



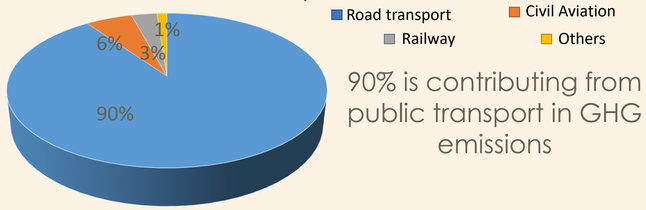
Source: Comprehensive Mobility Plans and Traffic and Transportation Studies (various years)

Public and Non-motorized transport modal share account for between **25-75%**of all trips.

GHG EMISSIONS FROM TRANSPORT SECTOR INDIA:

- Road transport is the most significant contributor to greenhouse gas emissions from the transport sector in India, with about 90 %of emissions.
- Greenhouse gas emissions from this sector mainly involved burning fossil fuels by on-road vehicles.
- 72 %of air pollution in Delhi is caused by vehicular emission

Source: Review of Urban Transportation in India 2015



90% is contributing from public transport in GHG emissions

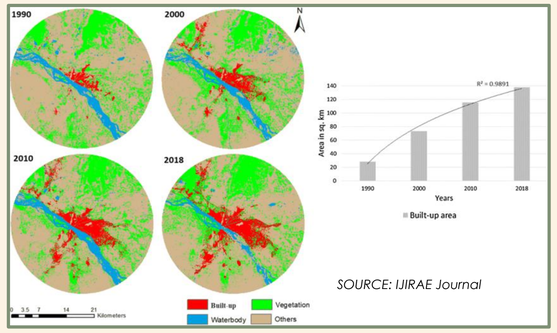
POLICIES BY INDIAN GOVERNMENT TO IMPROVE PUBLIC TRANSPORT

YEAR	POLICY
2005	Jawaharlal Nehru National Urban Renewal Mission (JNNURM)
2006	National Urban Transport Policy- 2006.
2010	National Road Safety Policy
2013	The National Electric Mobility Mission Plan
2016	scheme for strengthen public transport
2020	sustainable Urban Transport Policies

NEED FOR THE STUDY

- As the city of Vijayawada is growing very rapidly in terms of development population and economy the city needs a specific care in its growing development pattern.

YEAR	POPULATION
2011	14,76,931
2021	19,20,000
SOURCE: Census 2022	19,77,000
2023	20,36,000



SOURCE: IJIRAE Journal

CITY POPULATION (in million)	DESIRED SHARE OF PUBLIC TRASNPORT
Less than 1.0	30%
1	35%
1.5	40%
3	50%
6	70%
9	75% and above

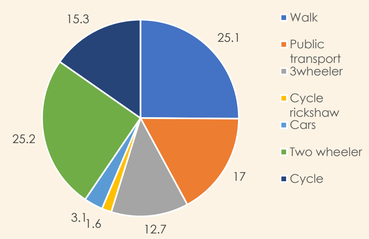
City size (Mill pop)	Desired Modes of travel
0.1 - 0.25	Non-motorized vehicles, motorized IPT,
0.25 - 0.5	Non-motorized vehicles, motorized IPT, public bus systems
0.5 – 1.0	Non-motorized vehicles, motorized IPT, public transport (buses)
1.0 – 5.0	Non-motorized vehicles, motorized IPT, high-capacity bus system, rail-based public transport
>5.0	Non-motorized vehicles, motorized IPT, and taxi systems, high-capacity bus system, rail-based system serving intercity trips.

Source: NTUP

Trip length (km)	Desired travel modes
0 – 2	Walk, bicycle, two-wheeler, cycle rickshaw
2 – 5	Bicycle, two-wheeler, car, cycle rickshaw
5 – 10	Bicycle, two-wheeler, car, three-wheeler, bus, taxi
10 – 15	Car, bus, taxi, metro/rail based
>15	Car, express bus, metro/rail based system, taxi

- Vijayawada has a population of around 2 million. So it require high-capacity bus system based public transport.
- Vijayawada has average trip length between 3 – 5 km.
- Bus terminal receives 3 lakh passengers each day and experiences an annual loss of roughly 90 lakh rupees.

Modal share of Vijayawada



- In the present city bus service, the main bus route ply through Bandar road, Eluru road, Ibrahimpatnam route, Prakasham road, milk factory route and nunna route. All other roads in the city have no bus services or poor service frequency. Each bus route has completely different frequency level leading to high waiting time in some area.
- Buses are **accessible** to **70%** of Vijayawada residents, however only **30% use** them.
- As of March 2017, there were **9,86,870** private vehicles registered in Vijayawada city overall. According to the results of the Andhra Pradesh Control Pollution Board, the monitored values of PM10, SO2, NO2, and ammonia were found to be within the NAAQS's standard levels for a 24-hour average. Only **the PM2.5 values**, which are 83 ug/m3, are found to be **above the NAAQS** standard limits of 60 ug/m3 for yearly averages.

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"ASSESSING THE FACTORS WHICH INFLUENCE THE UASAGE OF PUBLIC TRASNPORT UNDER DIFFERENT URBAN CHARACTERISTICS – CASE STUDY OF VIJAYAWADA"

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INTRODUCTION

AIM

To analysis the supply and demand indicators of public transport in different urban characteristics which hinders the public transportation dependency and improving supply of public transport which enhance public transportation ridership.

OBJECTIVES

- Assessing the existing public transportation characteristics.
- To delineate zones with low, moderate, and high public transport supply and understand the influence of urban characteristics of public transport usage.
- Analysis the existing pattern of public transport under urban characteristics
- To model the influence of urban characteristics on mode choice behavior.
- Recommending strategies for improving the ridership of public transport.

RESEARCH QUESTION

- ❑ What are the different factors which influence the mode choice behaviour of the public transport user?

HYPOTHESIS

- ❑ Improving public transportation supply which enhance the public transportation ridership.

SCOPE

- ❑ The scope of study is limited to only few areas in Vijayawada and we are tend to understand the influence of only road public transport to increase its ridership

LIMITATIONS

- ❑ Surveys are done on major bus routes of the study area to analyze the performance of city bus service

METHODOLOGY

LITERATURE STUDY →

1. "Assessing the factors that influence public transport mode preference and patronage: Perspectives of students of University of Cape Coast (UCC), Ghana"
2. "Factors Affecting the Interest of Urban Public Transport Users in Jember"
3. "Assessment of urban transport systems and services"

NEED OF THE STUDY → **BACKGROUND OF THE STUDY** →
- Review existing and factors influencing public transport
- Reasons of mode choice modelling & demand supply gap in PT
- Best Practices

SELECTION OF CASE AREA → **VIJAYAWADA** *(ASSESSING THE FACTORS WHICH INFLUENCE ON PUBLIC TRASNPORT UNDER DIFFERENT URBAN CHARACTERISTICS – CASE STUDY OF VIJAYAWADA)*

DEFINE AIM & OBJECTIVE → **AIM:** To analysis the supply and demand indicators of public transport in different urban characteristics which hinders the public transportation dependency and improving supply of public transport which enhance public transportation ridership.

ASSESSING THE EXISTING PUBLIC TRANSPORTATION CHARACTERISTICS.	→	Travel characteristics like trip length, trip purpose, travel time, mode of transport and public transportation characteristics like service coverage, bus fleet etc.	→ Through Household interview survey, public transport user survey
TO DELINEATE ZONES WITH LOW, MODERATE, AND HIGH PUBLIC TRANSPORT SUPPLY AND UNDERSTAND THE INFLUENCE OF URBAN CHARACTERISTICS OF PUBLIC TRANSPORT USAGE.	→	Urban Characteristics like population density, bus shelter density, land use and distance from CBD	→ Based on these we delineate zones using weighted index method
ANALYSIS THE EXISTING PATTERN OF PUBLIC TRANSPORT UNDER URBAN CHARACTERISTICS	→	From primary and secondary data we analysis the existing demand pattern	
TO MODEL THE INFLUENCE OF URBAN CHARACTERISTICS ON MODE CHOICE BEHAVIOR.	→	Logit model	
RECOMMENDING STRATEGIES FOR IMPROVING THE RIDERSHIP OF PUBLIC TRANSPORT.	→	Based on the analysis we will be recommending some proposals and strategies	

SCOPE

The scope of study is limited to only few areas in Vijayawada and we are tend to understand the influence of only road public transport to increase its ridership

LIMITATIONS

- ❑ Surveys are done on major bus routes of the study area to analyze the performance of city bus service.

URBAN CHARACTERISTICS in general definition means Population, Site, Function, land use, hierarchy of settlement , growth process, Heterogeneity, Politics, Work, Segmentation of personality, Regimentation, Social distance, Formality of relations, Anonymity, Mobility and transiency, Urban Facilities, Formal Social Interaction, Social Institutions and Social Organizations,economic mobility, High Standard of Living etc.

Urban characteristics according to our objective – Population density, Bus shelters density, land value and distance from CBD
Using these urban characteristics we delineate the wards.

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LITERATURE REVIEW

RESEARCH PAPER TITLE – "Assessing the factors that influence public transport mode preference and patronage: Perspectives of students of University of Cape Coast (UCC), Ghana"

TITLE	AUTHOR & YEAR	AIM	CASE AREA	DATA REQUIRED	DATA COLLECTION METHODS	ANALYSIS	PROPOSAL	CONCLUSION
Assessing the factors that influence public transport mode preference and patronage: Perspectives of students of University of Cape Coast (UCC), Ghana	Enoch F. Sam,Kofi Adu-Boshen,Kwaku Kissah Korsah - International development and Sustainability Volume 3 Number 2 (2014)	The study set out **to assess the factors that influence student** of the University of Cape Coast (UCC), **in their choice of public transport service operator**	University of Cape Coast (UCC), Ghana. **The study was conducted at five (5) main bus terminals** in cape coast namely pedu bus terminal, chapel square terminal, tantri terminal, Bakaano terminal and intercity STC yard	Background information of the respondents **like age, sex, destination, frequency of trips and service operator** survey questions like **reliability of bus/service provider, quality of in-vehicle experience, service availability, perceived safety of bus/accident record, comfort/ vehicle quality, fare affordability**	The data collection methodology in this study includes primary data collection. **Both quantitative and qualitative method** of data collection were employed in the study. Questionaries mainly semi-structed and close ended constituted the prominent data gathering instrument. However some I**ndividual-in-depth** were done with some students especially those who were press for time	The data collected from the field was **first cross-checked** and edited **to ensure the data given was relevant** for the purpose of the study. **The data was coded and fed into the computer. The Statistical product for service solution** was employed to process and **analyze the questionaries**. The IDIs was analyzed manually. The data form the Idls was transcribed, categorized under specific theme and used for the analysis. **Frequency distribution tables and cross tabulations were used to represent the results.**	Transport service operators **should improve on the services they provide to the public** and as well should **endeavor to ensure that their buses are safe, comfortable and reliable**. On the other hand efforts should be made to **charge fare which were within reach of the ordinary population. Increase their fleet and capacity during festival periods** as their huge demand. Improvement in these area **will help increase revenue and profit** and in the process **minimize the cost of operation and invariably the fare charged the passengers.**	From the study findings it could be concluded that the **issues of fare, perceived safety and accident record of a transport service operator, the comfort and vehicle quality as well as service reliability in terms of time schedules are the main criteria commuters in this case students look out for in deciding which public transport service operator to choose and as well played significant roles in the choices** these students made at the time. Moreover, students of University of Cape Coast, based on the ratings they to the **various transport service operators, prefer the Metro Mass Transit (MMT)Ltd and Intercity STC Coaches Ltd fleet compared to the other intercity transport service** operators enumerated **because they have relatively cheaper fares and are perceived as safe, as well as are comfortable and reliable** respectively.

RESEARCH PAPER TITLE – "Factors Affecting the Interest of Urban Public Transport Users in Jember"

TITLE	AUTHOR & YEAR	AIM	CASE AREA	DATA REQUIRED	DATA COLLECTION METHODS	ANALYSIS	PROPOSAL	CONCLUSION
Factors Affecting the Interest of Urban Public Transport Users in Jember	Willy Kriswardhana et al 2022 - IOP Conference Series: Earth and Environmental Science	The study mainly focus on **factors affecting peoples interest in using public transportation in Jember** decreasing with a low load factor value below 50%	Jember regency – This research was conducted at the location of the stop on the route of Lyn Tawang Alun – Campus, namely in the area around the city centre.	Respondent questionary include name, **gender, age, last education, occupation, monthly income, the purpose and purpose of the respondent's trip, the quality of public transportation services** in Jember Regency, and **factors influencing the selection of criteria for public transportation** services in Jember Regency and **number of fleets operating based on routes and vehicle codes.**	**Primary data** were obtained directly from the field by distributing questionnaires to service users. While **secondary data was obtained from the relevant agencies, namely the Department of Transportation Jember**.	Based on the results of the questionare data , further analysis was carried out using the **Analytical Hierarchy Process (AHP)** methods. It is used to **determine the weight of the factors that influence the interest of public transport users in Jember.** The effort to be made is to formulate a policy strategy to support people who originally use private transportation switching to public transportation.	In order to support the public's need for transportation and to maintain the stability of public transportation in Jember Regency, it is hoped that there will be an **update of the existing system** and the **improvement of services required to increase the interest of public transport users. Future studies can explore the demand for public transport** in Jember.	The results showed that there were 5 selected factors: **service coverage, Lyn information, safety, fare, and urban planning**. The **weights of the factors** that influence the interest of public transport users in Jember are **40% of the safety factor, 17% of the service coverage factor, 16% of the urban planning factor, 14% of the Lyn information factor, and 13% the fare factor.** The study's finding is aligned with our study, which finds that the **safety factor is the leading factor affecting people's interest in riding public transportation.** The essential factor that needs to be improved is the safety factor. Furthermore, there is a **need to broaden the coverage area** of public transportation.

RESEARCH PAPER TITLE – "Assessment of urban transport systems and services"

TITLE	AUTHOR & YEAR	AIM	CASE AREA	DATA REQUIRED	DATA COLLECTION METHODS	ANALYSIS	PROPOSAL	CONCLUSION
Assessment of urban transport systems and services	By the secretariat - Economic and Social Commission for Asia and the Pacific Committee on Transport - Bangkok, 19–21 November 2018	This document **contains status of urban transport systems and services in the region** and information on the **sustainable urban transport index for cities in Asia and the Pacific**, as well as **Challenges and issues related to intelligent transport system applications** are also reviewed	Asia-Pacific region like Bandung and Surabaya in Indonesia; Dhaka; Ho Chi Minh City, Viet Nam; Surat, India; and Suva	Urban transport details like **ridership, modal share, fleet of electric buses** etc. and **indicators of sustainable urban transport index like Traffic fatalities, Public transport quality and reliability, Operational costs of the public transport system, Air quality, Greenhouse gas emissions from transport, intermodal facilities and infrastructure for active modes and Modal share of active and public transport in commuting etc.**	The data collection methodology in this is from secondary sources like **Information collected during a mission to Surat from 25 to 27 July 2018, Global BRT Data, Statistical Yearbook for Asia and the Pacific 2016, Asian Development Bank, Sustainable Transport Initiative: Operational Plan (Manila, 2010).**	Sustainable urban transport **indicators on different scales need to be normalized before comparison and aggregation** are possible. **The linear rescaling method** that is applied for the index is a common approach in composite index design. This allows for a simple transformation to a **linear scale of 1–100** for each indicator. One of the important user-friendly outputs of the **analysis is the display of results in a spider diagram**. The visual display of the state of each indicator in a city easily allows policymakers to comprehend the system and focus on the indicators which have low values	The Committee on Transport is **invited to endorse the sustainable urban transport index** as a tool **to measure the sustainability of urban transport systems and services in cities and track improvements over time**. The Committee may **wish to acknowledge the potential advantages, challenges and issues regarding the development of intelligent transport systems**. The Committee may also wish **to support the planned activities on developing policy recommendations**	The secretariat published a study entitled **Policy Framework for the Use and Deployment of Intelligent Transport Systems in Asia and the Pacific in 2017**. The secretariat also published the **Review of Developments in Transport in Asia and the Pacific 2017**, which provided **qualitative comparative analysis by intelligent transport system**. The secretariat **is implementing a two-year intelligent transport system project funded by the Korea-ESCAP Cooperation Fund** and is planning to organize an expert group meeting and a regional meeting in 2019 to discuss guidelines for regulatory issues for its application.

PT SUPPLY INDICATORS

- Quality of public transportation services
- trip duration
- Reliability
- Fare
- network connectivity
- Information
- Comfort
- Safety
- Service coverage
- Infrastructure
- Age profile of the fleet
- Fuel efficiency
- Revenue
- Fleet utilization
- Accessibility
- staff's behaviour
- Capacity

PT DEMAND INDICATORS

- Traffic fatalities
- public transport quality and reliability
- Operational costs
- Air quality,
- Greenhouse gas
- Reliability of bus/ service provider,
- Quality of in-vehicle experience,
- Passengers foot fall
- Modal share
- Perceived safety of bus/ accident record,
- Comfort/ vehicle quality

SURVEYS

- Preference survey
- Stated preference survey
- Survey planning sampling
- Individual in-depth survey
- longitudinal surveys
- Household interview survey
- Corridor line survey
- Screen line survey
- Public transport user survey

MODE CHOICE MODELLING

- Mode choice model
- Choice Set Formation
- Statistical modelling
- Soft compute basicing
- Analytical hierarchy process
- Statistical product for solution service model
- Linear rescaling
- Fuzzy logic
- Discrete Choice Model
- Logit model
- Probit model

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STUDY AREA

DATA REQUIRED	PRIMARY / SECONDARY	OFFICES/SURVEYS
TRAVEL CHARACTERISTICS		
Trip length	Primary	Surveys
trip length frequency	Primary	Surveys
Mode of transport	Primary	Surveys
trip purpose	Primary	Surveys
travel time	Primary	Surveys
Travel cost	Primary	Surveys
transport expenses	Primary	Surveys
waiting time	Primary	Surveys
PUBLIC TRASNPORT CHARACTERISTICS		
Passenger footfall	Secondary	offices
Comfort level	Primary	Surveys
Service reliability	Primary	Surveys
security	Primary	Surveys
Punctuality	Primary	Surveys
URBAN CHARACTERISTICS		
Land use	Secondary	Offices/websites
Population density	Secondary	Offices/websites
Distance from CBD	Secondary	Offices/websites
Bus shelter density	Secondary	Offices/websites

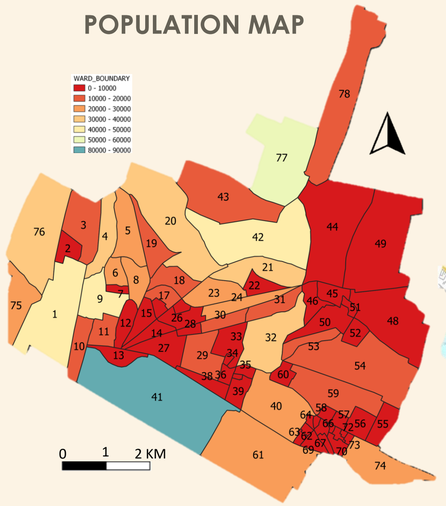
SURVEYS

- Household interview survey
- Public transport User survey

OFFICES

- Transport commissioner, AP,
- RTA VIJAYAWADA
- APSRTC NTR Administrative Block
- APSRTC City Bus Stand , VIJAYAWADA
- DTPC
- APCRDA
- Vijayawada municipal Corporation
- Vijayawada town planning department

POPULATION MAP



ROAD HIEARCHY MAP

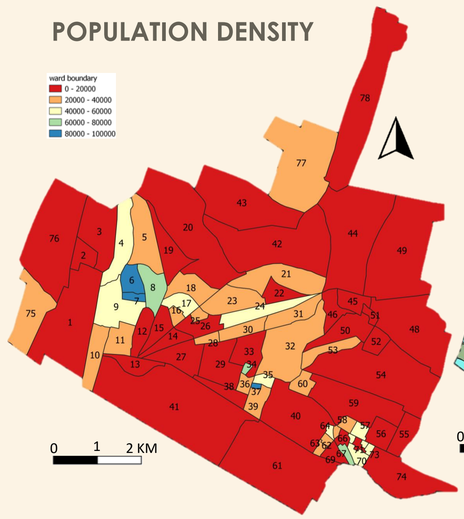
Vijayawada BRTS Project

The unused bus shelters are now hubs of mischief mongers and the at night the road becomes a track for bike races. The BRTS corridor is a perfect example of poor planning of the governments. The Congress government wasted crores on the project which is not suitable for congested cities like Vijayawada.

STUDY AREA

- **Vijayawada,** is a flourishing town in the **NTR District** of coastal **Andhra Pradesh with 78 wards of VMC area** 61.88 sq. km.
- It is **2nd largest city** in the state of Andhra Pradesh and34th **largest**
- It lies on the **banks of River Krishna** surrounded by the hills of Eastern Ghats known as Indrakeeladri Hills in Krishna District.
- **Vijayawada Metropolitan area** is delineated covering an area of **104.8 sq.km.**
- The city can be categorized as **Tier-I** and **Metropolitan city.**
- The Vijayawada City, commonly known as "Bezwada," is a city in Andhra Pradesh that is governed by the Andhra Pradesh Capital Regional Development Authority.
- Vijayawada has a population of **14.76 lakh people** and is one of the densely populated cities, with **over 31,200 inhabitants** per square km. The city occupies an area of **160 square kilometers**.

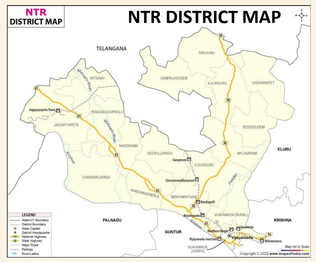
POPULATION DENSITY



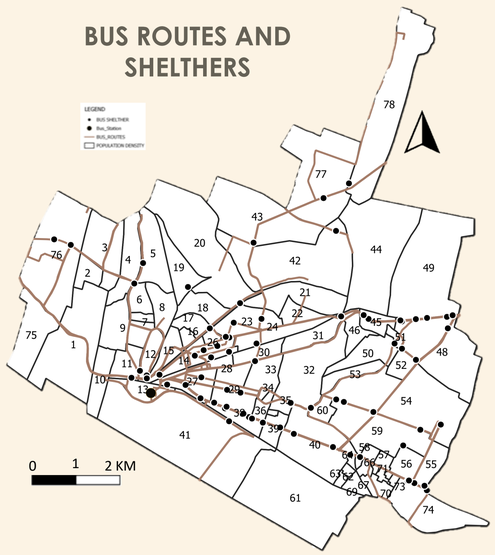
LAND USE MAP

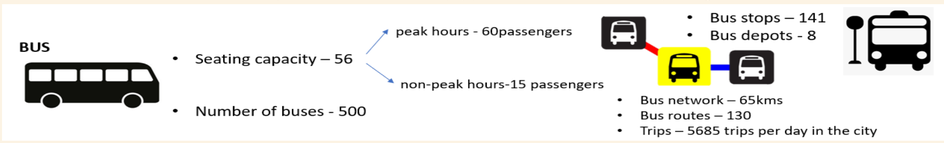
The BRTS corridor, that runs from Meesala Rajeswara Rao Bridge to Padavalarevu Gunadala, was proposed in 2005 by the then Congress government, relocating the Vijayawada-Gudivada railway line which passes through the city. Officials utilised the funds of JNNURM. The original proposal was to have a 15.5km-long corridor. The works of the project were completed in 2013 and officials started running BRTS bus services from Pandit Nehru Bus Station to the Benz circle covering around 15km. When the two-lane BRTS corridor constructed in the middle of Ring Road and Eluru Road started causing traffic snarls, the BRTS corridor was confined to a stretch of 4km from Pezzonipeta to Gunadala

SOURCE: https://timesofindia.indiatimes.com/city/vijayawada/once-a-corridor-for-buses-now-just-a-long-clothesline/articleshow/71988345.cms



BUS ROUTES AND SHELTHERS





WHY VIJAYAWADA?

- As Vijayawada is one of the largest city in the state of Andhra Pradesh.
- It is one of the major economic and cultural centres of the state
- City is experiencing fast growth as multifunctional national city.
- Vijayawada has a population of around 2 million. So it require high-capacity bus system
- It is one of the biggest and busiest bus terminals in the whole of Asia.
- Because o f the accessibility, availability and more familiar of the city to do survey and to get accurate data as within two days of the survey, it is impossible to identity traffic and travel pattern.

The entire city is well connected by a grid of bus routes operated by Andhra Pradesh State Road Transport Corporation (APSRTC). In relation to the Vijayawada City Transport idea, APSRTC also won several awards, the most recent of which was for Best Mileage. City Ordinary, Metro Express, Metro Deluxe, and Metro Luxury A/C services are the several types of city bus services. Additionally, 28% of city buses are Metro Express and 70% are City Ordinary. It operates about 24 special services to the High Court and the Secretariat in addition to the 26 ordinary city buses. It was one of the pioneers in implementing buses running on CNG in South India.

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"ASSESSING THE FACTORS WHICH INFLUENCE THE UASAGE OF PUBLIC TRASNPORT UNDER DIFFERENT URBAN CHARACTERISTICS – CASE STUDY OF VIJAYAWADA"

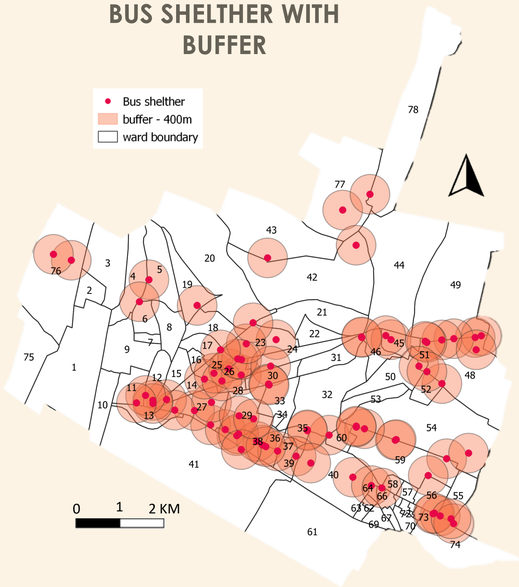
SEAL AND SIGNATURE

B. SRAVANI – 2190200268
B. Planning IV Year VIII Semester
Department of Planning

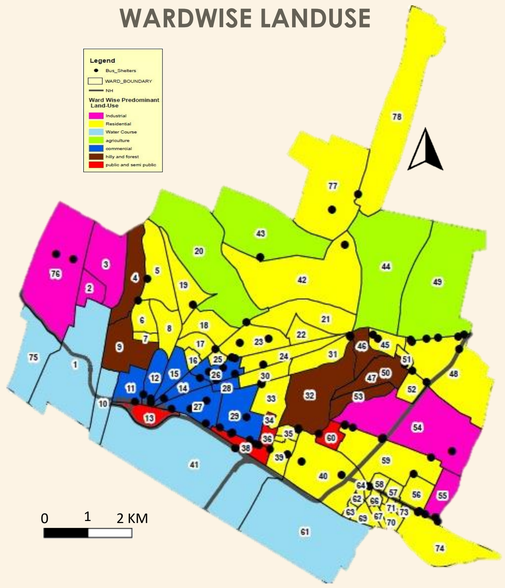
SHEET NO. 04

DELINEATION

BUS SHELTHER WITH BUFFER

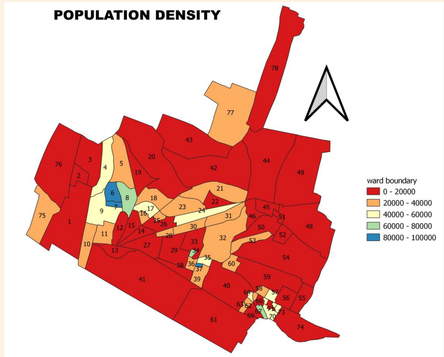


BUS SHELTHER WITH WARDWISE LANDUSE

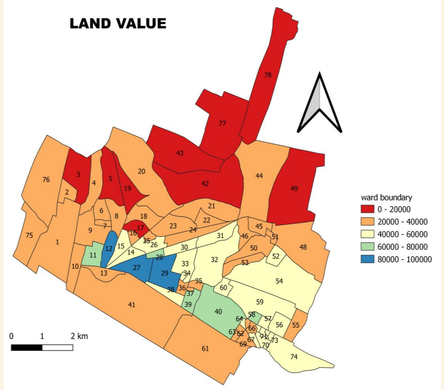


- Around 76 Bus Shelters are observed in the VMC study area across 78 wards of VMC Area
- Standard buffer distance of 400 meters is considered for the assessment of coverage.
- Most of the area is not under bus stop coverge

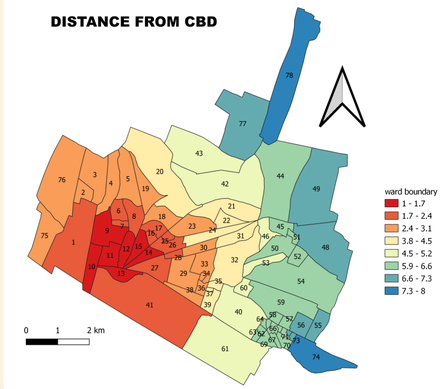
POPULATION DENSITY



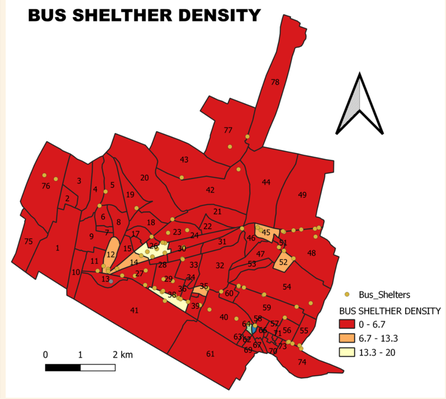
LAND VALUE



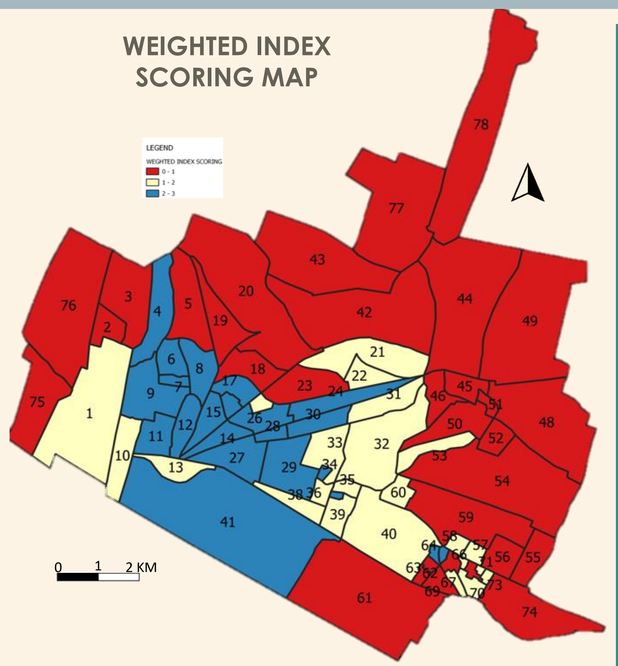
DISTANCE FROM CBD



BUS SHELTHER DENSITY



WEIGHTED INDEX SCORING MAP



- We have delineated the wards based on weighted mean method
- Now we divided the wards according to scoring and based on high residential area we have selected one ward form each score.
- So as to study all the aspects like ward with high, low public transport supply and wards that are in core area, periphery area and between core & periphery areas etc..
- Therefore wards **78 where is low public transport supply , 40 with medium public transport and 41 with high public transport supply**

WEIGHTED MEAN METHOD

- Weighted mean method have been used for delineation of the study area because of data constraints in other method.
- Weighted Mean is **an average computed by giving different weights to some of the individual values**.
- The weighted mean is a type of mean that is calculated by multiplying the weight (or probability) associated with a particular event or outcome with its associated quantitative outcome and then summing all the products together.

CRITERIAS	SCALING		
	1	2	3
Population density	0 to 33,333	33,333 to 66,666	66,666 to 99,999
Bus shelther density	0 to 15.15	15.15 to 30.30	30.30 to 45.45
Land value	0 to 33,333	33,333 to 66,666	66,666 to 99,999
Distance from CBD	5.4 TO 8.1	2.7 to 5.4	0 to 2.7
Weightage		0.25 (equal weightages)	

First set the certain criteria's you are considering to delineate the study area.

Find the data regarding that criteria's and give scaling using k mean clustering in SPSS(ex: scaling up to 1-5)

Now normalize the data to scaling and then normalize them into weights by multiplying with the weights

Now summarize all weighted values and save the excel in csv format

Join the csv files with the shapefile in GIS and understand the required delineate area for study purpose

WARDS	POPULATION	AREA IN SQKM	POPULATION DENSITY PER SQKM	Normalizing to scale - pop density	Normalizing to weightage - pop density	LAND VALUE PER SQ YARD	Normalizing to scale - land value	Normalizing to wightage - land use	NUMBER OF BUS SHELTER	BUS SHELTHER DENSITY	Normalized to scale - bus shelther density	Normalized to weightage - bus shelther density	DISTANCE FROM CBD(KM)	Normalized to scale - distance from CBD	Normalized to weightage - distance from CBD	TOTAL SCORE
1	43624	2.41	18101.24	1.00	0.25	25000	1	0.25	0	0	1	0.25	2	3	0.75	1.50
2	2422	0.29	8351.72	1.00	0.25	25000	1	0.25	0	0	1	0.25	3	2	0.5	1.25
3	15927	1.02	15614.71	1.00	0.25	17000	1	0.25	0	0	1	0.25	3	2	0.5	1.25
4	37039	0.71	52167.61	2.00	0.50	35000	2	0.5	0	0.00	1.00	0.25	3	2	0.5	1.75
5	21419	0.87	24619.54	1.00	0.25	17000	1	0.25	1	1.15	1.00	0.25	3	2	0.5	1.25
6	28235	0.29	97362.07	3.00	0.75	25000	1	0.25	1	3.45	1.00	0.25	2	3	0.75	2.00
7	8151	0.09	90566.67	3.00	0.75	25000	1	0.25	0	0.00	1.00	0.25	2	3	0.75	2.00
8	28021	0.46	60915.22	2.00	0.50	25000	1	0.25	0	0.00	1.00	0.25	2	3	0.75	1.75
9	41586	0.84	49507.14	2.00	0.50	25000	1	0.25	0	0.00	1.00	0.25	1	3	0.75	1.75
10	11795	0.52	22682.69	1.00	0.25	25000	1	0.25	0	0.00	1.00	0.25	1	3	0.75	1.50

SCORE 1	RESIDENTIAL AREA (SQ.KM)
WARD 2	0.085
WARD 3	0.542
WARD 5	0.279
WARD 18	0.198
WARD 19	0.311
WARD 20	2.111
WARD 23	0.351
WARD 42	1.699
WARD 43	1.373
WARD 44	2.54956
WARD 45	0.06
WARD 46	0.017
WARD 47	0.049
WARD 48	1.07
WARD 49	1.884
WARD 50	0.049
WARD 51	0.065
WARD 52	0.195
WARD 54	1.147
WARD 55	0
WARD 56	0.196
WARD 59	0.819
WARD 61	0.407
WARD 62	0.024
WARD 63	0.031
WARD 66	0.028
WARD 69	0.1054
WARD 72	0.00065
WARD 74	1.09
WARD 75	0.107
WARD 76	1.55
WARD 77	1.819
WARD 78	**2.5409**

SCORE 2	RESIDENTIAL AREA (SQ.KM)
WARD 1	0.448
WARD 10	0.048
WARD 13	0
WARD 21	0.65
WARD 68	0.003
WARD 70	0.06
WARD 71	0.014

WARD 25	0.023
WARD 31	0.193
WARD 32	0.405
WARD 33	0.282
WARD 35	0.04
WARD 36	0.027
WARD 38	0.026
WARD 39	0.137
WARD 40	**0.736**
WARD 53	0.059
WARD 57	0.066
WARD 58	0.067
WARD 60	0.098
WARD 67	0.019
WARD 73	0.025

SCORE 3	RESIDENTIAL AREA (SQ.KM)
WARD 4	0.258
WARD 6	0.13
WARD 7	0.029
WARD 8	0.173
WARD 9	0.162
WARD 11	0.00013
WARD 12	0.052
WARD 14	0
WARD 15	0
WARD 16	0.067
WARD 17	0.067
WARD 24	0.291
WARD 26	0.019
WARD 27	0
WARD 28	0.027
WARD 29	0.0054
WARD 30	0.145
WARD 34	0.0084
WARD 37	0.011
WARD 41	**0.785**
WARD 64	0.007
WARD 65	0.006

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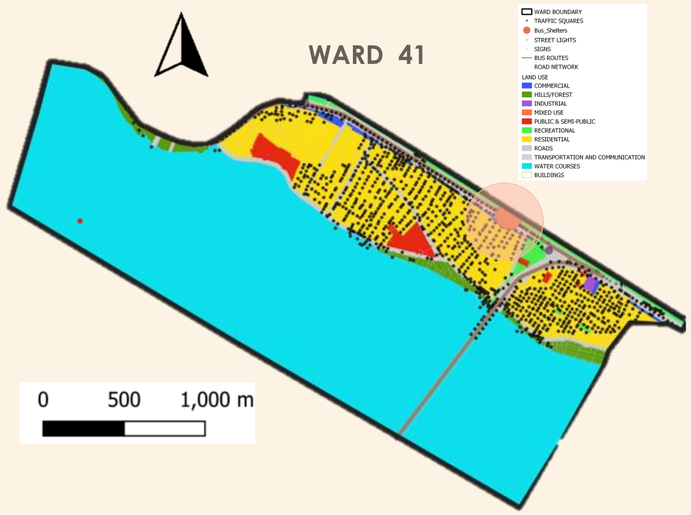
SHEET NO. 05

PRELIMINARY ANALYSIS

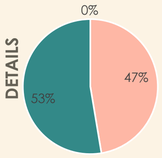
WARD 41



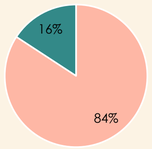
WARD NO 41	
Population	85990
area in sq. km	4.48
population density	19194.20
Land value	40000
No of bus shelters	1
Bus shelther density	0.22
Distance from CBD in km	2
Average trip length	1-2 km

SOCIO-ECONOMIC DETAILS

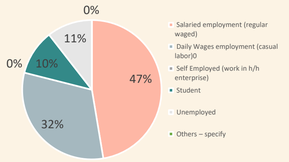
SEX



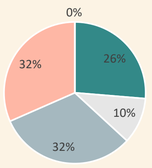
DRIVING LICENSE



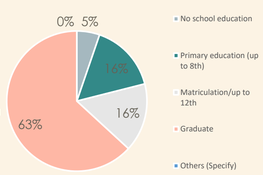
OCCUPATION



INCOME



EDUCATION



MODE	DISTANCE			
	0 - 4 km	4 - 8 km	8 - 12km	> 12 km
Walk				
2 wheeler	1	9	2	1
Car	8	2		
Bus		4		
Auto		8		

TRIP DETAILS

MODE	COST				
	0-10k	10-20k	20-30k	30-40k	>40k
Walk	4				
2 wheeler	18	6	3		
Car	4	4		2	
Bus		2	2		
Auto			8		

MODE	PURPOSE					
	Work	Education	Shopping	Recreational/Social	Others (Medical etc)	Return Home-Ret.
Walk				2		2
2 wheeler	11		2	2	2	10
Car	4		1	1		4
Bus	1	2				1
Auto	1	1	1		1	4

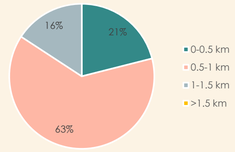
MODE	FREQUENCY				
	Daily	Weekly	Few days a week	Monthly	Rarely
Walk	4				
2 wheeler	21	5	1		
Car	7		1	2	
Bus	4				
Auto	4	2			2

MODE	TRAVEL TIME				
	0-5 min	5- 10 min	10-15 min	15- 20 min	>20 min
Walk		2	2		
2 wheeler	9	9	6		3
Car	3	4	1	2	
Bus				2	2
Auto				6	2

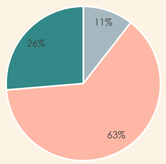
INCOME	EXPENDITURE ON TRANSPORT MONTHLY				
	0-500	500-1000	1000-1500	1500-2000	>2000
<10000	1	1	2	1	
10K-25K		1		1	
25K-50K	1	3	2		
50K-1LAKH	3		2	1	

INCOME	MODE					
	Walk	Cycle	2 wheeler	Car	Bus	Auto
<10000	2	1	2			
10K-25K		1	1			
25K-50K			5	1		
50K-1LAKH			3	3		

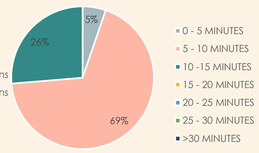
DISTACNE TO NEAREST BUS STOP



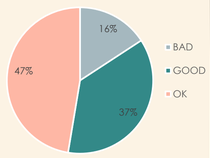
AVERAGE WAITING TIME IN MINUTES



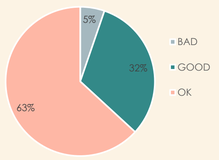
FREQUENCY OF BUSES



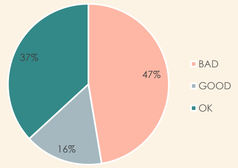
COMFORT LEVEL



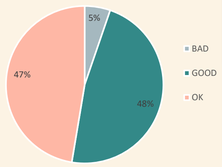
SECURITY LEVEL



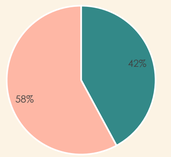
SERVICE RELIABILITY



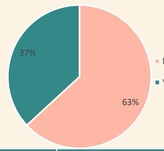
PUNCTUALITY



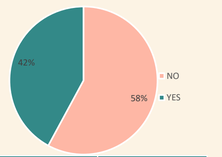
WILLINGNESS TO SHIFT TO PUBLIC TRASNPORT



DO YOU THINK IT IS SAFE AND CONVENIENT TO WALK ON ROADS OF VIJAYAWADA CITY?

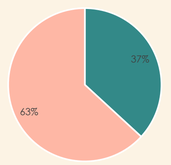


ARE YO SATISIFED WITH THE WAY YOU TRAVEL IN THE CITY?

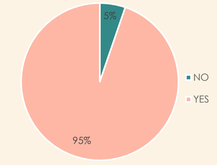


	EXISTING	SCEANRIO 1	SCENARIO 2	SCENARIO 3
COST	10	15	15	20
COMFORT	LOW	LOW	MED	HIGH
TIME	25	20	18	15
DISTANCE	5	5	5	5

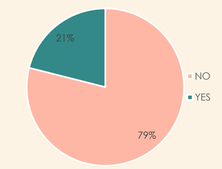
SCENARIO 1



SCENARIO 2

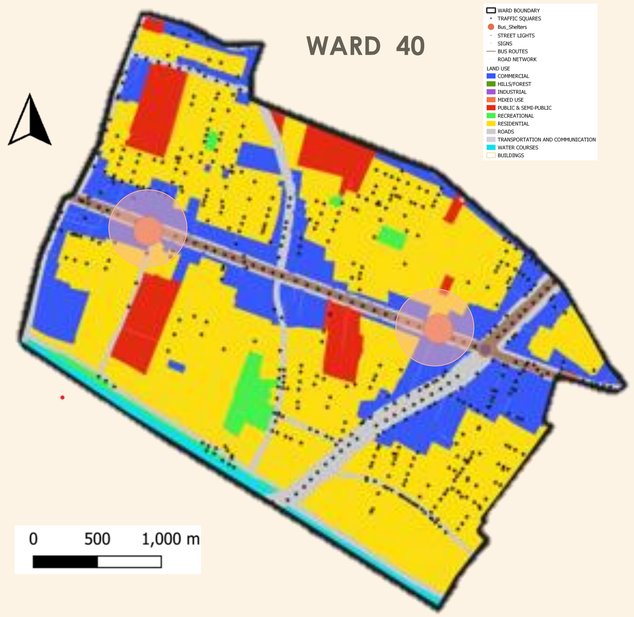


SCENARIO 3



WARD NO 41 is in the core area. Major bus terminal is near to this ward. From the bus shelter to bus terminal the distance is 1.8km. As it is core area the trip characteristics like waiting time, frequency of buses, expenditure on transport, travel time is very less compared to ward 40 and 78. As it is core area people prefer 2wheeler most probable as all the facilities are available near by. And additional trip characteristics like comfort level is less compared to ward 40 and 78 as it is core area it is busy with crowd and service reliability, punctuality and security level is high. Modal split of 2wheelers and car is more than bus and auto.

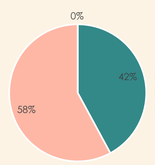
WARD 40



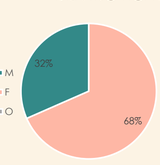
WARD NO 40	
Population	25953
area in sq. km	1.6
population density	16220.63
Land value	61000
No of bus shelters25953	2
Bus shelther density	1.25
Distance from CBD in km	5
Average trip length	3-4 KM

SOCIO-ECONOMIC DETAILS

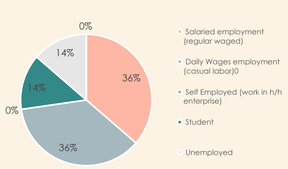
sex



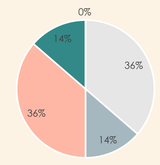
DRIVING LICENSE



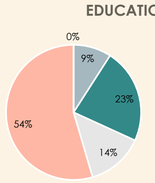
OCCUPATION



INCOME



EDUCATION



MODE	DISTANCE			
	0 - 4 km	4 - 8 km	8 - 12km	> 12 km
Walk				
2 wheeler	4	24	7	2
Car	2	4		
Bus	2	2		
Auto	2	2	6	

MODE	PURPOSE					
	Work	Education	Shopping	Recreational/Social	Others (Medical etc)	Return Home-Ret.
Walk						
2 wheeler	17	1	3	2	1	13
Car	2					3
Bus	1	2				1
Auto	1	1	1		2	5

TRIP DETAILS

MODE	COST				
	0-10k	10-20k	20-30k	30-40k	>40k
Walk					
2 wheeler	11	22	4		
Car			4	2	
Bus	2		2		
Auto		2		2	6

MODE	FREQUENCY				
	Daily	Weekly	Few days a week	Monthly	Rarely
Walk					
2 wheeler	30	6	1		
Car	6				
Bus	4				
Auto	4	2			4

MODE	TRAVEL TIME				
	0-5 min	5- 10 min	10-15 min	15- 20 min	>20 min
Walk					
2 wheeler	3	8	15	5	6
Car			2	4	
Bus				2	2
Auto			3		7

INCOME	EXPENDITURE ON TRANSPORT MONTHLY				
	0-500	500-1000	1000-1500	1500-2000	>2000
<10000	1	3	1	1	2
10K-25K		2			1
25K-50K	1	3		3	1
50K-1LAKH		1	1		1

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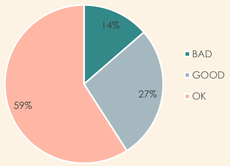
B. SRAVANI – 2190200268
B. Planning IV Year VIII Semester
Department of Planning

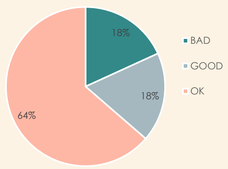
SHEET NO.
06

PRELIMINARY ANALYSIS

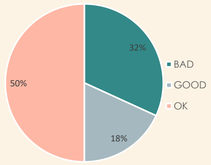
COMFORT LEVEL



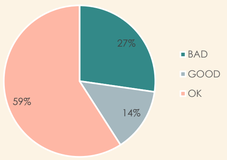
SECURITY LEVEL



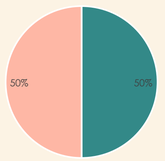
SERVICE RELIABILITY



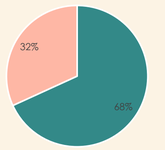
PUNCTUALITY



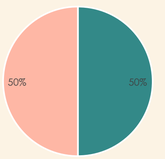
WILLINGNESS TO SHIFT TO PUBLIC TRASNPORT



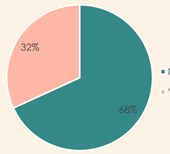
DO YOU THINK IT IS SAFE AND CONVENIENT TO WALK ON ROADS OF VIJAYAWADA CITY?



ARE YO SATISIFED WITH THE WAY YOU TRAVEL IN THE CITY

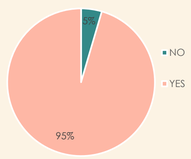


SCENARIO 1

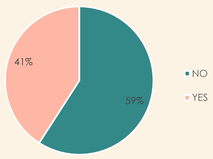


	EXISTING	SCEANRIO 1	SCENARIO 2	SCENARIO 3
COST	10	15	15	20
COMFORT	LOW	LOW	MED	HIGH
TIME	25	20	18	15
DISTANCE	5	5	5	5

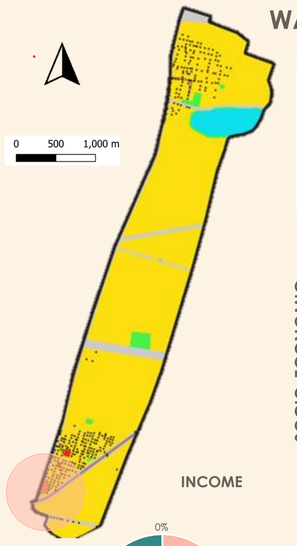
SCENARIO 2



SCENARIO 3



WARD NO 40 is in the area between periphery area and core area. As it is area between periphery area and core area the trip characteristics like waiting time, frequency of buses, expenditure on transport, travel time is very less compared ward 78 and high compared to ward 41. And additional trip characteristics like comfort level is less compared to ward 44 and more compared to ward 78. Modal split of 2 wheeler is more than car and bus.

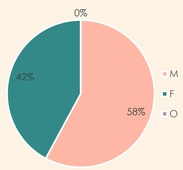


WARD 78

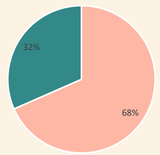
WARD NO 78	
Population	12552
area in sq. km	2.68
population density	4683.58
Land value	9500
No of bus shelthers25953	1
Bus shelther density	0.37
Distance from CBD in km	8
Average trip length	4-5 KM

SOCIO-ECONOMIC DETAILS

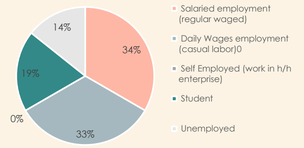
sex



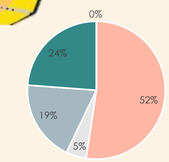
DRIVING LICENSE



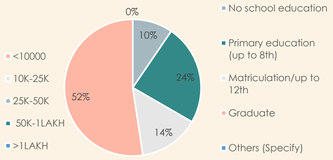
OCCUPATION



INCOME



EDUCATION



MODE	DISTANCE			
	0 - 4 km	4 - 8 km	8 - 12km	> 12 km
Walk				
2 wheeler	1	3	16	8
Car			6	6
Bus				4
Auto				10

TRIP DETAILS

MODE	PURPOSE					
	Work	Education	Shopping	Recreational/ Social	Others (Medical etc)	Return Home- Ret.
Walk						
2 wheeler	11	1	2	1	1	11
Car	4		1	2		5
Bus	1	2				1
Auto		2	1		2	5

MODE	COST				
	0-10k	10-20k	20-30k	30-40k	>40k
Walk					
2 wheeler	1	6	19	2	
Car					12
Bus					4
Auto					10

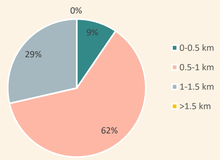
MODE	FREQUENCY				
	Daily	Weekly	Few days a week	Monthly	Rarely
Walk					
2 wheeler		25	1		
Car	9		1	2	
Bus	4				
Auto	4	2			4

MODE	TRAVEL TIME				
	0-5 min	5- 10 min	10-15 min	15- 20 min	>20 min
Walk					
2 wheeler	1		6		21
Car					12
Bus					14
Auto					

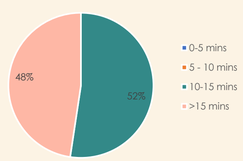
INCOME	EXPENDITURE ON TRANSPORT MONTHLY				
	0-500	500-1000	1000-1500	1500-2000	>2000
<10000			4	1	6
10K-25K					1
25K-50K				1	3
50K-1LAKH				1	4

INCOME	MODE					
	Walk	Cycle	2 wheeler	Car	Bus	Auto
<10000	3	1	7			
10K-25K		1				
25K-50K			3	1		
50K-1LAKH			2	3		

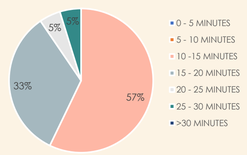
DISTACNE TO NEAREST BUS STOP



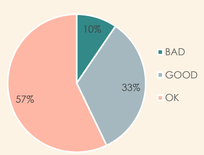
AVERAGE WAITING TIME IN MINUTES



FREQUENCY OF BUSES



COMFORT LEVEL



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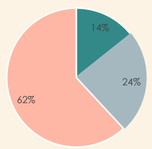

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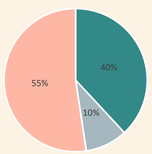

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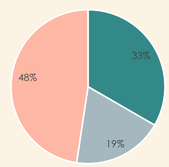

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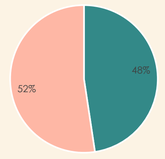

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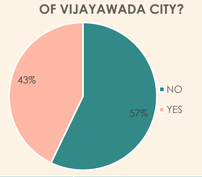

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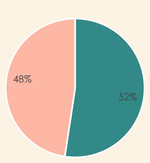

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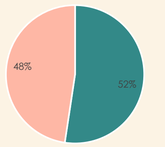
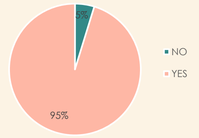
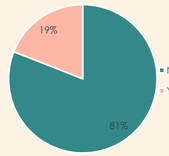


SCENARIO 2



SCENARIO 3



WARD NO 78 is in the periphery area. The trip characteristics like waiting time, frequency of buses, expenditure on transport, travel time is high compared to ward 78 and 41. And additional trip characteristics like comfort level is more and service reliability, punctuality and security level is less compared to ward 44 & 78. Modal split of 2 wheeler and auto is more than bus and car.

WARD NO 41

- Distance – 4-8km
- Travel cost – 0-10k
- Travel time – 5-10min
- Expenditure on transport monthly – 1000-1500
- Frequency of buses – 5-10minutes
- Waiting time – 5-10minutes
- Distance to nearest bus stops – 1-2km
- Comfort level – 47%

WARD NO 40

- Distance – 8-12km
- Travel cost – 20-30k
- Travel time – 15-20min
- Expenditure on transport monthly – 1500-2000
- Frequency of buses – 15-20minutes
- Waiting time – 15-20minutes
- Distance to nearest bus stops – 2-2.5km
- Comfort level – 45%

WARD NO 78

- Distance – >12km
- Travel cost – >40k
- Travel time – >20min
- Expenditure on transport monthly – >2000
- Frequency of buses – 25-30minutes
- Waiting time – 25-30minutes
- Distance to nearest bus stops – >3.5km
- Comfort level – 57%

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Batch - 2019 - 23

"ASSESSING THE FACTORS WHICH INFLUENCE THE UASAGE OF PUBLIC TRASNPORT UNDER DIFFERENT URBAN CHARACTERISTICS – CASE STUDY OF VIJAYAWADA"

SEAL AND SIGNATURE

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B. Planning IV Year VIII Semester
Department of Planning

SHEET NO. 07

MODE CHOICE MODEL ANALYSIS

WHAT IS MODE CHOICE MODELLING?

The philosophy behind mode choice model is to effectively manage the transport demand and be able to provide for these demands by making changes in the existing system. Used to study the existing transportation system and forecast the future needs of the proposed transportation system as we get an insight to preferences and requirements of commuters.

Factors Affecting Mode Choice Behaviour:

- SOCIAL
- ECONOMIC
- CULTURAL
- ENVIRONMENTAL

Mode Choice Models:

- **Aggregate and Disaggregate Mode Choice Models**
- **Statistical Mode Choice Models**
  - Multinomial Logit Models
  - Nested Logit Models
  - Multinomial Probit Model
  - Generalized Extreme Value Model
- **Soft Computing Mode Choice Models**
  - Artificial Neural Network Models
  - Fuzzy Logic Based Models
  - Hybrid Mode Choice Models

Collecting required data for mode choice model like trip information through surveys → Doing the outliers test for the data → Then check the correlation between the variables using Pearson correlation coefficient in SPSS software → Variables which have high correlation are considered in logit model in SPSS software → Analyzing the model

OUTLIERS TEST

An outlier is an observation that appears to deviate markedly from other observations in the sample. Identification of potential outliers is important for the following reasons. An outlier may indicate bad data. Outlier is a data point in the dataset that differs significantly from the other data or observations.

G (Observed value)	0.000
G (Critical value)	0.019
p-value (one-tailed)	**<0.0001**
alpha	**0.05**

H0: The variances are identical.
Ha: At least one of the variances is lower than the others.
As the computed p-value is lower than the significance level alpha = 0.05, one should reject the null hypothesis Ho, and accept the alternative hypothesis Ha.

CORRELATION ANALYSIS

- Correlation analysis, also known as bivariate, is primarily concerned with finding out whether a relationship exists between variables and then determining the magnitude and action of that relationship.

Import the data in SPSS software → Then analyze>>correlate>> bivariate → In this we have chosen pearl son correlation → Then run the model we will get the correlation matrix → Now keep that matrix in excel and apply pearl son -1 to 1 values as condition format

	WARDNO	SEX	AGE	DL	EDUC	OCCUP	INCOME	EXPENDITURE	VEHICLE TYPE	AGEOFVEHICLE	PURPOSE	FREQUENCY	MODE	DISTANCE	COST	TIME	WAITING TIME	DISTANCETONEARESTBUSSTOP	FREQUENCYOFBUSES	TRAVELTIME	SECURITY	COMFORT	SERVICE	PUNCTUALITY	WILLINGNESSTOSHIFT	SAFE	SATISIFIED	S1	S2	S3
WARDNO	1	0.078	-0.007	-0.043	-0.020	0.089	-0.091	0.627	-0.016	-0.185	0.013	0.040	0.091	0.756	0.607	0.054	0.634	-0.145	0.816	0.76	0.037	-0.009	-0.070	-0.21	-0.025	0.133	0.069	0.076	-0.004	-0.092
SEX	0.078	1	-0.415	-0.365	0.105	0.026	0.191	0.228	-0.130	-0.136	-0.224	-0.185	0.138	0.036	0.158	-0.061	0.087	-0.050	0.003	-0.022	-0.224	0.007	-0.295	0.037	-0.214	-0.139	-0.346	-0.35	0.209	0.113
AGE	-0.007	-0.415	1	0.107	-0.713	0.387	-0.197	0.012	0.045	-0.054	0.042	0.502	0.114	0.062	-0.025	-0.082	0.044	0.217	0.164	0.179	0.267	-0.118	0.053	0.043	0.114	0.207	0.097	-0.165	0.039	0.044
DL	-0.043	-0.365	0.107	1	0.216	-0.65	0.522	-0.199	0.552	0.037	0.025	-0.092	-0.528	-0.120	-0.259	0.027	-0.345	-0.106	-0.004	-0.018	-0.106	-0.098	-0.031	0.104	0.051	0.292	0.171	0.329	-0.100	-0.138
EDUC	-0.020	0.105	-0.713	0.216	1	0.625	0.412	-0.143	0.353	0.171	0.064	-0.38	-0.39	-0.094	-0.144	0.26	-0.222	-0.048	-0.143	-0.162	-0.274	-0.001	-0.116	0.018	-0.148	-0.065	0.17	0.274	0.044	-0.066
OCCUP	0.089	0.026	0.387	-0.65	-0.625	1	-0.724	0.21	-0.644	-0.296	0.083	0.446	0.622	0.154	0.279	-0.083	0.395	0.148	0.074	0.092	0.289	0.102	0.139	-0.17	0.116	-0.117	-0.082	-0.308	0.013	0.115
INCOME	-0.091	0.191	-0.197	0.522	0.412	-0.724	1	0.010	0.626	0.244	-0.003	-0.054	**-0.68**	-0.155	-0.109	0.068	-0.267	-0.228	-0.121	-0.206	-0.19	-0.195	-0.321	0.261	-0.131	-0.006	0.035	0.206	0.099	0.028
EXPENDITURE	0.627	0.228	0.012	-0.199	-0.143	0.21	0.010	1	-0.082	-0.297	0.082	0.18	**0.425**	0.711	0.863	0.058	0.797	-0.065	0.514	0.484	-0.053	-0.034	-0.053	-0.145	-0.095	-0.070	-0.136	-0.141	-0.014	0.030
VEHICLETYPE	-0.016	-0.130	0.045	0.552	0.353	-0.644	0.626	-0.082	1	0.183	0.028	0.070	-0.573	-0.165	-0.189	0.194	-0.381	-0.132	0.022	0.035	-0.22	-0.222	-0.017	0.184	-0.099	0.041	0.196	0.275	0.327	0.123
AGEOFVEHICLE	-0.185	-0.136	-0.054	0.037	0.171	-0.296	0.244	-0.297	0.183	1	-0.055	-0.138	-0.284	-0.150	-0.313	-0.192	-0.288	-0.040	-0.053	-0.069	-0.181	-0.135	-0.18	-0.213	-0.090	-0.135	-0.007	0.237	0.053	-0.202
PURPOSE	0.013	-0.224	0.042	0.025	0.064	0.083	-0.003	0.082	0.028	-0.055	1	0.251	0.088	0.023	0.105	0.6	0.078	-0.048	-0.056	-0.074	0.051	-0.083	-0.001	0.049	-0.123	-0.144	0.126	0.092	0.014	-0.023
FREQUENCY	0.040	-0.185	0.502	-0.092	-0.38	0.446	-0.054	0.18	0.070	-0.138	0.251	1	0.404	0.108	0.302	0.039	0.255	-0.023	0.032	0.002	0.129	-0.418	0.003	0.128	-0.110	-0.124	0.143	-0.115	0.089	0.352
MODE	0.091	0.138	0.114	-0.528	-0.39	0.622	-0.38	0.425	-0.573	-0.284	0.088	0.404	1	0.261	0.583	-0.037	0.572	-0.042	-0.014	-0.020	0.017	-0.006	0.010	-0.054	-0.061	-0.116	-0.113	-0.29	-0.193	0.176
DISTANCE	0.756	0.036	0.062	-0.120	-0.094	0.154	-0.155	0.711	-0.165	-0.150	0.023	0.108	**0.261**	1	0.767	-0.083	0.857	0.042	0.721	0.678	0.016	-0.103	-0.070	-0.298	0.000	0.037	-0.019	-0.090	-0.028	0.047
COST	0.607	0.158	-0.025	-0.259	-0.144	0.279	-0.109	0.863	-0.189	-0.313	0.105	0.302	**0.583**	0.767	1	0.030	0.905	-0.090	0.508	0.452	-0.053	-0.158	-0.020	-0.117	-0.100	-0.135	-0.035	-0.090	-0.034	0.16
TIME	0.054	-0.061	-0.082	0.027	0.26	-0.083	0.068	0.058	0.194	-0.192	0.6	0.039	-0.037	-0.083	0.030	1	-0.032	-0.016	-0.013	-0.049	-0.122	-0.009	0.030	0.114	-0.345	-0.134	0.130	0.024	-0.007	0.084
WAITINGTIME	0.634	0.087	0.044	-0.345	-0.222	0.395	-0.267	0.797	-0.381	-0.288	0.078	0.255	**0.572**	0.857	0.905	-0.032	1	-0.015	0.545	0.493	0.066	-0.107	-0.005	-0.223	-0.018	-0.062	-0.039	-0.187	-0.151	0.154
DISTANCETONEARESTBUSSTOP	-0.145	-0.050	0.217	-0.106	-0.048	0.148	-0.228	-0.065	-0.132	-0.040	-0.048	-0.023	-0.042	0.042	-0.090	-0.016	-0.015	1	0.093	0.181	0.118	-0.118	0.121	-0.089	0.187	0.078	0.213	-0.306	0.171	0.025
FREQUENCYOFBUSES	0.816	0.003	0.164	-0.004	-0.143	0.074	-0.121	0.514	0.022	-0.053	-0.056	0.032	-0.014	0.721	0.508	-0.013	0.545	0.093	1	0.934	0.034	-0.157	-0.046	-0.278	0.019	0.033	0.127	-0.025	0.094	-0.081
TRAVELTIME	0.76	-0.022	0.179	-0.018	-0.162	0.092	-0.206	0.484	0.035	-0.069	-0.074	0.002	-0.020	0.678	0.452	-0.049	0.493	0.181	0.934	1	0.002	-0.138	-0.010	-0.373	0.078	0.085	0.141	0.005	0.095	-0.066
SECURITY	0.037	-0.224	0.267	-0.106	-0.274	0.289	-0.19	-0.053	-0.22	-0.181	0.051	0.129	0.017	0.016	-0.053	-0.122	0.066	0.118	0.034	0.002	1	0.033	0.31	0.093	0.32	0.113	0.208	-0.134	0.044	-0.012
COMFORT	-0.009	0.007	-0.118	-0.098	-0.001	0.102	-0.195	-0.034	-0.222	-0.135	-0.083	-0.006	**-0.480**	-0.103	-0.158	-0.009	-0.107	-0.118	-0.157	-0.138	0.033	1	0.186	0.024	0.091	0.137	-0.087	0.111	-0.203	-0.417
SERVICE	-0.070	-0.295	0.053	-0.031	-0.116	0.139	-0.321	-0.053	-0.017	-0.18	-0.001	0.003	0.010	-0.070	-0.020	0.030	-0.005	0.121	-0.046	-0.010	0.31	0.186	1	0.17	0.241	0.071	0.29	-0.177	-0.179	0.289
PUNCTUALITY	-0.21	0.037	0.043	0.104	0.018	-0.17	0.261	-0.145	0.184	-0.213	0.049	0.128	-0.054	-0.298	-0.117	0.114	-0.223	-0.089	-0.278	-0.373	0.093	0.024	0.17	1	0.011	0.072	-0.090	-0.098	0.118	0.093
WILLINGNESSTOSHIFT	-0.025	-0.214	0.114	0.051	-0.148	0.116	-0.131	-0.095	-0.099	-0.090	-0.123	-0.110	-0.061	0.000	-0.100	-0.345	-0.018	0.187	0.019	0.078	0.32	0.091	0.241	0.011	1	0.393	0.005	0.031	0.192	-0.031
SAFE	0.133	-0.139	0.207	0.292	-0.065	-0.117	-0.006	-0.070	0.041	-0.135	-0.144	-0.124	-0.116	0.037	-0.135	-0.134	-0.062	0.078	0.033	0.085	0.113	0.137	0.071	0.072	0.393	1	-0.010	0.122	-0.282	-0.118
SATISIFIED	0.069	-0.346	0.097	0.171	0.17	-0.082	0.035	-0.136	0.196	-0.007	0.126	0.143	-0.113	-0.019	-0.035	0.130	-0.039	0.213	0.127	0.141	0.208	-0.087	0.29	-0.090	0.005	-0.010	1	0.166	-0.212	0.118
S1	0.076	-0.35	-0.165	0.329	0.274	-0.308	0.206	-0.141	0.275	0.237	0.092	-0.115	-0.29	-0.090	-0.090	0.024	-0.187	-0.306	-0.025	0.005	-0.134	0.111	-0.177	-0.098	0.031	0.122	0.166	1	-0.197	-0.233
S2	-0.004	0.209	0.039	-0.100	0.044	0.013	0.099	-0.014	0.327	0.053	0.014	0.089	-0.193	-0.028	-0.034	-0.007	-0.151	0.171	0.094	0.095	0.044	-0.203	-0.179	0.118	0.192	-0.282	-0.212	-0.197	1	0.117
S3	-0.092	0.113	0.044	-0.138	-0.066	0.115	0.028	0.030	0.123	-0.202	-0.023	0.352	0.176	0.047	0.16	0.084	0.154	0.025	-0.081	-0.066	-0.012	-0.417	0.289	0.093	-0.031	-0.118	0.118	-0.233	0.117	1

From the correlation analysis the parameters which have high correlation are distance, cost, waiting time, comfort, occupation and income which will be considered in modelling

MULTINOMIAL LOGIT MODELS

- Multinomial logistic regression is used to predict categorical placement in or the probability of category membership on a dependent variable based on multiple independent variables.

In SPSS software analyze>>regression>>multinominal regression → Using correlation factors as covariate and mode choice as dependent variable → Run the model

UTILITY EQUATION

$Y = ax_1 + bx_2 + cx_3 + \ldots\ldots + m$ $\quad Y = U_k$

$U_{2wheelers} = m + ax_1 + bx_2 + cx_3 + \ldots\ldots\ldots$ $\quad U_{bus} = m + ax_1 + bx_2 + cx_3 + \ldots\ldots\ldots$

$P(BUS) = e^{Ubus} / e^{Ubus} + e^{Uk}$

a,b,c,d are the values of B from parameter estimates, $x_1 x_2 x_3$ are from input data

Results and finding

MODE		B
2 Wheeler	Intercept (m)	-32.308 (m)
	OCCUPATION (X1)	-73.986 (a)
	INCOME (X2)	-25.961 (b)
	DISTANCE (X3)	26.142 (c)
	COST (X4)	-5.742 (d)
	WAITINGTIME (X5)	17.507 (e)
	COMFORT (X6)	-3.681(f)

MODE		B
Car	Intercept (m)	-106.956 (m)
	OCCUPATION (X1)	-3.516 (a)
	INCOME (X2)	31.341 (b)
	DISTANCE (X3)	-37.056 (c)
	COST (X4)	17.600 (d)
	WAITINGTIME (X5)	3.082 (e)
	COMFORT (X6)	-1.381 (f)

MODE		B
Bus	Intercept (m)	169.609 (m)
	OCCUPATION (X1)	-47.806 (a)
	INCOME (X2)	-107.552 (b)
	DISTANCE (X3)	-12.945 (c)
	COST (X4)	13.310 (d)
	WAITINGTIME (X5)	1.511 (e)
	COMFORT (X6)	-60.691(f)

MODE		B
Auto	Intercept (m)	-66.424 (m)
	OCCUPATION (X1)	15.1829 (a)
	INCOME (X2)	17.189 (b)
	DISTANCE(X3)	-13.568 (c)
	COST (X4)	13.582 (d)
	WAITINGTIME (X5)	1.330 (e)
	COMFORT (X6)	-30.959 (f)

U_{BUS} = 169.6 + OCCUPATION (-47.8) + INCOME (-107.5) + DISTANCE (-12.9) + COST (13.3) + WAITING TIME (1.51) + COMFORT (-60.691)

Observed	Predicted					
	WALK	2WHEELER	CAR	BUS	AUTO	Percent Correct
WALK	4	0	0	0	0	72%
2WHEELER	0	38	0	0	0	85.4%
CAR	0	0	7	0	0	80%
BUS	0	0	0	20	0	89%
AUTO	0	0	0	0	10	84%
Overall Percentage	4%	43%	10%	21%	11%	**89%**

The model is 89% percentage accuracy and in table it is showing the percentage of ridership for different modes from survey data.

SCENARIO ANALYSIS

	EXISTING	SCEANRIO 1
COST	10	15
COMFORT	LOW	LOW
TIME	25	20
DISTANCE	5	5

Observed	Predicted				
SCENARIO 1	WALK	2WHEELER	CAR	BUS	AUTO
WALK	4	0	0	0	0
2WHEELER	0	35	0	0	0
CAR	0	0	6	0	0
BUS	0	0	0	29	0
AUTO	0	0	0	0	9
Overall Percentage	4%	35%	6%	**29%**	9%

	EXISTING	SCENARIO 2
COST	10	15
COMFORT	LOW	MED
TIME	25	18
DISTANCE	5	5

Observed	Predicted				
SCENARIO 2	WALK	2WHEELER	CAR	BUS	AUTO
WALK	4	0	0	0	0
2WHEELER	0	30	0	0	0
CAR	0	0	4	0	0
BUS	0	0	0	36	0
AUTO	0	0	0	0	7
Overall Percentage	4%	32%	5%	**36%**	8%

	EXISTING	SCENARIO 3
COST	10	20
COMFORT	LOW	HIGH
TIME	25	15
DISTANCE	5	5

Observed	Predicted				
SCENARIO 3	WALK	2WHEELER	CAR	BUS	AUTO
WALK	4	0	0	0	0
2WHEELER	0	36	0	0	0
CAR	0	0	6	0	0
BUS	0	0	0	26	0
AUTO	0	0	0	0	7
Overall Percentage	4%	36%	7%	**26%**	8%

SCENARIO 2 has the highest percentage in shifting toward public transport that is bus. In which cost and comfort is increasing and waiting time is reducing.

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"ASSESSING THE FACTORS WHICH INFLUENCE THE UASAGE OF PUBLIC TRASNPORT UNDER DIFFERENT URBAN CHARACTERISTICS – CASE STUDY OF VIJAYAWADA"

SEAL AND SIGNATURE

B. SRAVANI – 2190200268
B. Planning IV Year VIII Semester
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SHEET NO. 08

PROPOSALS

INFERENCES FROM ANALYSIS

- Distance, travel time, comfort and cost are the major factors which hinders the usage of public transport.
- From mode choice modelling the highest percentage shift towards public transport is high in scenario 2.
- In which comfort has to increase, waiting time has to decrease and with in comfort there are 2 types of comforts to be provided one is while walking to the bus stop and second is at the bus stop.

1 CITY LEVEL

CITY LEVEL

- Signal coordination
- Dynamic bus Schedule
- App with common mobility card

1. SIGNAL CORDINATION

Traffic signal coordination is the process of designing traffic signal corridors so that traffic can efficiently progress from one end of the corridor to the other with minimal delays and/or stops. Signal coordination is the linking together of consecutive traffic signals along a road to minimize stops and delays. It is done when they are closely space to enable vehicle in one predominant direction to get continuous green.

Signal coordination is applicable at:

For signals that are closely spaced, it is necessary to coordinate the green time so that vehicles may move efficiently through the set of signals.

In some cases, two signals are so closely spaced that they should be considered to be one signal.

In other cases, the signals are so far apart that they may be considered independently. Vehicles released from a signal often maintain their grouping for well over 335m.

Four major areas of consideration for signal coordination:

Benefits

- Fuel conservation and minimum air pollution
- Maintain preferred speed and avoid stoppage and delays
- possibility of sending vehicles through successive intersections in moving platoons

Purpose of signal system

Physical layout of the street system and the major traffic flows determine the purpose of the signal system. It is necessary to consider the type of system, whether one-way arterial, two-way arterial, one-way, two-way, or mixed network. the capacities in both directions on some streets, the movements to be progressed, determination of preferential paths.

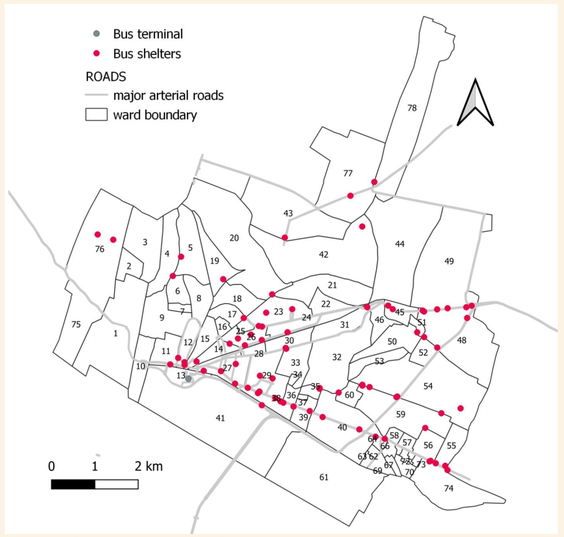
Factors lessening benefits

- Inadequate roadway capacity
- existence of substantial side frictions, including parking,
- wide variability in traffic speeds
- very short signal spacing
- heavy turn volumes, either into or out

Exceptions

All signals cannot be easily coordinated. When an intersection creating problems lies directly in the way of the plan that has to be designed for signal coordination, then two separate systems, one on each side of this troublesome intersection, can be considered. A critical intersection is one that cannot handle volumes

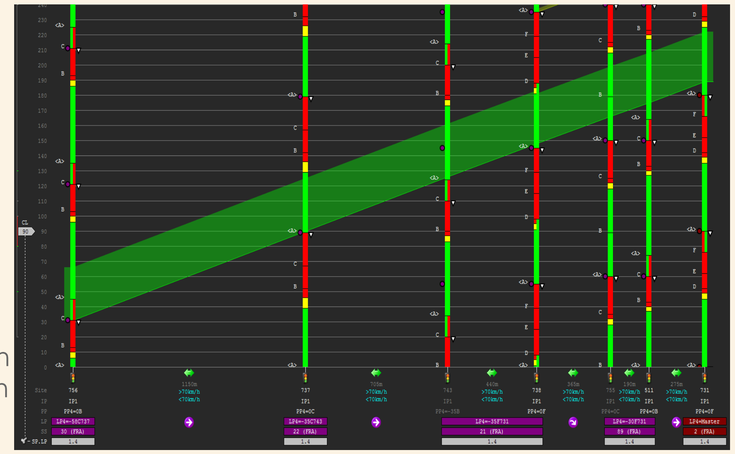
MAJOR ARTERIAL ROADS



Time is in the vertical axis and distance along the horizontal axis. The duration of the green and red lights facing the main road are shown. The green band shows how traffic in one direction gets through multiple intersections without stopping. The time from the start of green at one intersection to the start of green at the next intersection is known as the linking offset. In morning and afternoon peaks, linking offsets may be selected to favors traffic in the peak direction.

Coordination can be accomplished using a few methodologies, however the most prevalent is time-based coordination.

Time-based coordination achieves coordination by systematically offsetting the green indication for the coordinated phase(s). In order to ensure consistent operations all of the traffic signals within a time-based coordinated corridor need to have the same cycle length, where cycle length is the amount of time between sequential yellow indications for the coordinated phase. It is vital that the clocks within the controllers are synced with one another as any drift in the clock time will have a negative effect on the quality of the progression.



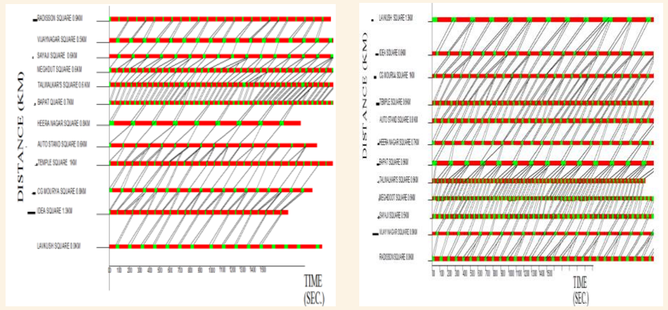
SOURCE: https://www.vicroads.vic.gov.au/traffic-and-road-use/traffic-management/traffic-signals/signal-coordination

Synchronization of Traffic Signals "A Case StudyMr-10 Road, Indore"

- Signal design & synchronization have been done for 12 intersections of MR-10 Road to minimize delay which will also increase the traffic Capacity of MR-10 Road.
- Journey time 266 seconds is reduced from Raddisson Square to Lavkush Square. & Journey time 225 seconds is reduced from Lavkush Square to Raddisson Square.
- Journey speed increases from 33.23 kmph to 46.94 kmph i.e. 13.71 kmph increase from Raddisson Square to Lavkush Square & Journey speed increases from 31.43 kmph to 44.14 kmph i.e. 12.71 kmph increase from Lavkush Square to Raddisson Square.
- 390 kl petrol and 517 kl diesel per annum have been saved & loss occurred of Rs.2.00 million/annum, 54.15 million/annum and 47.01 million/annum due to vehicle delay, low running speed of vehicle and loss of people's time respectively. CO2 emission is estimated to reduce by 2.29 Million Kg. per Annum.

SOURCE: https://www.ijsr.net/archive/v5i7/ART2016336.pdf

Time and Distance Diagram Radisson Square to Lavkush Square and Lavkush Square to Radisson



Results of Synchronization

	E to W Time Saving		W to E Time Saving	
	Before	After	Before	After
Journey time (sec)	910	644	962	685
Journey Speed (kmph)	33.23	46.94	31.43	44.14
Delay time (sec)	35	0	45	0
No of Passengers per hr	4217		4187	
Time Saving Sec/hr/pass	266		277	

Benefits in terms of Money

Direction	*Raddisson to Lavkush(E-W)*	*Lavkush to Radisson(W-E)*	*Total*
Due to save time			
Time Saving in Rs.(Per Day)	63,332	65,482	1,28,814
Time Saving in Rs.(Per Annum)	2, 31, 16,334	2, 39, 01,021	4,70,17,355
Due to Low Running Speed			
Loss of fuel in Rs.(Per Day)	81,126	76,122	1,57,248
Loss of fuel in Rs.(Per Annum)	2, 96, 10, 990	2, 47, 84,530	5,43,95,520
Due to Delay			
Loss of fuel in Rs.(Per Day)	2,416	3,082	5,498
Loss of fuel in Rs.(Per Annum)	8, 82,088	11, 25,209	20,07,297
Total Rs.(Per Day)	1,46,874	1,44,686	2,91,560
Total Rs.(Per Annum)	5,36,09,412	4,98,10,760	10,34,20,172

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PROPOSALS

2. DYNAMIC BUS SCHEDULE

Vijayawada fixed bus schedule

- **Fixed bus schedule** with a constant headway. However, as passenger demand varies over time and space, a fixed schedule with a constant headway may lead to inadequate number of buses during peak periods and under-utilization of the system in off-peak periods, which may not be beneficial for the operator. In addition to this, variability in traffic conditions may lead to irregularities in adhering to the predefined schedule, making the users wait longer or miss bus.

- To overcome these problems, the present study proposes a Demand and Travel Time Responsive (DTR) model to maximize the benefit of the operator by preparing an optimal schedule that can adapt to the variations in passenger demands and traffic conditions in real-time, subjected to minimizing the waiting time of the passengers, capacity constraints of the buses to achieve the maximum financial benefit as well as social satisfaction that is **dynamic bus schedule.**

Dynamic bus schedules can be implemented in several ways:

To implement dynamic bus schedules, transportation providers may need to invest in new technology, such as GPS tracking or real-time passenger data collection tools. They may also need to train staff on how to use these tools and adjust schedules in real-time.

OR Through manual adjustments made by transportation providers based on various factors.

Advantages

- operate more efficiently
- improve the travel experience
- minimizing the waiting time of the passengers
- increase accessibility for passengers
- improving traffic management.
- cost savings

System performance also improves with increased number of terminals without any appreciable change in the total number of buses required for scheduling. Comparing, Dynamic scheduling with fixed scheduling the results clearly demonstrates that dynamic scheduling provides better level of service.

Dynamic scheduling of buses on a corridor and sensitivity analysis for generation of primary bus routes – A case study of New Delhi

The model is tested for the Ring road system of New Delhi. The circular bus transit system on the ring road is simulated for morning peak period from 7:30 a.m. to 10.30 a.m. Depending on the average link flow criterion, 100 buses were taken and initial time table was prepared. This is given as input to the model. The model suggests 21 additional buses. The average waiting time of passengers, average queue length, maximum queue length formed at each stop is also given as an output along with saving in waiting time at all stops because of scheduling 21 additional buses. the level of service.

	Dynamic scheduling	Conventional scheduling
Total buses operated	129	130
Average waiting time (minutes)	7.65	8.56
Avg. Queues lengths	23.08	24.03
Maximum queue lengths	103	124

Comparison between dynamic scheduling and fixed scheduling

SOURCE: https://www.codatu.org/wp-content/uploads/Dynamic-scheduling-of-buses-on-a-corridor-and-sensitivity-analysis-for-generation-of-primary-bus-routes-B.-MARWAH-R.-PARTI-G.-SAYEE-RAM.pdf

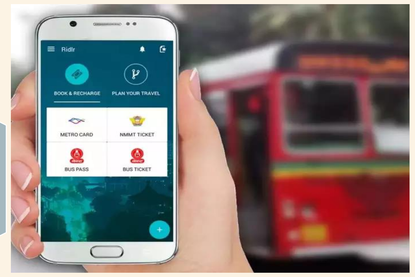
3. APP DEVELOPING WITH COMMON MOBILITY CARD

One of the major issues faced by bus commuters is the lack of access to information to plan their journeys. To make public transport more reliable, convenient and safer for its citizens. There was no official mobile platform of the Andhra Pradesh Government through which the citizens could view the static/ dynamic schedule of buses, locate bus stops, see the arrival time of buses or plan their journeys. So, we can develop the App which can provide information to the citizens with common mobility card which can be used for paying buses, IPT etc.

Features

- Universal journey planner for all Delhi commuters using the bus or metro system
- Real-time arrival information of all cluster buses at any bus stop and static data of DTC buses
- Access to all bus stops, bus and metro routes, fares, and expected time of arrival (ETA) of buses and metro.

SOURCE: https://ddc.delhi.gov.in/our-work/6/one-delhi-app



- In late 2018, following the launch of the common mobility card (ONE card) that could be used to pay for bus and metro fares in Delhi, the Dialogue and Development Commission (DDC) of Delhi conceived the idea of a common mobility app to cater to all the public transport needs of people of Delhi.

- DDC partnered with the Transport Department and IIIT Delhi, to design and build the Delhi Government's first official common mobility app - ONE DELHI APP. The app was launched in March 2019 by Hon'ble Minister (Transport) and Vice Chairperson (DDC)

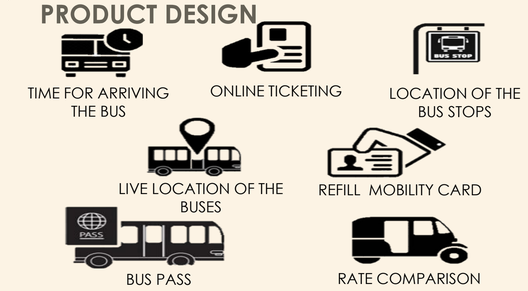
Case study – Delhi Mobility App

The vision of the Delhi Government has been to make public transport more reliable, convenient and safer for its citizens. One of the major issues faced by bus commuters in Delhi is the lack of access to information to plan their journeys. Furthermore, public transport users in Delhi had to rely on different apps to view metro schedules and other information like the location of bus stops.

In early 2022, a new beta version of the ONE DELHI app was launched with features:

- Live Bus Tracking
- Contactless Ticketing
- **Journey Planner**
- EV Charging
- Passenger and Official Complaint and Feedback System

PRODUCT DESIGN



In July 2021, the Delhi Cabinet approved the grant of a 10% discount in fares to the commuters of DTC and Cluster Buses on the purchase of bus tickets through the contact-less ticketing feature in mobile apps

PROPOSALS

2 WARD LEVEL

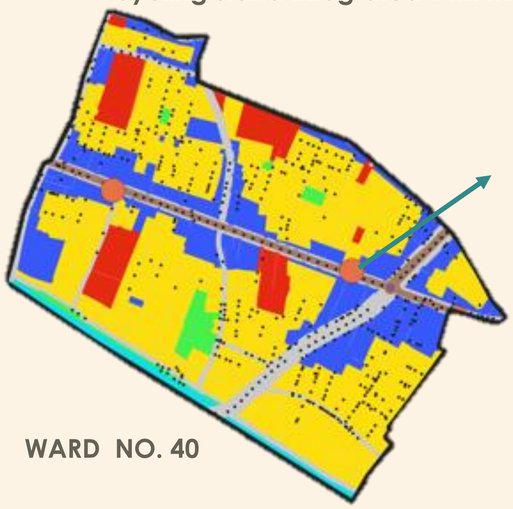
WARD LEVEL

Integrated bus stop

1. Integrated bus stop

- Redesign bus stop design with proper infrastructure and cycling stand integrated with the bus stop
- Integrated halt time go stand for IPT
- Revised road cross sections ward wise by providing well connected access by footpath or pavements

Redesign bus stop design with proper infrastructure and cycling stand integrated with the bus stop



WARD NO. 40

SOURCE: https://thelocalbrief.com/newsletters/tlb-bengaluru/smart-bus-stops-in-electronic-city/

Bengaluru's been on a rejuvenation kick lately. The Electronic City Industrial Township Authority (ELCITA) is going to set up four "smart" bus shelters as a part of their pilot project. The aim of the project is to implement the city's first Metro Neo network – an electric trolleybus system. And these shelters will be a part of it. In total, 15 smart bus shelters will be set up. But for now, the initial four will be placed opposite 3M India, Infosys, Otium and Phase 2 (XIME College). Considering the lack of proper bus stops from the BBMP in the area, this is a welcome move.

Integrated halt and go stand for IPT

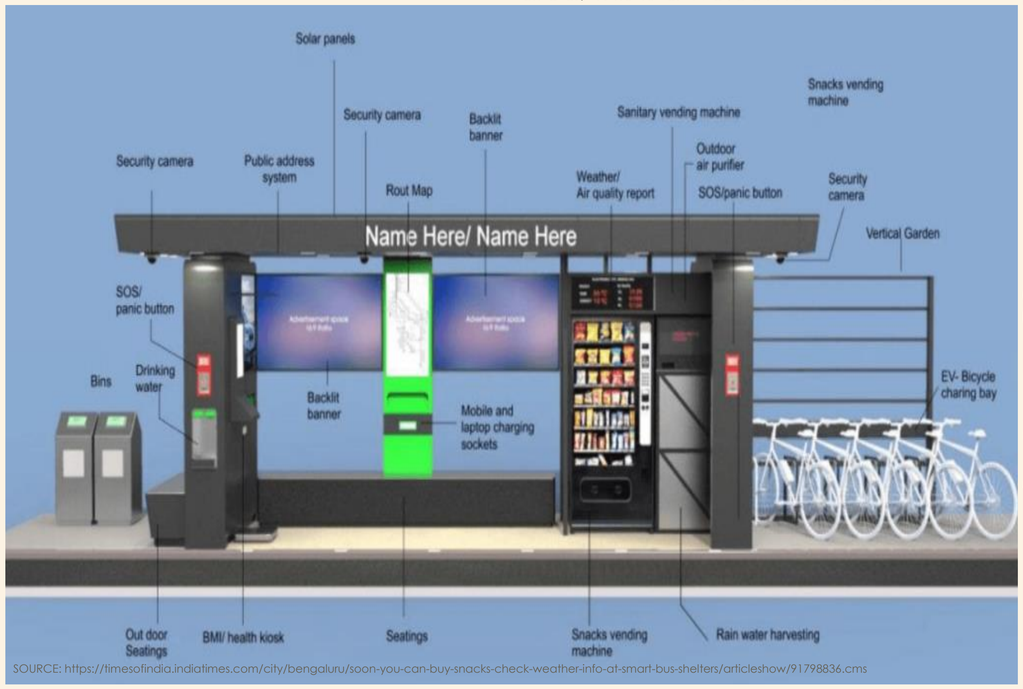
Integrated halt and go stand is the auto stand in which auto drivers halt their autos for few minutes there if passengers demand is there, then they will take that passengers. Basically, it is best possible way for llast mile connectivity through IPT as we doesn't need any particular space for the autos just autos will waiting there for few minutes and take passengers if there is demand. This halt and go spots doesn't need any basic infrastructure. All of them will be GPS-enabled and can be tracked on cellphones.

SOURCE: https://www.hindustantimes.com/delhi-news/511-spots-across-delhi-notified-as-designated-auto-stands-will-be-geo-tagged/story-a7JBK8RILGe7QaAxdCTWyL.html

Delhi has 402 designated halt-and-go spots for auto-rickshaws, which too provide for maximum five auto-rickshaws in a queue. Most of these spots unofficially act as auto-rickshaw stands on roads with relatively lean traffic, but without basic infrastructure. Notification of halt-and-go spots in Delhi had started in 2010

Stating specifics:

- Vending machine
- Charging stations
- EV – Bicycle bay
- Health Kiosks
- Public address system
- SOS button for emergencies
- Solar panels
- Basic infrastructure facilities



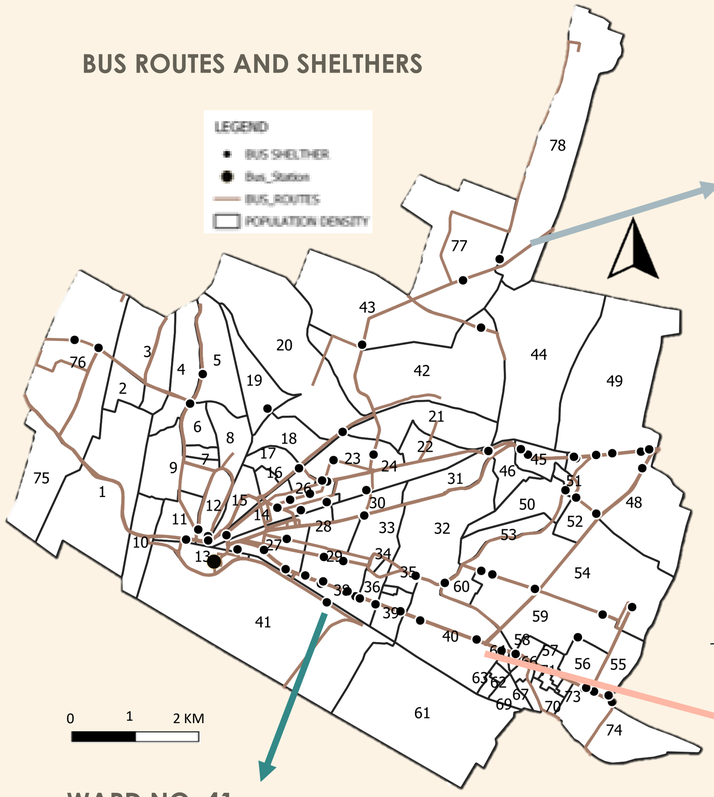
SOURCE: https://timesofindia.indiatimes.com/city/bengaluru/soon-you-can-buy-snacks-check-weather-info-at-smart-bus-shelters/articleshow/91798836.cms

It has been built at a **cost of Rs 20 lakh**; ELCITA chairperson Veerappan said that the group is planning to construct 24 more such bus stops across the area. "We want 25 smart bus stops in the 900-acre expanse of E-City. Each of these will be sponsored by a company that operates out of the area and we are in talks with Infosys, Wipro and the like to take up work on the next smart bus stop,

PROPOSALS

Revised road cross sections ward wise by providing well connected access by footpath

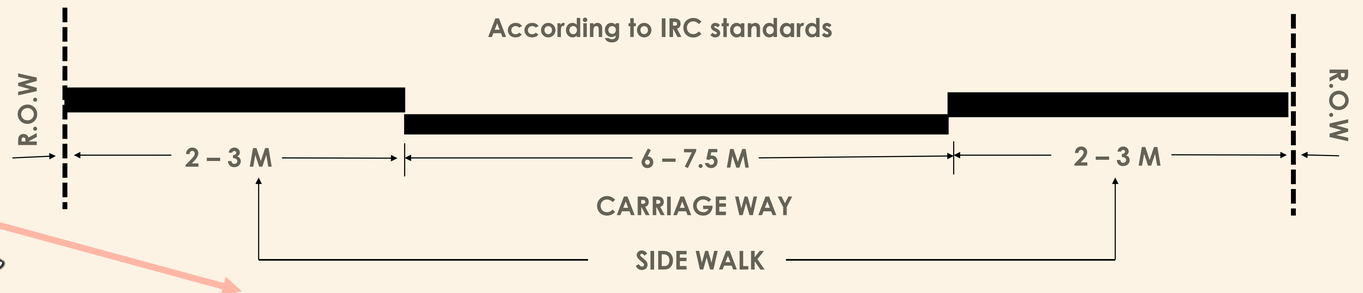
BUS ROUTES AND SHELTHERS



WARD NO. 41

WARD NO. 78

Ward 78 which is periphery area has road width of 9m and it doesn't has specific footpath as shown in images, so it has to revised with a proper road section which include footpath, which will provide well connection to the bus stand located in that ward.

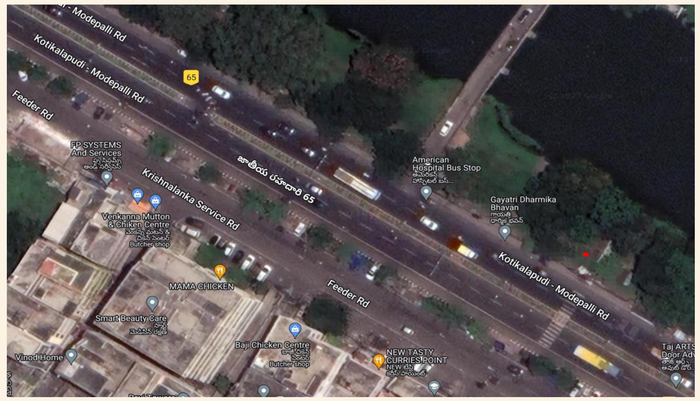


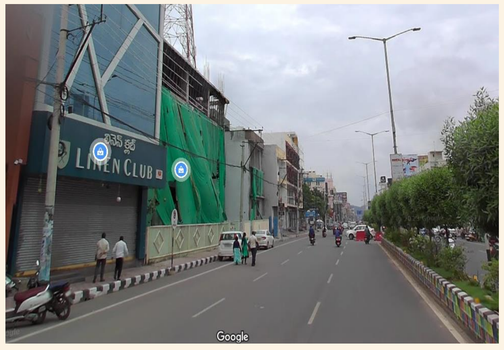
SOURCE: https://law.resource.org/pub/in/bis/irc/irc.gov.in.086.1983.pdf

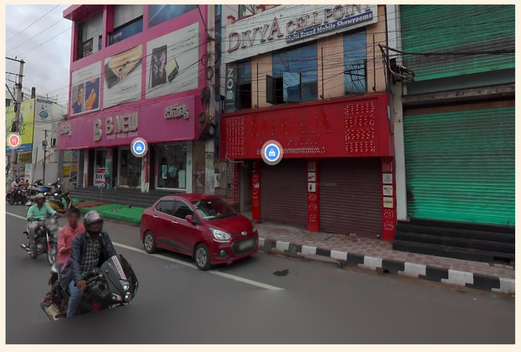
Side walk should have flat walking surfaces, allowing for proper drainage and preventing puddles from forming (IRC:SP:50 and IRC:103-2012, 6.1.6). Guide tiles should be laid along the length of the footpath to assist persons with vision impairments (IRC: 103-2012, 6.1.4)

SOURCE: https://portfolio.ceept.ac.in/2021/M/TI/planning-and-design-of-road-infrastructure-cf2019-spring-2022/planning-and-design-of-road-infrastructure-spring-2022-cf2019/

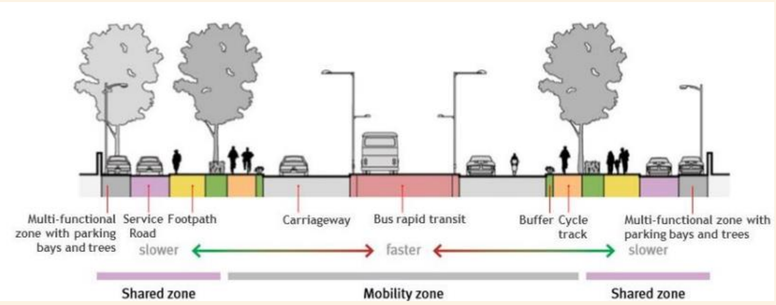
WARD NO. 40







Ward 41 which is core area has road width of 32m roads including service road and it has 2m footpath on one side of the road and 40 which is area between core areas and area between periphery has road width of 40m road and it has 2m footpath on both sides of the road. So, this wards had very good connectivity with footpaths of 2m with paved floors as shown in the images. For ward 41 and 40 can be designed with dedicated public rotate and NMT.



SOURCE: " *GUIDELINES ON REGULATION AND CONTROL OF MIXED TRAFFIC IN URBAN AREAS - INDIAN ROADS CONGRESS 2017* "

From the case study of Taranga Hill in Gujarat case study the construction of 1km side walk cost nearly 1 crores rupees.

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Batch - 2019 - 23

"ASSESSING THE FACTORS WHICH INFLUENCE THE UASAGE OF PUBLIC TRASNPORT UNDER DIFFERENT URBAN CHARACTERISTICS – CASE STUDY OF VIJAYAWADA"

SEAL AND SIGNATURE

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