LCMP Indicator comparison

Lessons from three Indian cities

Vishkhapattnam

Rajkot

Udaipur

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In Indian context

- NMT and Public transport is used by people who do not have other mode choice available, i.e. **CAPTIVE USERS**
- Captive users are likely to shift to carbon intensive modes because of
  - Existing hostile NMT and public transport infrastructure
  - Increase in income levels
- Short trip lengths due to compact city structure resulting in high percentage of potential users of NMT

Low carbon mobility plan

Retain

Shift

Improve

Expected Outcome of LCMP

- Propose strategies and plans to
  - Cause NMT and public transport users to shift from captive to choice users
  - Encourage the use of NMT and public transport by the potential users
  - Technological improvements to reduce emissions from motorized transportation
- Evaluate impact of strategies, plans and projects on emissions, accessibility, and social sustainability

Level of disaggregation suggested for data

Required –

TAZ size to be small enough to capture walk, bicycle & PT access/egress trips

	Rajkot	Vizag	Udaipur
Total study Area	285.63 sq km	516 sq km	348 sq km
Total population in study area	1,478,264	1,730,000	495,582
Total number of TAZ	394	97	56
Average Area of TAZ	0.72 sq km	5.3 sq km	6.21 sq km
Minimum area of TAZ		0.3 sq km	6.52 sq km
Maximum area of TAZ	24	78.33 sq km	23.33 sq km
Based on		Ward Boundary	Ward boundary
Remarks			**Population needs to be updated for 2011**

Data collection

(should specific summary format be given?

	Rajkot	Vizag	Udaipur
Traffic Volume Counts	12 intersections	19 intersections	
O-D Surveys	9 locations	8 locations	
Outer cordon	5	???	
Road inventory	Type of roads and km of road surveyed???	Arterial roads Km of roads surveyed?	
HH interview	Number of HH???	3100 HH	
Petrol pump surveys	Number of vehicles?	600 vehicles	
Safety data	City police (No. of years?)	Traffic police (No. of years?)	
Bus Route and Operations Data	BRT DPR Bus route and Bus stops collected???	APSRTC Bus route and Bus stops collected???	
Additional data	Land use for every plot	Property tax data for individual HH - GVMC	
Remarks			**No information on data collected**

Summary of measured indicators

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Mobility and Accessibility

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Modal shares	Modal shares by trip purpose	√	√	√			
	Modal shares by social groups	√	√	√	By gender not included		By gender not included
Travel time	Average travel time by trip purpose		√	√			
	Trip purpose wise average travel time disaggregated by social groups			√		By gender not included	

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Trip length	Average trip length frequency distribution		√				
	Mode wise average trip length disaggregated by social groups		√			By gender not included	
	Trip purpose wise average trip length disaggregated by social groups						
Affordability	Affordability of PT and para-transit fare by social group			√			Needs to be reported in a table
	Cost of commuting		√	√			

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Uda
Infrastructure quality	Average speed on roads of different modes	√	√	√		Speed by type of roads can be included	
	Percentage of Household within 10 min walking distance of PT and para-transit stop			√		Total HH need to be computed based on GIS needs to be done	
	Average number of interchanges per PT trip			√			
	Accessibility of disadvantaged groups by different modes[1]						Not avail

Landuse

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Land use parameter	Land use mix intensity - Job-housing balance	√	√	√	Overall entropy needs to be calculated	Aggregate at level of 9 zones	Data presented on map can be presented in tabular format
	Income level heterogeneity		√	√			
	Kernel density of roads, junctions and PT stop			√			

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Safety	Risk exposure mode wise.		√	√			Numbers need to be checked
	Risk imposed by modes		√	√			
	Overall safety		√	√			
	Speed limit restrictions - Percentage of roads having speed limit ≥ 50 kmph					%age of roads need to be mentioned	Not available
	Quality of footpath infrastructure	√	√	√		Percentage of roads need to be mentioned	

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Security	Percentage of road lighted			√		Percentage of roads need to be mentioned	
	Percentage of footpaths lighted			√		Percentage of roads need to be mentioned	
	Percentage of people feeling safe to walk/cycle and use PT in city by gender	√	√	√			

Emission and land resource

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Emission	GHG emissions - Equivalent CO_2 emissions per passenger km by mode		√			Equivalent CO2 emission need to be measured	Not available
	Lifecycle cost of different modes						Not available
Depletion of land resource	Per capita consumption of land for transport activity		√			Equivalent CO2 emissions need to be measured	Not available
	Land consumed for different transport activities		√				Not available

Health and transport investment

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Health hazards	Percentage of population exposed to air pollution						Not available
	Percentage of population exposed to noise levels > 50 dB						Not available
Investment	Trend in investments for development of infrastructure for various modes		√			Percentage need to be shown – along with graph	Not available

Indicator Name	Description	Measured			Remarks		
		Rajkot	Vizag	Udaipur	Rajkot	Vizag	Udaipur
Cost borne by operator	Tax burden mode wise		√				Not available
	Fuel prices by fuel type		√			Trends need to be looked	
	Other charges levied as applicable at city level disaggregated by modes		√				
Fare policy	Percentage of subsidies granted		√	√		Percentage needs to be calculated	No subsidies are there
	Percentage of population owning passes		√	√			Does not exist

Indicators measured and reported

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Indicators measured by Vizag and Udaipur

- Modal shares
  - Modal shares by trip purpose
  - Modal shares by social groups
- Travel time
  - Average travel time by trip purpose
- Affordability – Cost of commuting
- Infrastructure quality – Average speed of different modes
- Land use parameters
  - Land use mix intensity - Job-housing balance
  - Income level heterogeneity

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Indicators measured Vizag and Udaipur

- Safety
  - Risk imposed by modes
  - Risk exposure mode wise
  - Overall safety
  - Quality of footpath infrastructure
- Security
  - Percentage of people feeling safe to walk/cycle

Indicators not measured at all

- Trip length
  - Trip purpose wise average trip length disaggregated by social groups
- Infrastructure quality
  - Accessibility of disadvantaged groups by different modes
- Safety
  - Speed limit restrictions
- Emissions
  - Lifecycle cost of different modes
- Health hazards
  - Percentage of population exposed to air pollution
  - Percentage of population exposed to noise levels > 50 dB

Data collection

CMP requirement vs LCMP recommendation

Additional requirement between CMP and LCMP

Additional Data required	Description	Rajkot	Vizag	Udaipur
Location	Climatic condition			
Land area	Growth pattern			
	Identification of notified areas			
Demography	Age-sex pyramid			
Socio-economic data	Population by social group*			
Land use mix intensity	Determined by job-housing ratio or balance in a zone or level of study			
Footpath	Lighting			
Intersections	Intermediate pedestrian crossing			
Access	Barrier free access to bus stops			
	Barrier free access to footpaths			
NMV	Lighting			

Additional requirement between CMP and LCMP

Additional Data required	Description	Rajkot	Vizag	Udaipur
Intersection treatment	Traffic calming for access to properties			
NMV Parking	Number of parking			
	Distance of parking from PT stop			
	Parking charges			
IPT	Number of parking by specification of parking areas			
	Distance of formal parking from bus stop			
	Distance between parking stations			
	Parking charges			
Bus infrastructure and operation	Dedicated bus lanes (type and description)			
	Average distance between bus stop			

Additional requirement between CMP and LCMP

Additional Data required	Description	Rajkot	Vizag	Udaipur
Road infrastructure	**Lighting**			
MV intersections	**Turning time from each direction**			
	Signal phasing			
PT detail	**Fleet utilization rate**			
	Revenue per km			
Route detail – auto, cycle rickshaw and shared auto	**Route inventory for share auto**			
	Average waiting time for auto, cycle rickshaw and shared auto			
	Tax levied			
Delay and Queue length	**Delay by mode**			

Additional requirement between CMP and LCMP

Additional Data required	Description	Rajkot	Vizag	Udaipur
Number and location of injury/fatalities on road	By victim mode			
	By impacting vehicle			
Reported crimes	Disaggregated by mode			
Trip making information – household surveys	Travel distance			
	Access and egress mode			
	Access and egress public transport stop			
	Distance to access and egress public transport stop			
	Travel time to access and egress			
	Average waiting time to board Public transport			
	Average mileage if PMV used			
	Fuel used			
	Reason for using the mode used			

Additional survey requirements

Surveys required	Rajkot	Vizag	Udaipur
Household survey – access/egress trips			
Stated preference surveys	Mentioned in the report		
Petrol pump surveys	Mentioned in the report		

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Comparison between indicators

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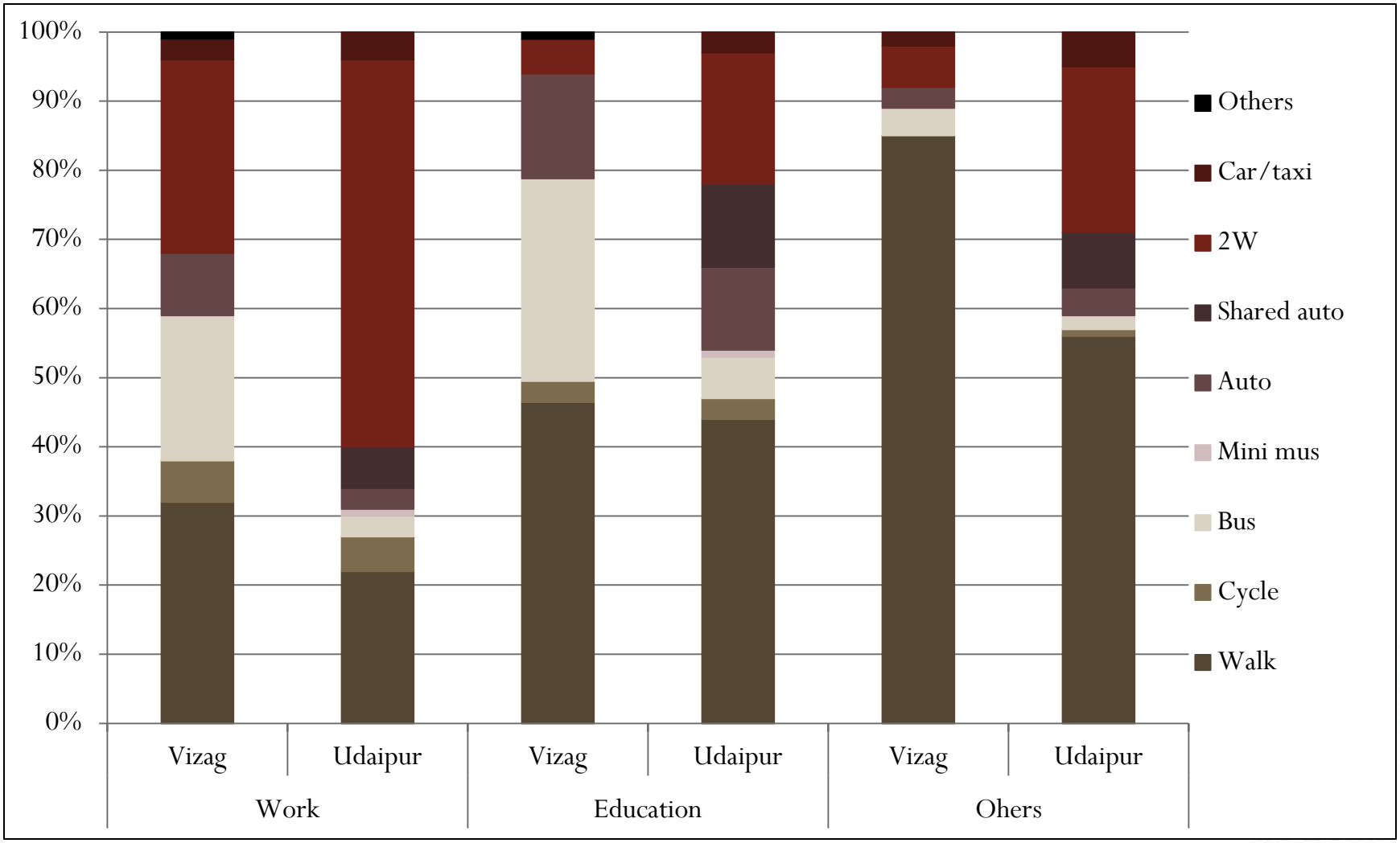
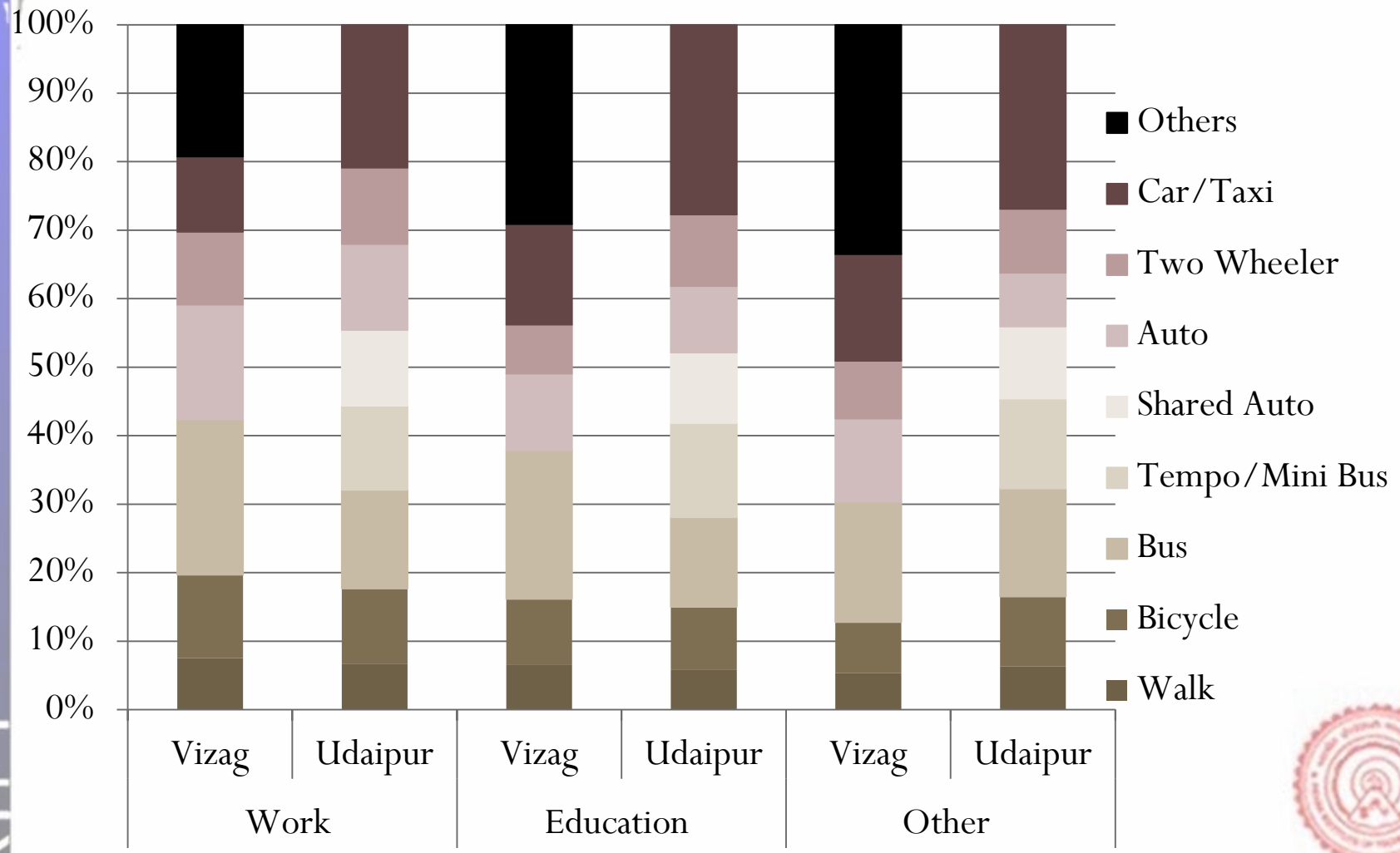
Modal share by trip purpose



Average travel time by trip purpose



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Mobility and Accessibility – Avg travel time by trip purpose – social group

	Work		Education		Others	
Income ranges	Vizag	Udaipur	Vizag	Udaipur	Vizag	Udaipur
< 5000	28.5	20.3	26.6	18.5	14.5	19.1
5000-10000	28.5		25.2		14.0	
10000-20000	28.2	20.4	25.2	17.6	15.8	17.7
20000-50000	31.6		26.3		14.2	
> 50000	22.4	20.4	21.6	20.5	21.2	19.4

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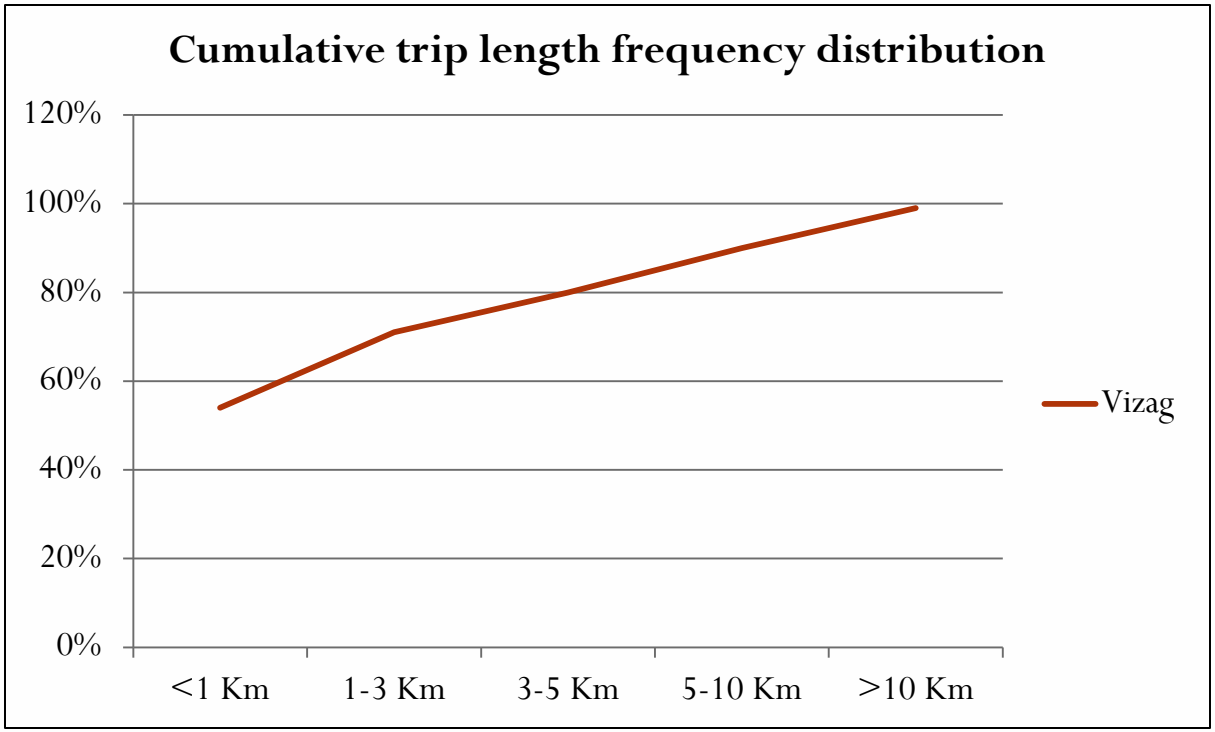
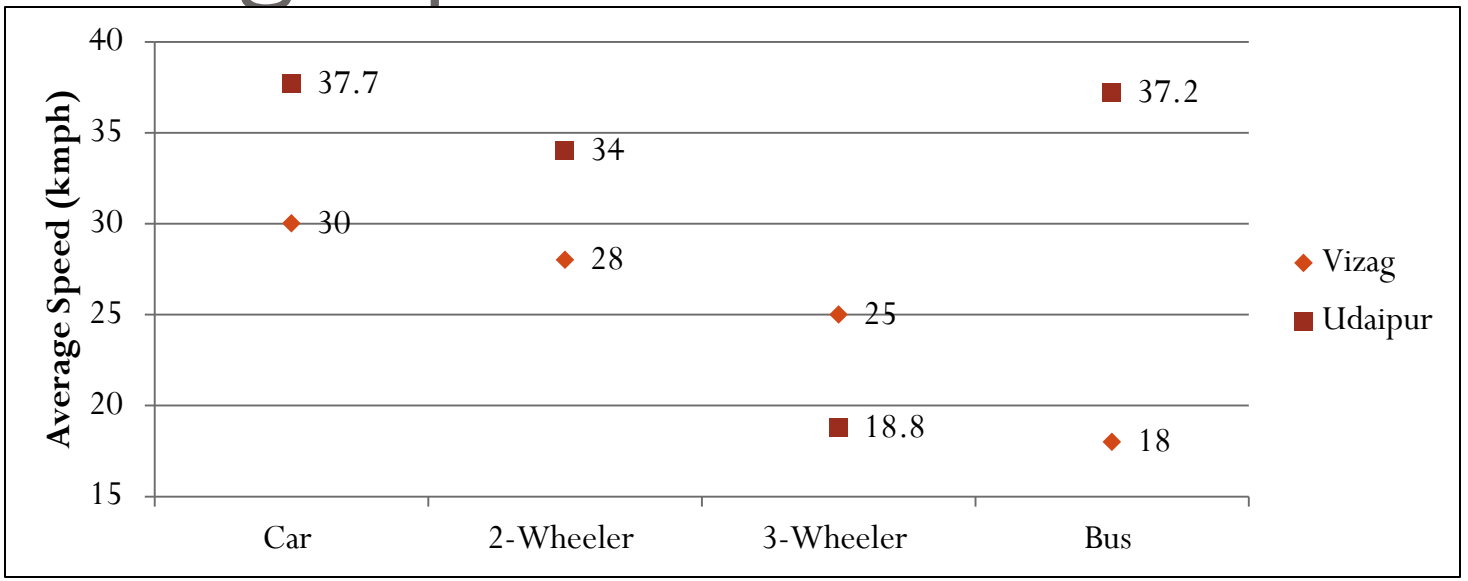
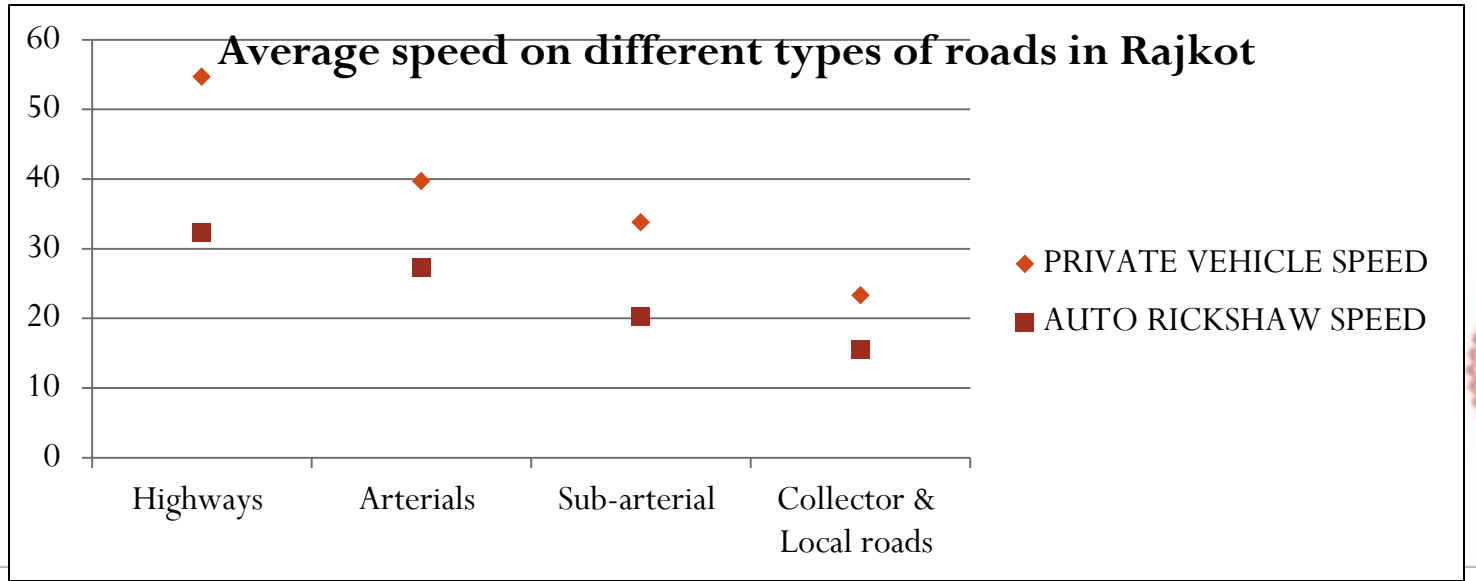
Trip length frequency distribution



Average speed on roads





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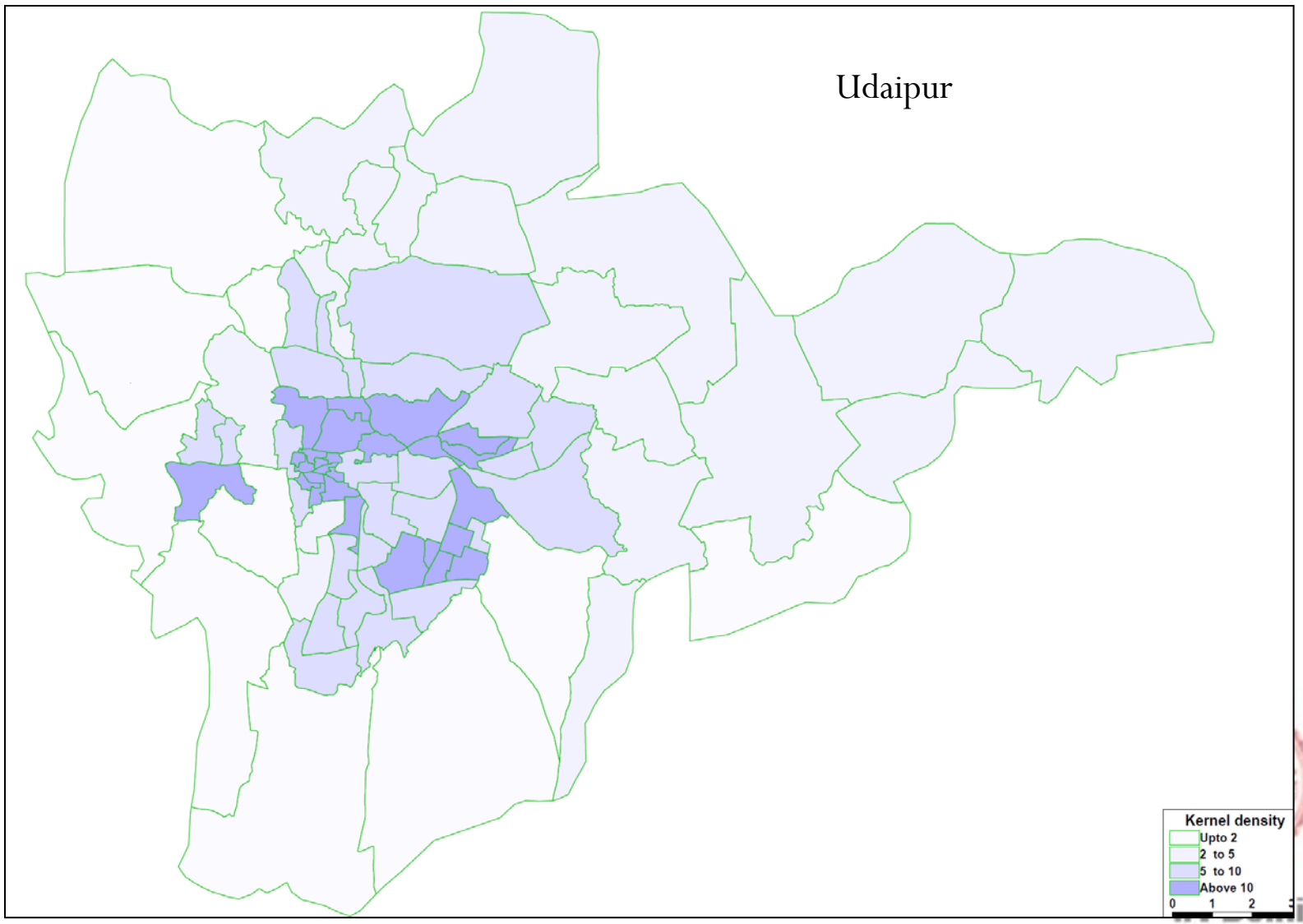
Kernel density of roads



Risk exposure and Risk imposed

Vizag	Risk imposed		Risk exposure	
	Vizag	Udaipur	Vizag	Udaipur
Cycle		7	0.52	78
Pedestrian		48	0.25	32
Truck	0.11			
Bus	0.03	36	0.03	588
Car	0.04	141	0.55	1524
TSR	0.03	27	0.29	13
MTW	0.04	189	0.75	180
Fixed object	0.04			
Others	0.04			
Unknown	0.01			

Quality of footpath infrastructure - Percentage of roads with ≥ 2 m

	Vizag	Rajkot
Width of Footpath (in m)	Length (km)	
1.5	27	
2.0	6	27%
3.0	4	
Total	37	

Vizag	
Quality of footpath	Proportion of footpaths
No encroachments	30%
Discontinuous	50%
Mostly un-usable	20%
Total	100%

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Security - Percentage of people feeling safe to walk/cycle and use PT in city by gender

	Vizag		
	Good	OK	Bad
Females	2%	83%	15%
Males	5%	76%	19%
Overall	4%	79%	17%

Safety perception- Udaipur

	Male					Female				
	1	2	3	4	5	1	2	3	4	5
Walk	55%	19%	9%	9%	8%	53%	22%	8%	10%	7%
Bicycle	28%	38%	18%	9%	7%	28%	43%	13%	9%	7%
Bus	2%	4%	6%	25%	63%	1%	4%	6%	45%	44%

FINDINGS

Specified formats have not been followed for data collection

Standardized reporting formats not used

Collected data shows problems/errors (registration, safety data)

Difficulty in understanding safety indicators

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Specific Remarks

- TAZ size is large. Difficult to capture primary walk and bicycle trips, access and egress trips and model the same for scenarios
- Need to define income levels based on asset ownership and dwelling type
- Need to report indicators in the specified format as proposed in the toolkit
- Need to correct vehicle registration numbers

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Recommendations

- Need to define detailed method for measuring indicators
  - Job-housing balance
  - Income level heterogeneity
  - Life cycle cost by modes
  - Health hazards
- Dummy report format may be given
- List of minimum and desirable indicators
- Possible pitfalls may be mentioned with data collection format
- Method and Checks for pilot survey

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