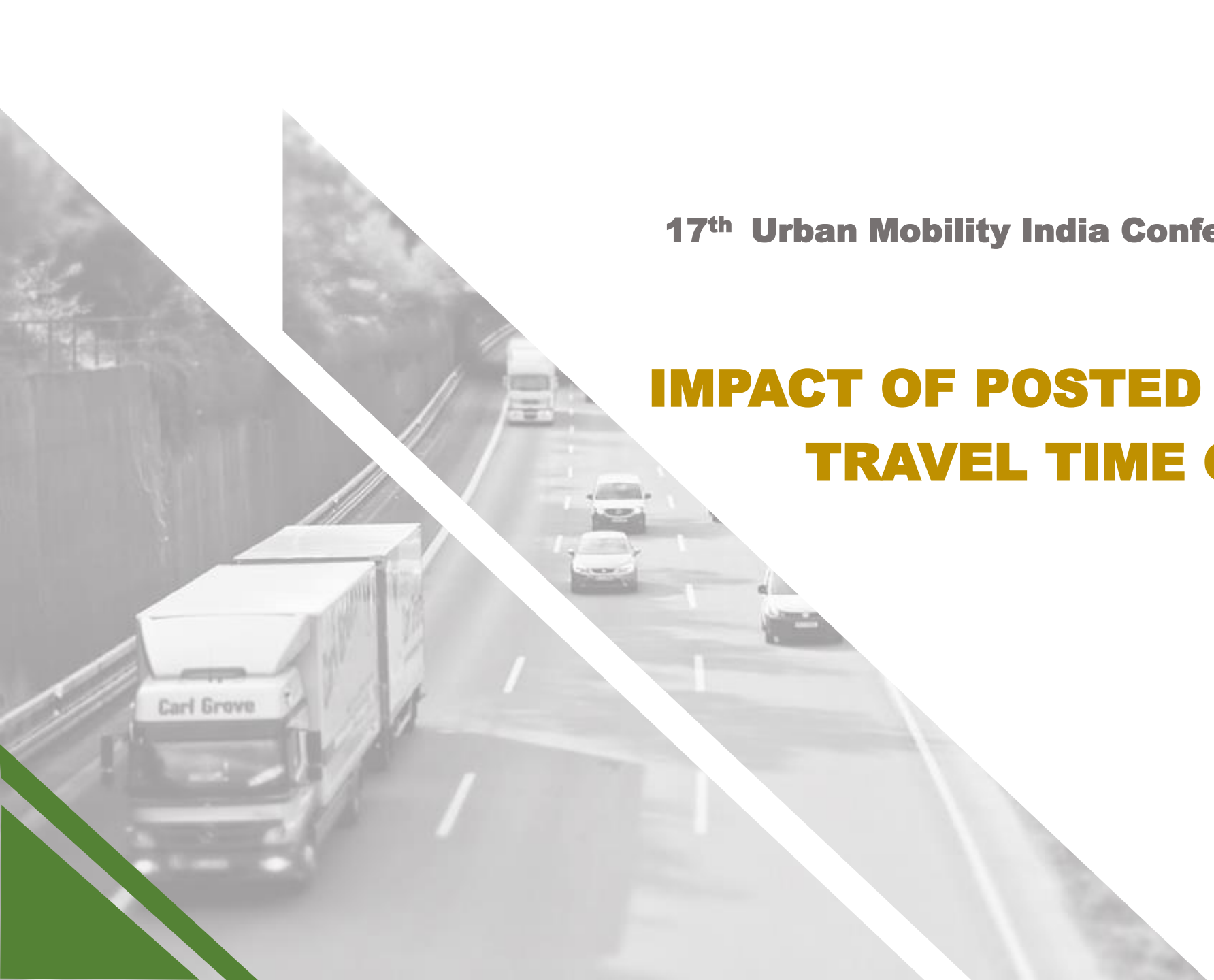

17th Urban Mobility India Conference cum Exhibition 2024

IMPACT OF POSTED SPEED LIMITS ON TRAVEL TIME ON URBAN ROADS

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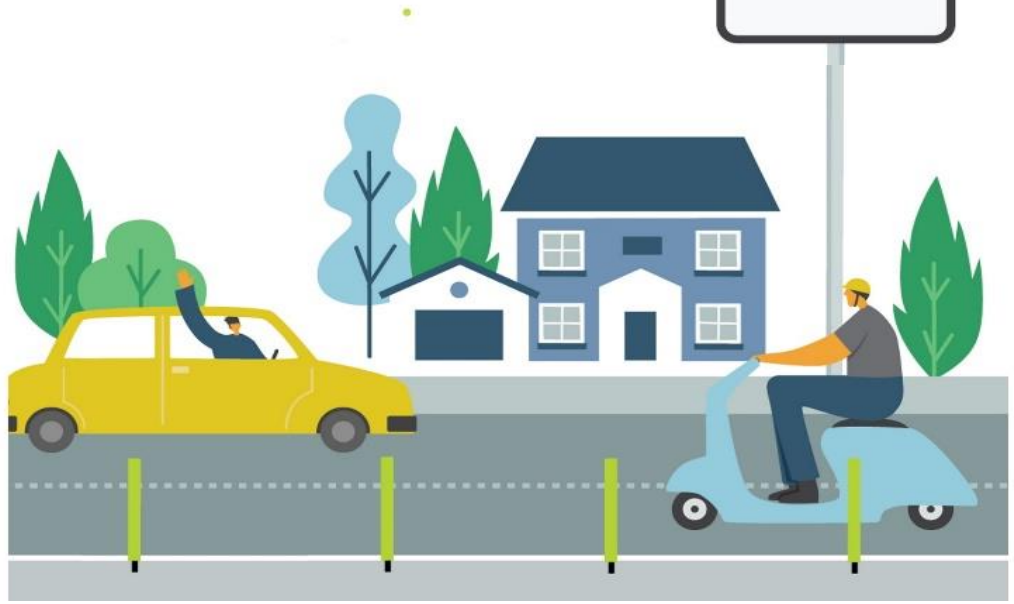
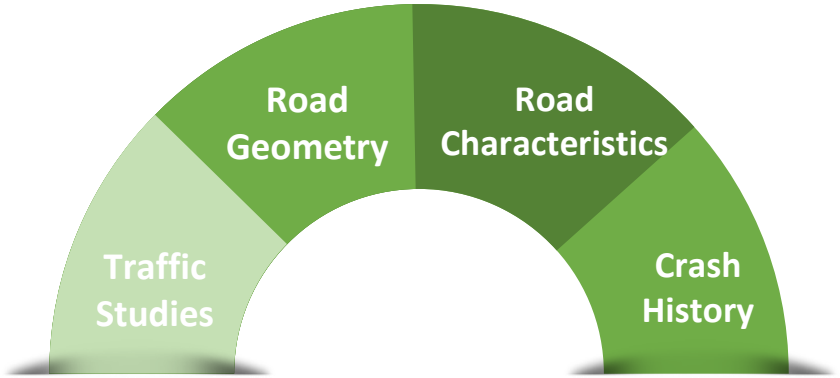
INTRODUCTION

Speed limits represent the legally maximum speeds at which vehicles can operate on specific road types.

Speed limits have been based on considerations of safety and mobility.
These are decided based on the 85%ile speed of vehicles moving on roads.



Parameters for setting Speed Limits:



As per revision by MoRTH (2018):

Maximum speed limit: 70km/hr

(Within Municipal Limits)

Further, state & Local Authorities have the power to modify as per local road conditions and traffic studies.

- Posted Speed Limits are imposed to enhance road safety by reducing the severity of accidents
- Some PSLs are not aligned effectively with existing road design and traffic patterns that can lead to inconsistencies

NEED

Inconsistencies in **Posted Speed Limit (PSL)** disrupt traffic flow.

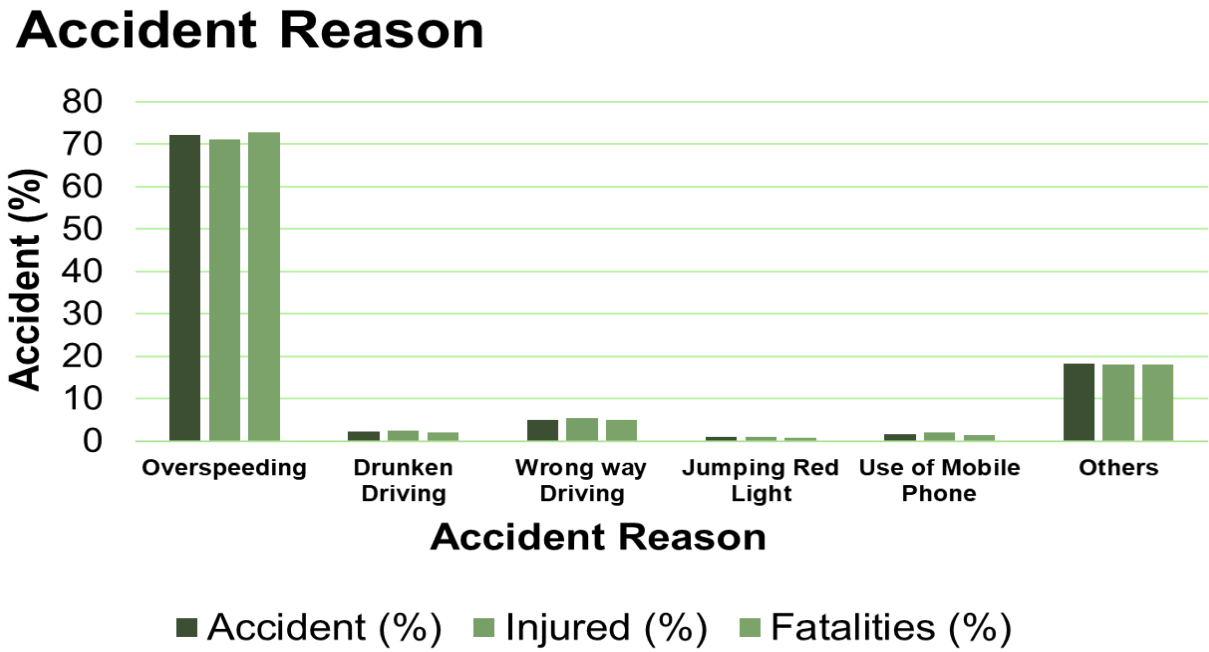
Low PSL on High capacity Roads → Congestion

High PSL on Low Traffic Roads → Speeding & Accident

This **raises questions about the safety** of road users, thus, the need is to understand the speed limit behavior and to provide recommendations for better road safety and mobility.

"Lower speed limits on roads challenges for commuters thus could be increased in the coming days"- Transport Minister

???..




News / India News / Gadkari wants to increase speed limits on expressways to 140 ...

Gadkari wants to increase speed limits on expressways to 140 kmph, Bill soon

PTI |

Oct 08, 2021 09:27 PM IST

Join Us

Are our Urban Roads capable of increasing speed limits???...

RESEARCH DESIGN

Aim

To analyse the impact of posted speed on travel time on urban roads for better safety and mobility

Objectives

01 Speed Variation

To examine existing speed limits on urban roads in different cities.

02 Speed Impacts

To investigate the impact of posted speed limits on travel time, and delay.

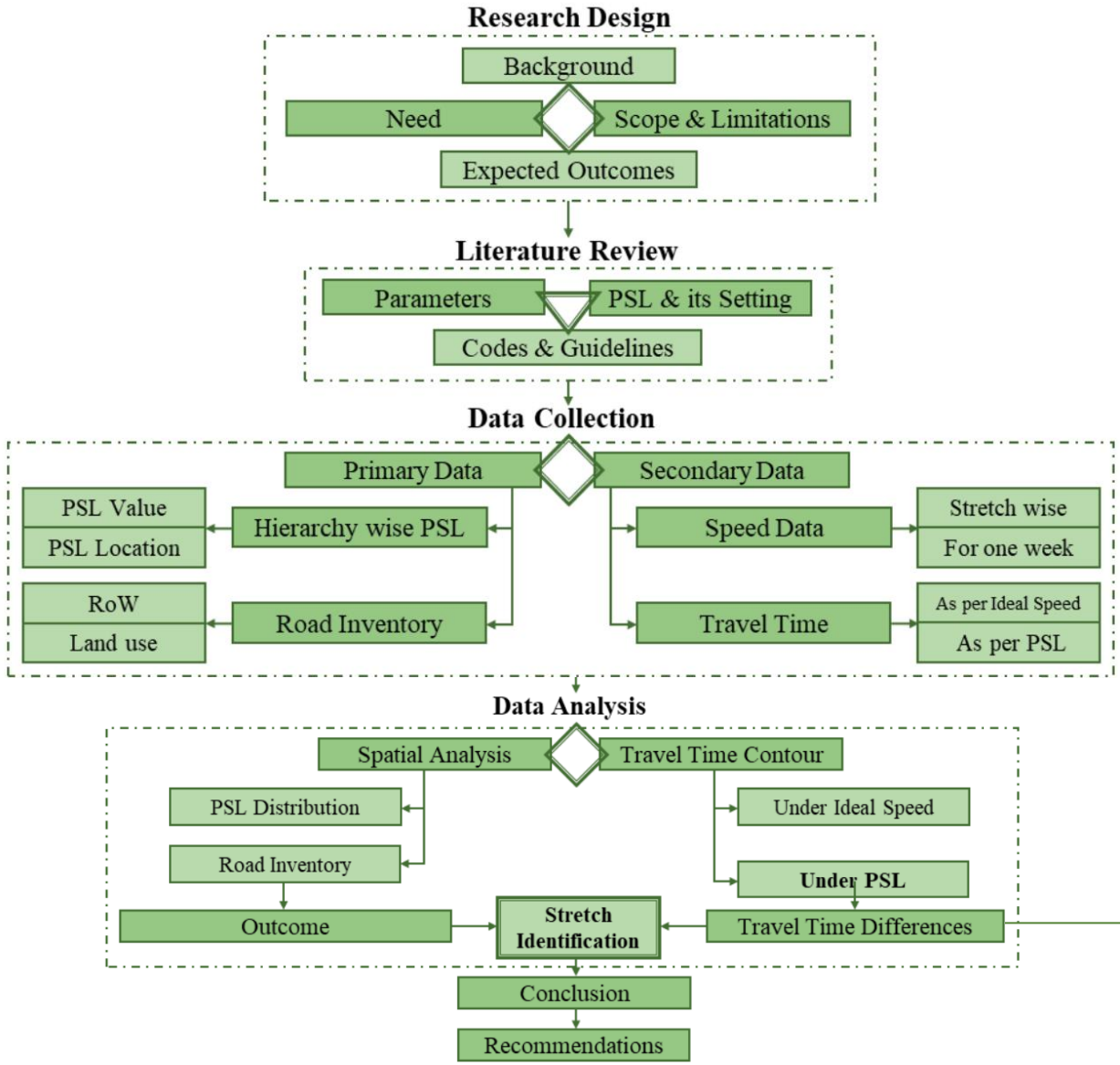
03 Recommendations

To provide recommendations for better road safety and mobility through posted speed limits.

Scope & Limitation

- The research will primarily focus on roads in urban areas covering both core and outer regions.
- It will focus only on higher hierarchy roads i.e. Arterial and Sub-arterial roads only.
- This research will not consider the local residential roads.

METHODOLOGY



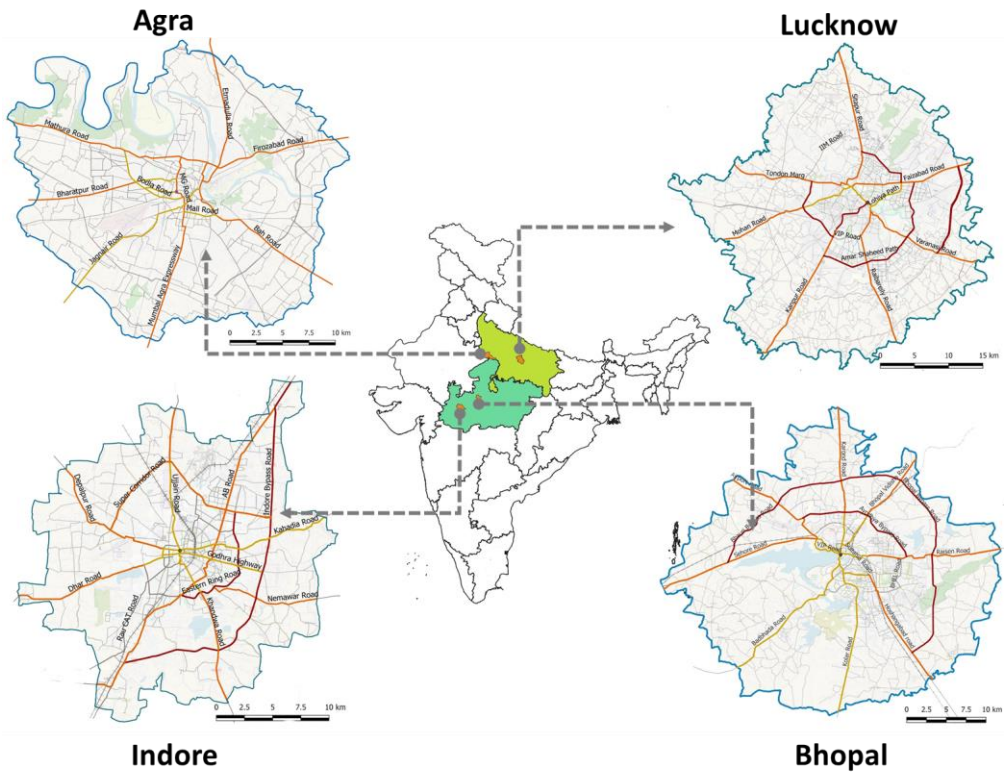
- Identification of Roads (For all identified cities)
- Calculation of travel time under Ideal Speed (near to Free-flow condition) & as per PSL
- Travel time difference for all cities (Ideal speed & as per PSL)
- Calculation of ratio of Travel time (PSL) and Travel Time difference (From minimum to maximum)
- Range distribution -(0.132 - 0.120)- Speed Near to PSL (No Difference)
  (0.154 - 0.270)- Up to difference of 10 min.
  (0.333 – 0.520)- More than 10 min
- Identification of three types of Roads (In all four cities)

LITERATURE REVIEW

S.No.	Name of the Document	Author & Year	Findings	Learning Outcomes
1	Impact of Speed Limits and Road Characteristics on Free-Flow Speed in Urban Areas	Ary P. Silvano and Karl L. Bang (2018)	PSL from 50 to 40 km/h **lowers** the mean speed level by **1.57 km/h** for a reduction of 4%. (accident-11%) PSL change from 50 to 60 km/h **raises** the mean free flow speed by **2.59 km/h** (accident-14%)	Free flow speed is less impacted by the Speed Limit only Affected by both on free flow speed
2	Sustainability Assessment of Speed Regulation of Urban Traffic	Baohua MAO, Haibo CHEN, Shanliang CHEN (2002)	Altering Speed Limit has a direct impact on **journey time, emission, and energy consumption.** **Additional emissions** when speeds are lowered from **25km/h** increase very rapidly, ranging from 40% to 400% while energy consumption increases by a maximum of 57.5%.	Higher limits may be better in terms of energy consumption, delay & travel time
3	Free flow speed estimation A probabilistic, latent approach. Impact of speed limit changes and road characteristics	Silvano, Ary P.; Koutsopoulos, Haris N.; Farah, Haneen (2020)	**Shorter time headways** result in drivers perceiving their state as constrained by the **vehicle in front**.	Drivers perceive their state of speed choice as constrained by the vehicle in front.
4	Why do drivers exceed speed limits	George Yannis & Georgia Louca & (2012)	**The belief that others break speed limits** influences significantly the driver's attitude toward exceeding speed limits.	Belief that other drivers exceed speed limits frequently
5	Impacts of Lowered speed limits in urban areas	Archer J., Fotheringham N., Symmons M. (2008)	**Cost Benefit Analysis** Although it **impact mobility** (individual level) but bring more **reduction in accidents**	Cost- Delay and more travel time Benefit- Accident rate reduces
6	Why is necessary to reduce speed limits in urban areas to 30km/hr?	Hernan Gonzalo , Marta Rojo Arce, Nadia Aponte, -Acebo (2021)	To **avoid an accident**, the Stopping Sight Distance must always be less than the Sight Distance. The **fatality risk** at **50 km/h** is more than **twice higher** than the risk **at 40 km/h** and more than **five times higher** than the risk at **30 km/h.**	Necessary for the safety of pedestrian and cycle users & Accident Reduction **Sight Distance > SSD**
7	Impact of Speed Limits and Information System on Speed Choice from Safety purpose	Ary P. Silvano (2013)	PSL directly influences the driver's speed choice. Drivers are constrained by the vehicle ahead and the relative speed of vehicles.	PSL directly influence the driver's speed choice

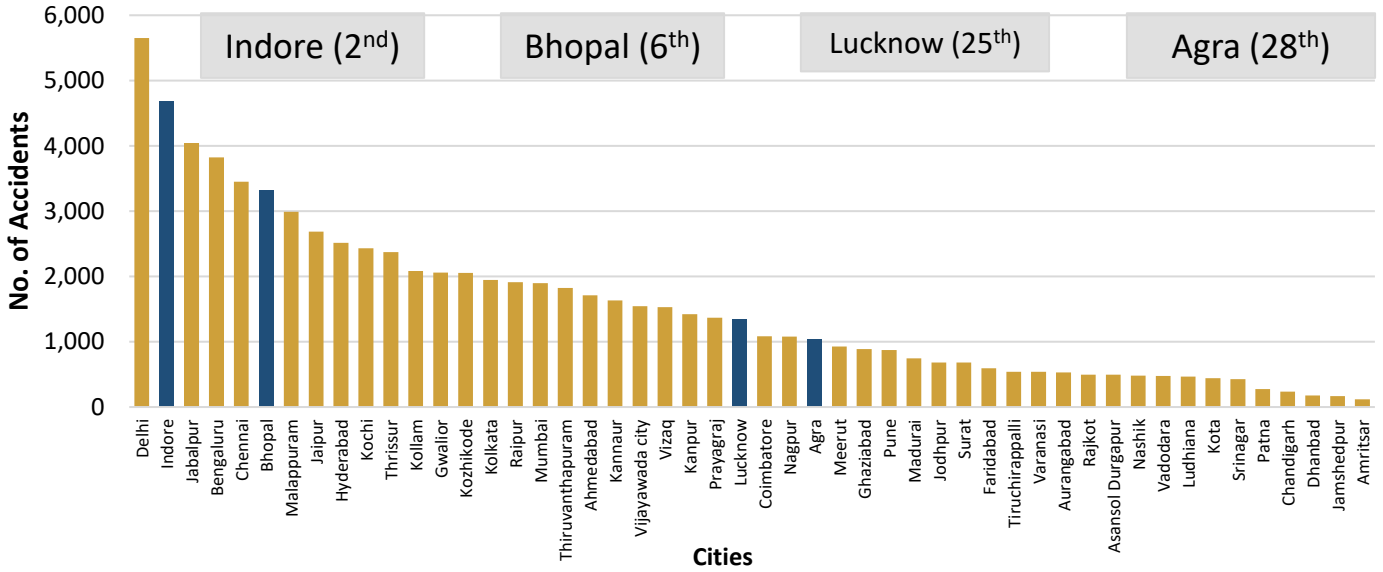
STUDY AREA

- Cities are selected based on Accidents Ranking (Safety Perception)
- **Four** Cities are selected as case study for comparison



- Arterial, Sub-Arterial, and Ring Roads are surveyed
- The road network in all cities is of **radial pattern**.

Accident Ranking of top 50 Million+ Cities



Source: Accident Report (2022)- MoRTH

City Comparison

S.No.	City	Area (Sq.km)	Population (2011)	Road Length (km)
1	Agra	121	15.8 lakh	610.16
2	Lucknow	631	29.0 lakh	1468.77
3	Bhopal	463	18.8 lakh	894.64
4	Indore	530	21.6 lakh	585.13

Source: DPR, Census 2011, OSM

ANALYSIS (PSL DISTRIBUTION –AGRA)

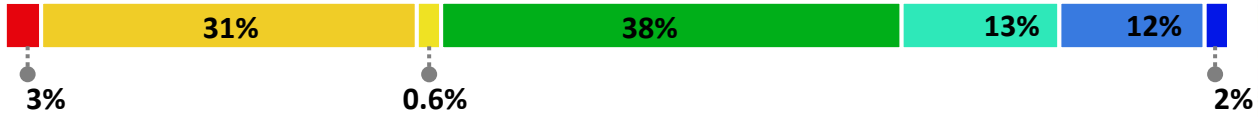
PSL Distribution

Total Surveyed Road: **109.2** km (**18%** of Total Road)
No. of PSL: **68**

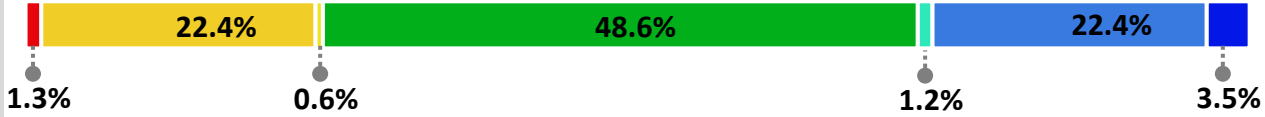
Arterial Road: **66** %
3 PSL /10 km

Sub Arterial Road: **34** %
3 PSL /10 km

PSL Count



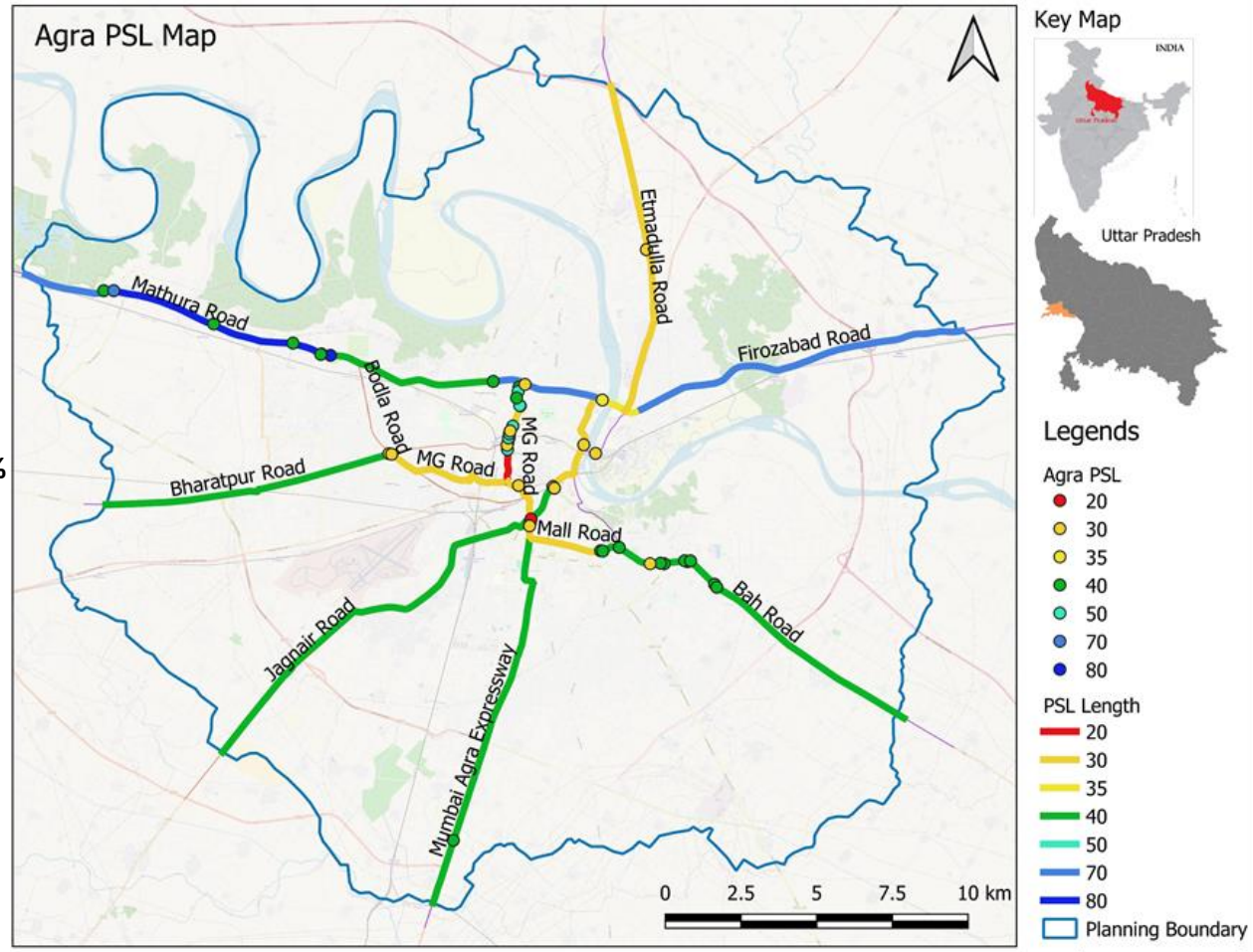
PSL Length



Average Spacing

- For continuity in **40 & 50km/h**, Avg. distance is **500-1000m**
- PSL 50 → 50 → 30km/h; **150-200m → 50m →** Junction
- On Highway-PSL (**70, 80km/h**), the distance is above **2 km**

PSL Distribution Map



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ANALYSIS (PSL DISTRIBUTION –LUCKNOW)

PSL Distribution

Total Surveyed Road: **213.2** km (**14.5%** of Total Road) | PSL: 152

Arterial Road: **61.6** %	Sub Art. Road: **9.4** %	Ring Road: **29** %
3 PSL /10 km	**6** PSL /10 km	**4** PSL /10 km

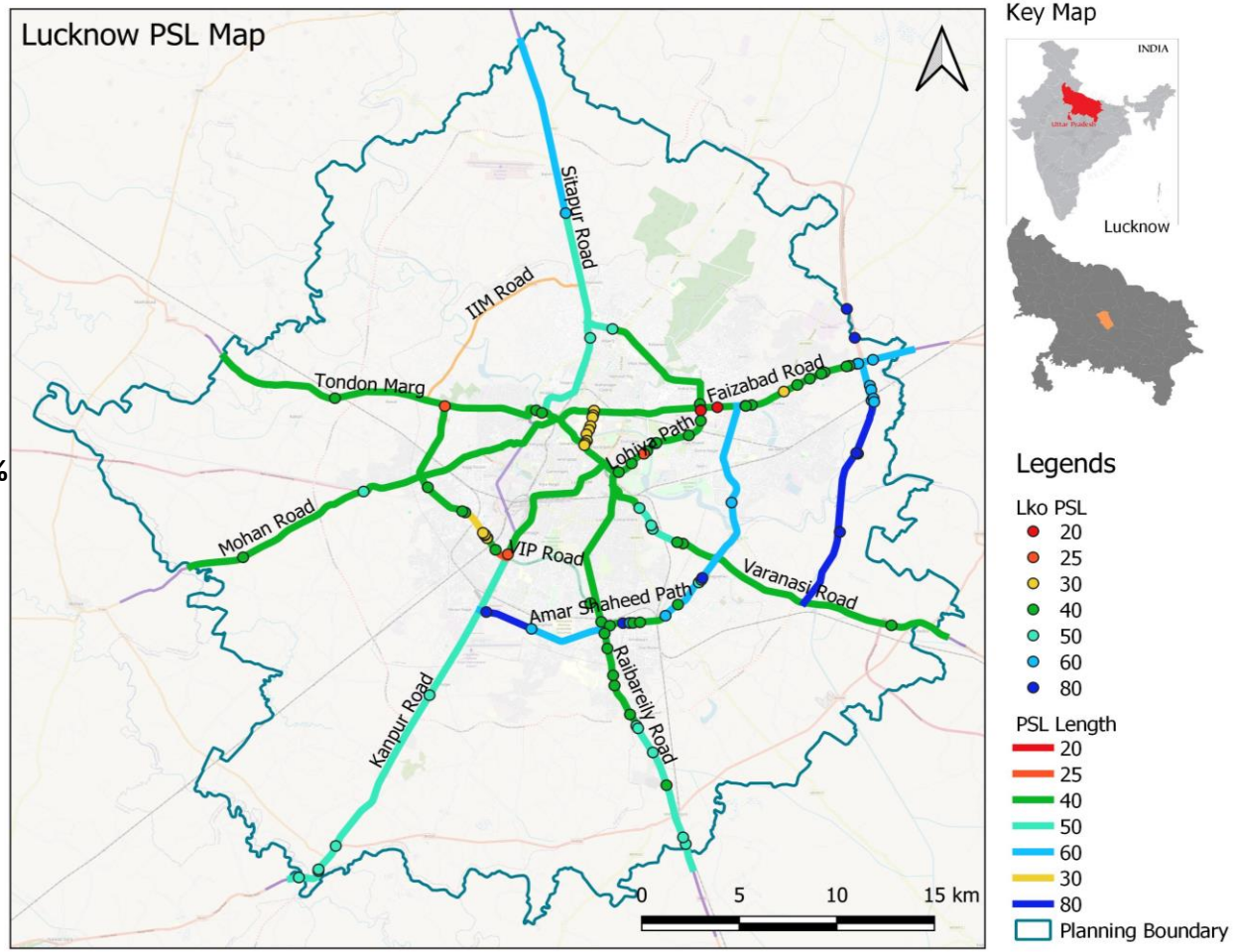
PSL Count

PSL Length

Average Spacing

- For PSL **30km/h**, Avg. distance is **200-500m**
- PSL 40 → 40km/h; **500-1000m ,** Avg. Distance; **3km**
- For Higher PSL (**50, 60km/h**), the distance is above **4 km**

PSL Distribution Map



Source: Author generated

ANALYSIS (PSL DISTRIBUTION –BHOPAL)

PSL Distribution

Total Surveyed Road: **225.8** km (**25.2%** of Total Road) | PSL:79

Arterial Road: 40.3 %	Sub Art. Road: 29.5 %	Ring Road: 30.2 %
2 PSL /10 km	3 PSL /10 km	1 PSL /10 km

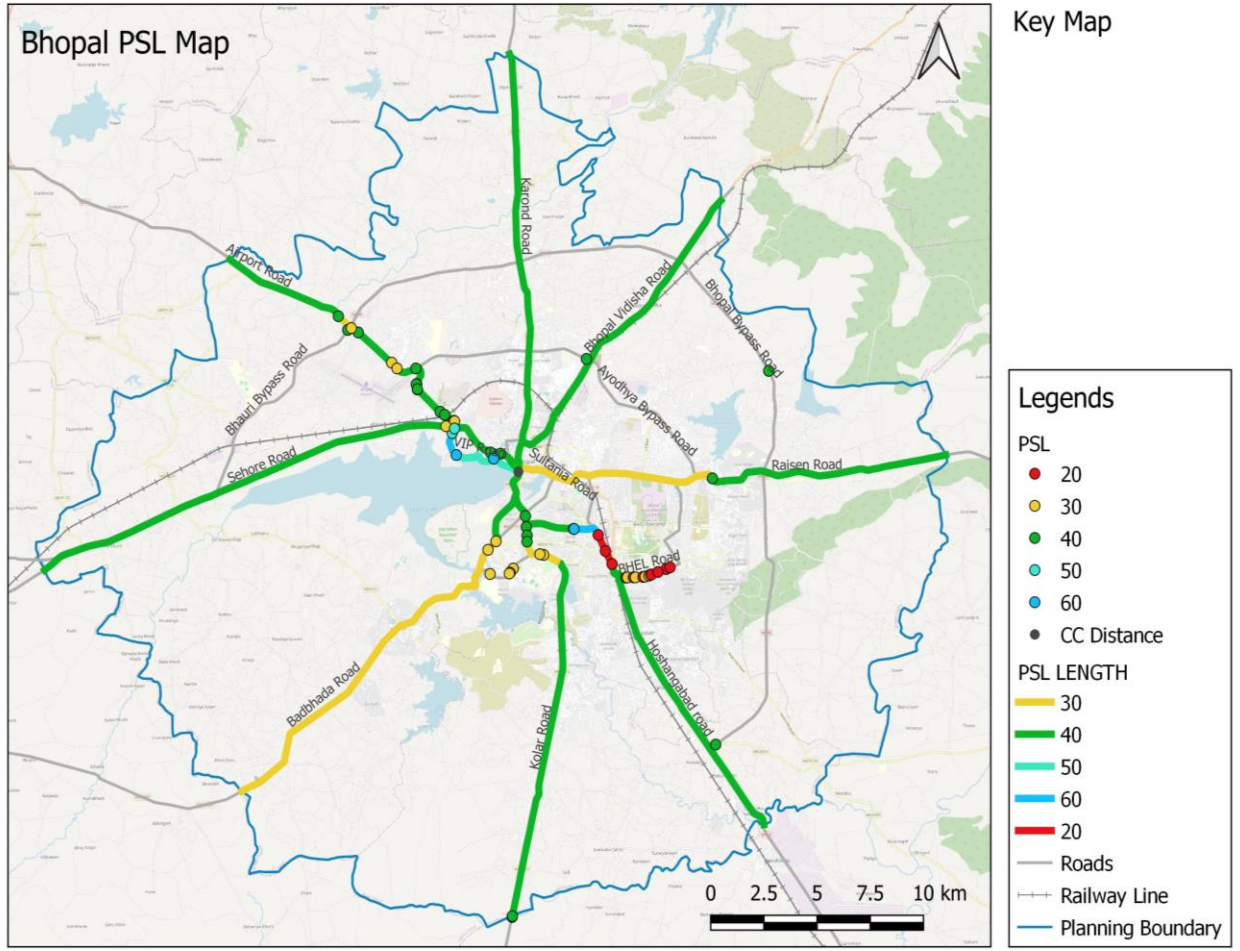
PSL Count

PSL Length

Average Spacing

- PSL 40 → 40km/h; **200 - 500m**
- PSL 30 → 20km/h; **200-250m → 50m → Junction**
- For Higher PSL (**50, 60km/h**), the distance is above **2 km**

PSL Distribution Map



Source: Author generated

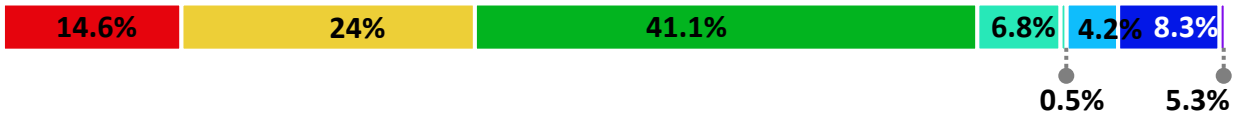
ANALYSIS (PSL DISTRIBUTION –INDORE)

PSL Distribution

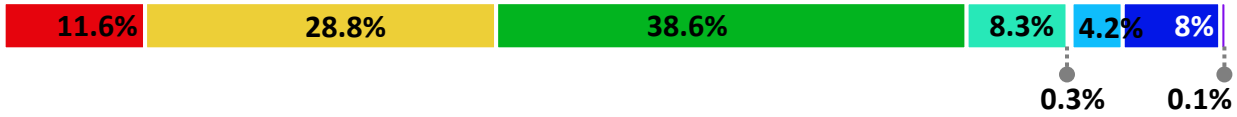
Total Surveyed Road: **177.3** km (**30.3%** of Total Road) | PSL:192

Arterial Road: **51.4** %	Sub Art. Road: **22.6** %	Ring Road: **26** %
7 PSL /10 km	**5** PSL /10 km	**3** PSL /10 km

PSL Count



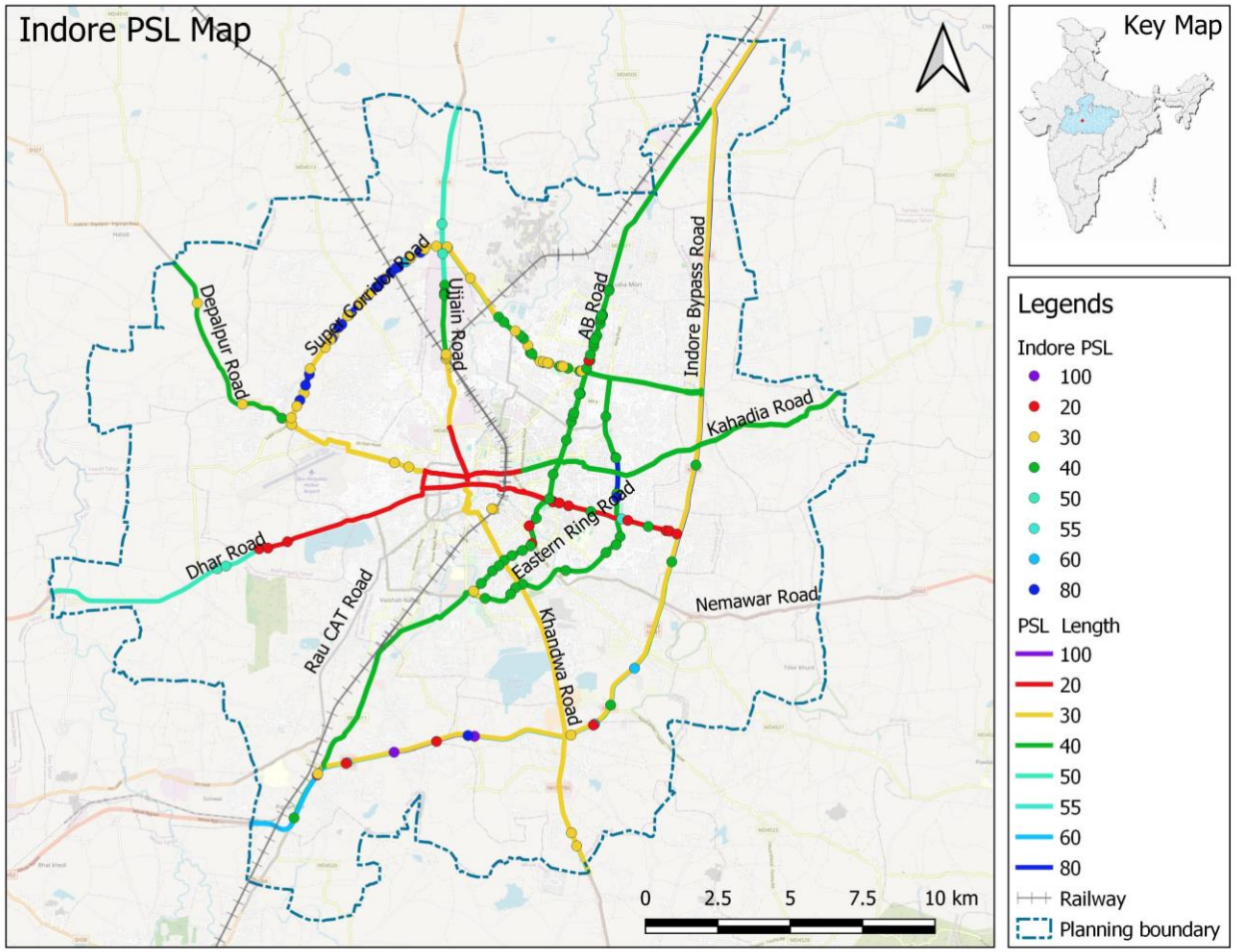
PSL Length



Average Spacing

- For PSL **20 & 30km/h**, Avg. distance is **300-350m**
- For Higher PSL (**50, 60, 80 & 100**), the distance is above **2 km**
- PSL 40 → 40km/h & 80 →80km/h**;** Avg. distance is **500m**

PSL Distribution Map



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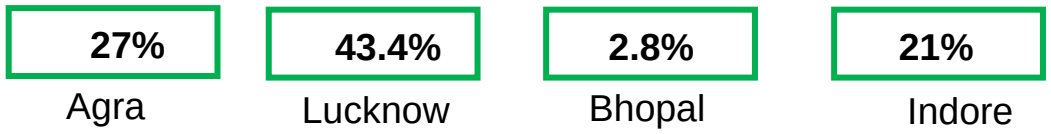
ANALYSIS (PSL DISTRIBUTION- ALL CITIES)

PSL Distribution

Higher PSL %age (more than PSL 40)



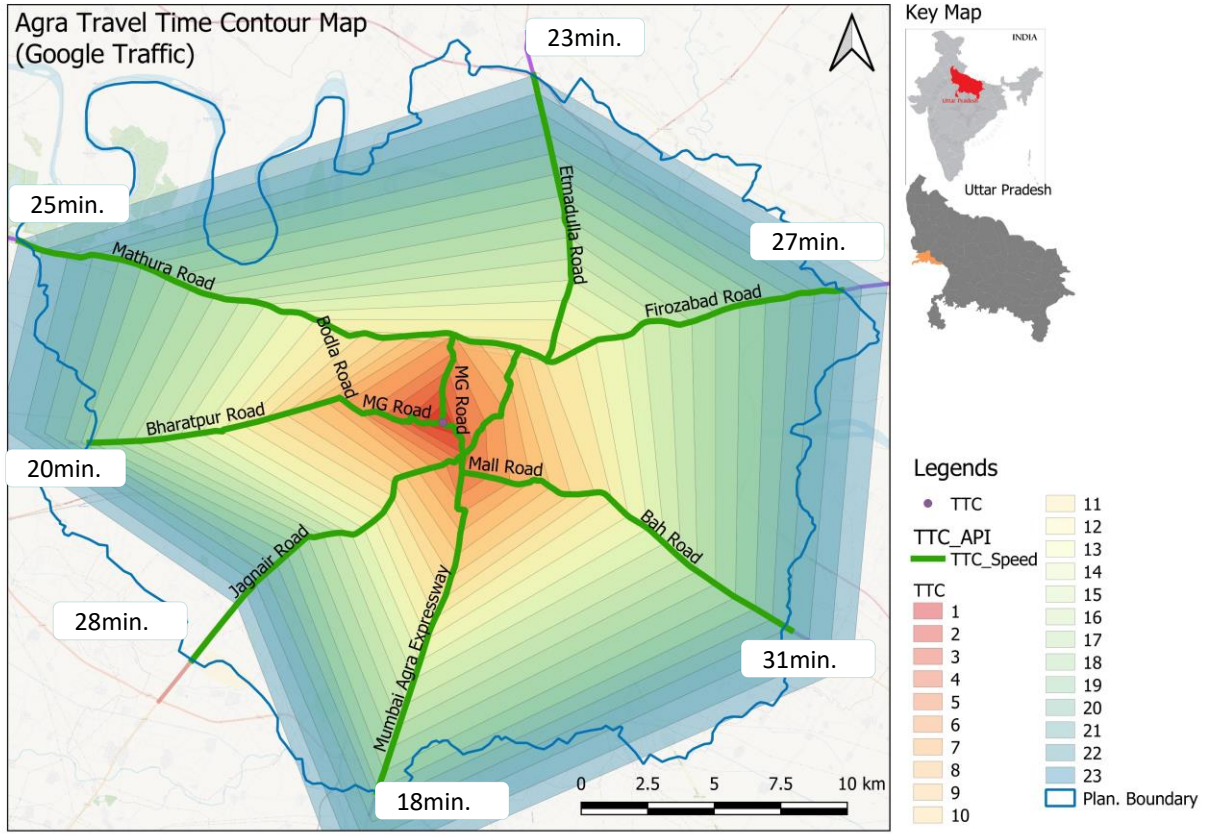
Indore has the maximum no. of PSLs while Bhopal has the least (3PSL Board/10km)

Lucknow has mostly higher PSL (running length) on roads while Bhopal has the least.

Indore and Lucknow have PSL count (PSL-wise) proportional to their running length whereas Agra and Bhopal don't.

In Bhopal, most roads have PSL of 40 kmph except two arterial roads.

ANALYSIS (IMPACT ON TRAVEL TIME- AGRA)



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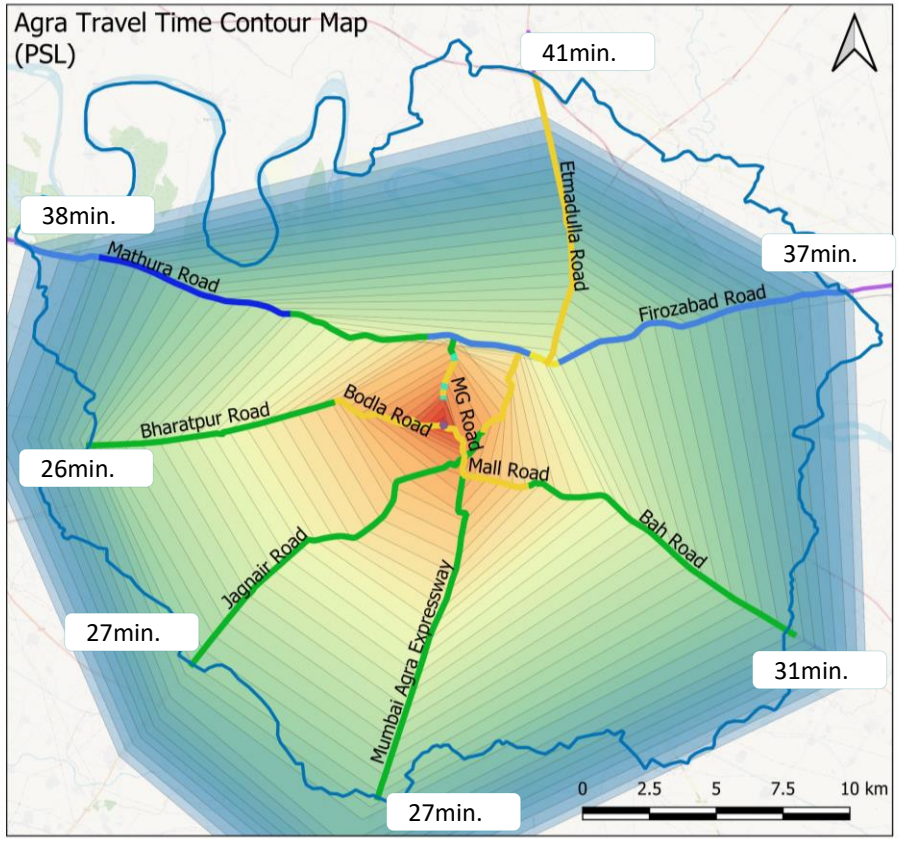
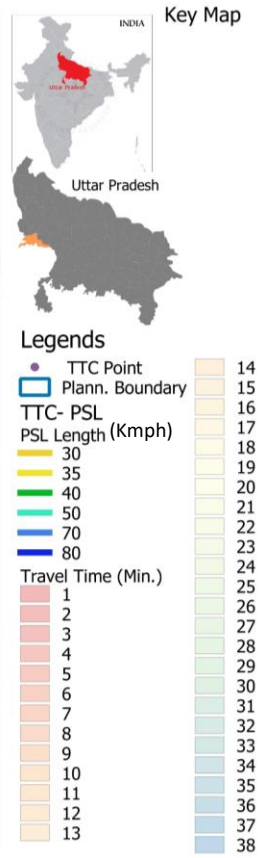




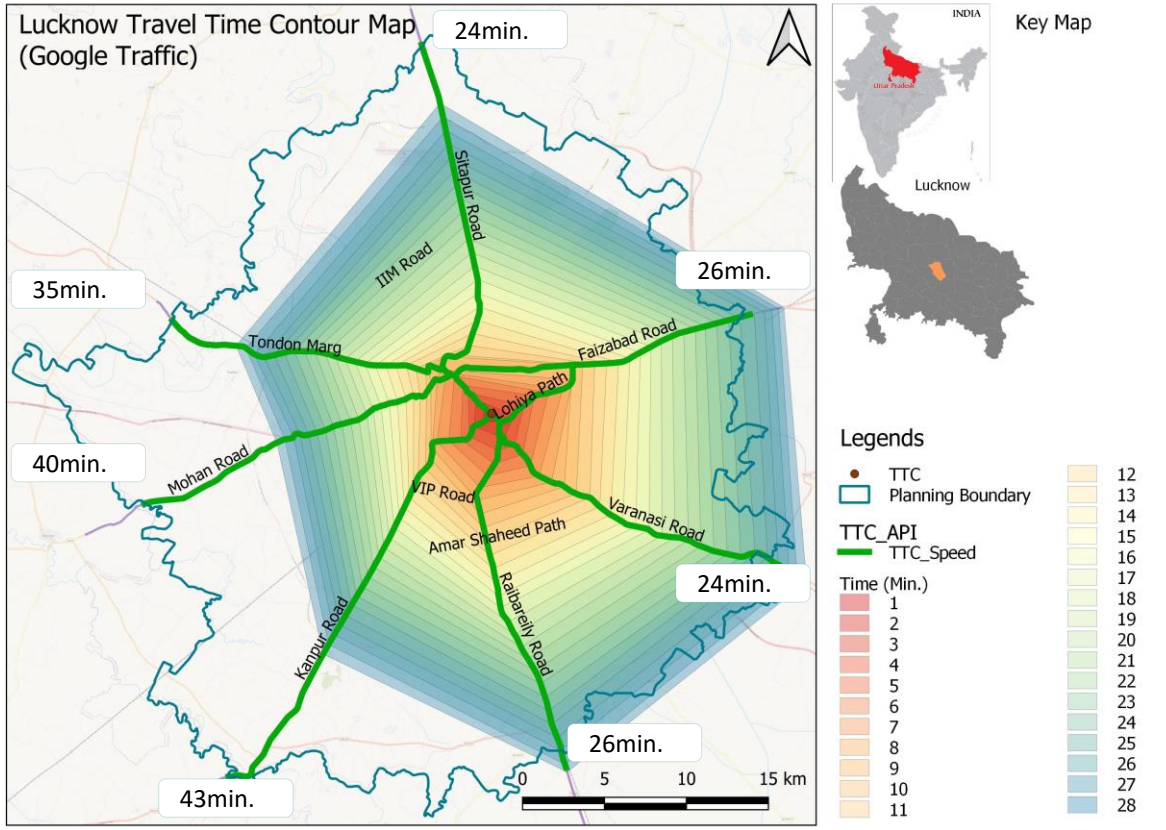
Source: Author generated

Travel Time Differences

Road Name (Agra)	Time (min.) As per Ideal Speed	Time (min.) As per PSL	Time Diff (min.)	Reason
Mumbai-Agra Expressway	18	27	9	Commercial Zone in Core Area
Bah Road	31	31	0	-
Jagnair Road	28	27	-1	Less Traffic

Road Name (Agra)	Time (min.) As per **Ideal Speed**	Time (min.) As per PSL	Time Diff (min.)	Reason
Bharatpur Road	20	26	6	Comm. Zone in Core Area
Mathura Road	25	38	13	Junction & High Traffic
Faizabad Road	27	37	10	Junction & High Traffic
Hathras Road	23	41	18	Parking & High Traffic

ANALYSIS (IMPACT ON TRAVEL TIME- LUCKNOW)



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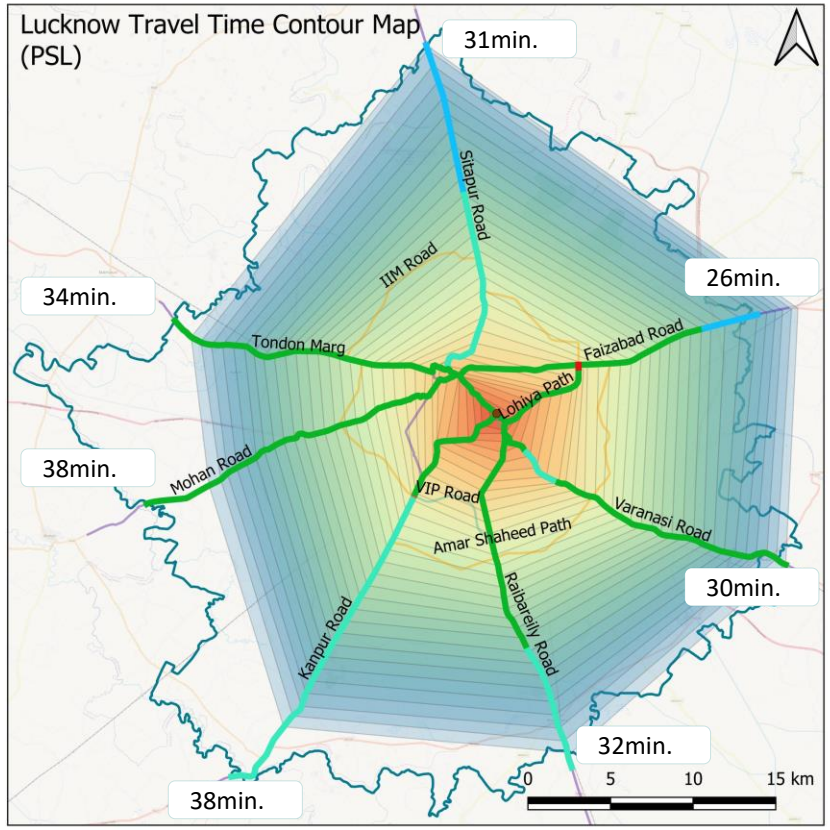
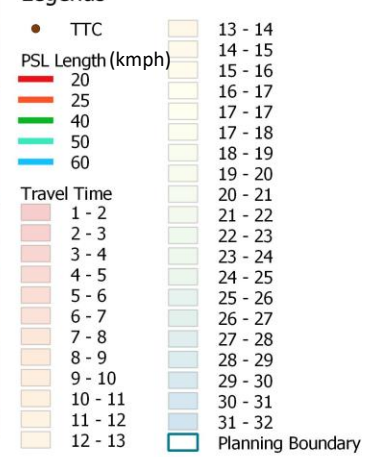




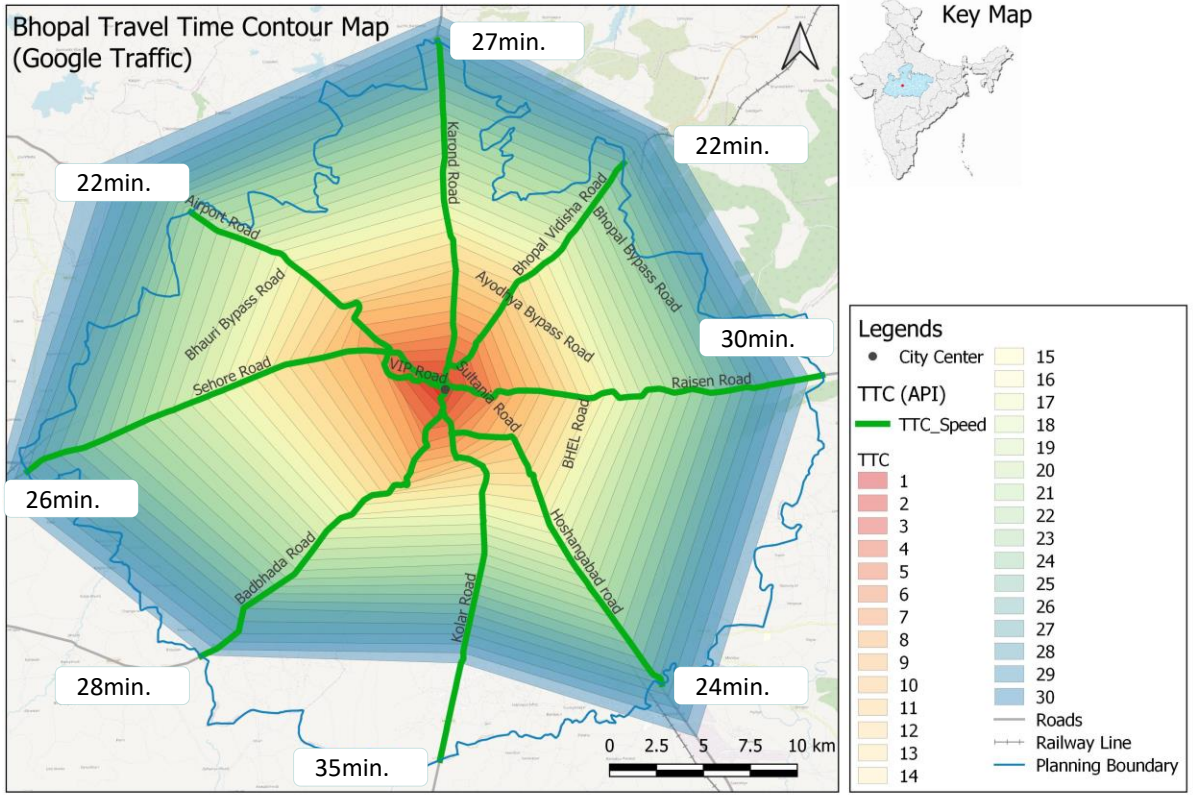
Source: Author generated

Travel Time Differences

Road Name (Lucknow)	Time (min.) As per Ideal Speed	Time (min.) As per PSL	Time Diff (min.)	Reason
Kanpur Road	43	38	-5	High Traffic in Core Area
Raebareilly Road	26	32	6	Less Puncture
Varanasi Road	24	30	6	Less Puncture & Res. Density
Tondon Road	35	34	-1	-

Road Name (Lucknow)	Time (min.) As per **Ideal Speed**	Time (min.) As per PSL	Time Diff (min.)	Reason
Mohan Road	40	38	-2	Less & Undivided Cariageway
Sitapur Road	24	31	7	No Res. Density along Road
Faizabad Road	26	26	0	-

ANALYSIS (IMPACT ON TRAVEL TIME- BHOPAL)



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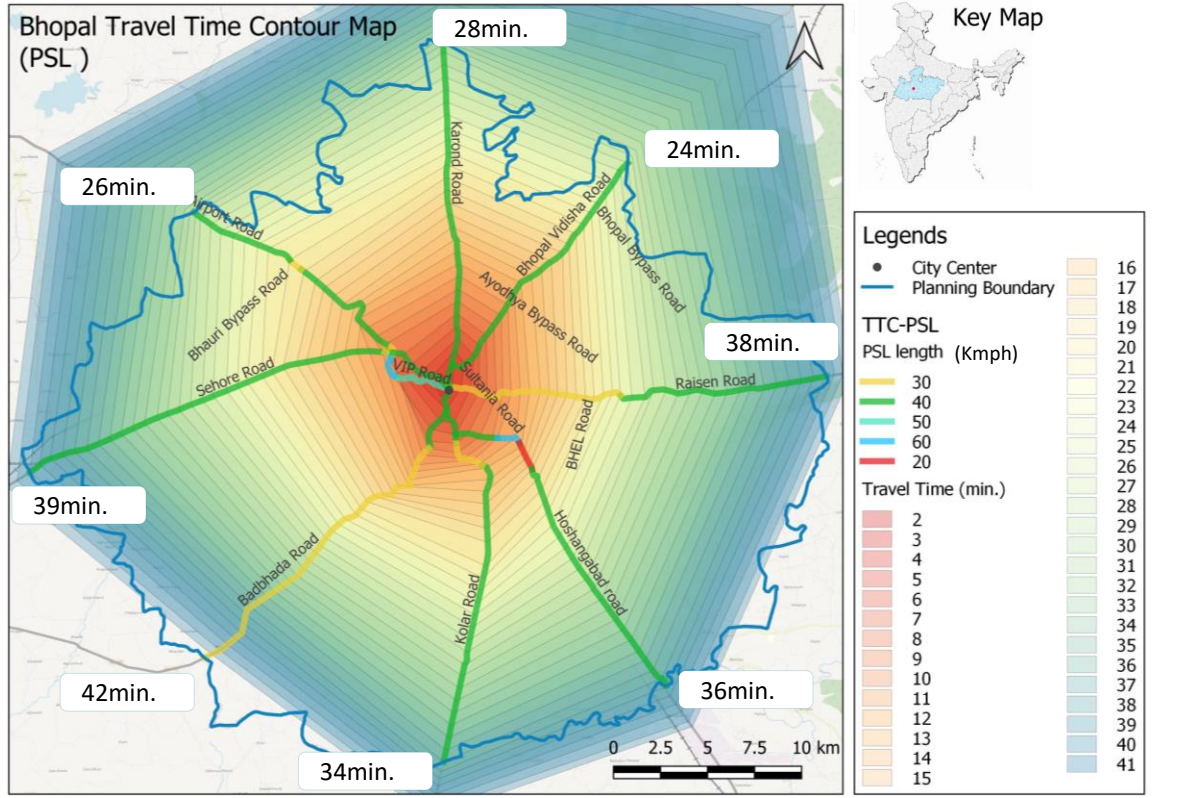


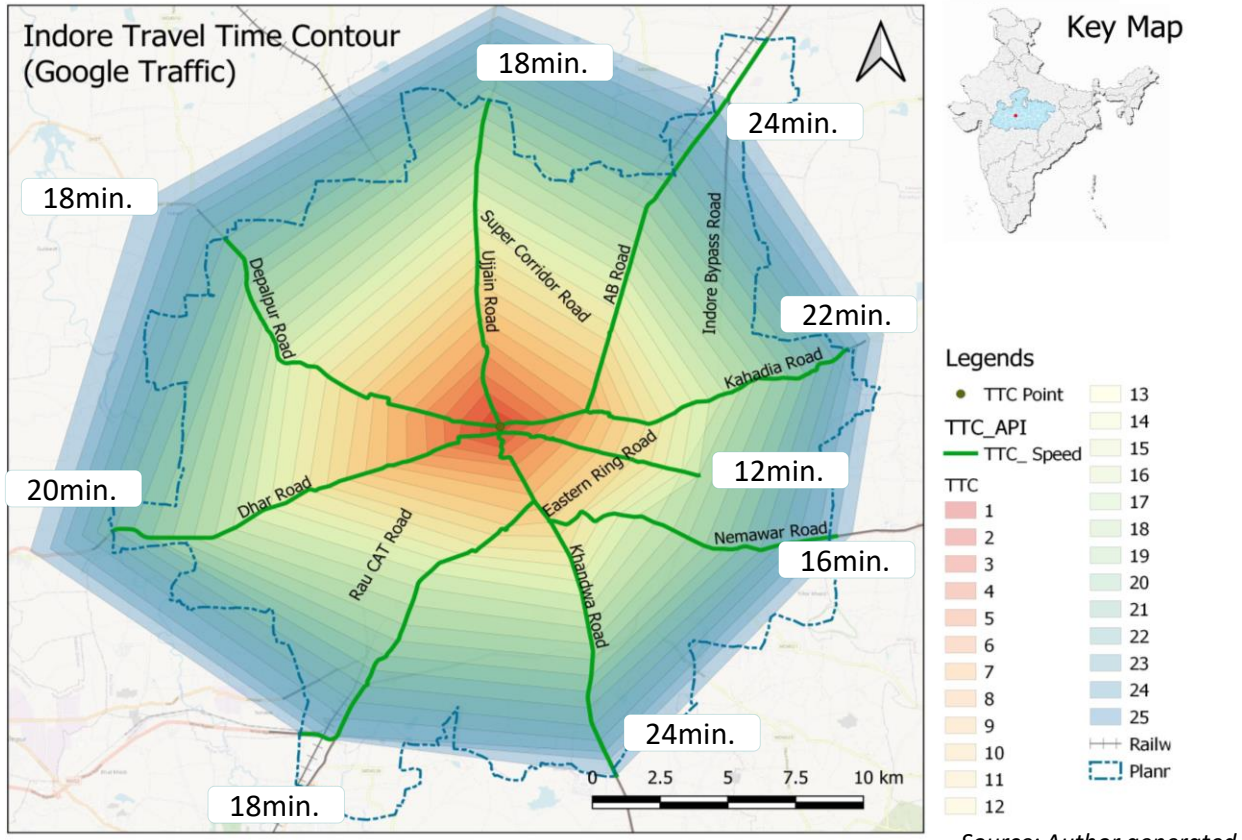
Source: Author generated

Travel Time Differences

Road Name (Bhopal)	Time (min.) As per **Ideal Speed**	Time (min.) As per PSL	Time Diff (min.)	Reason
Hoshangabad Road	24	36	12	High Traffic
Raisen Road	30	38	8	High Traffic in Core Area
Karond Road	27	28	1	-
Vidisha Road	22	24	2	Railway Crossing

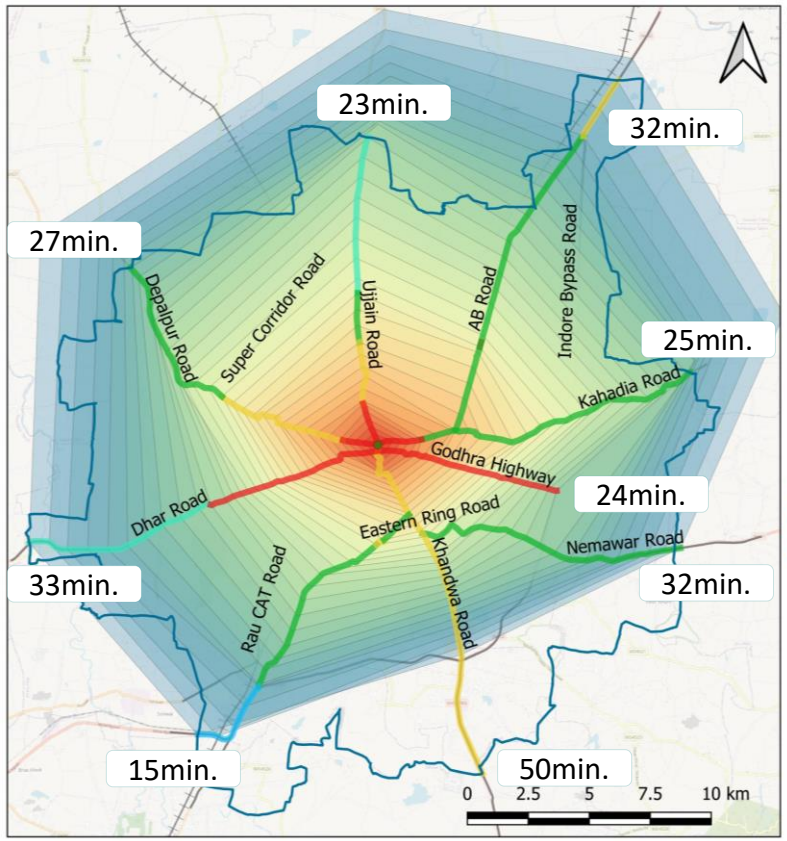
Road Name (Bhopal)	Time (min.) As per **Ideal Speed**	Time (min.) As per PSL	Time Diff (min.)	Reason
Sehore Road	26	39	13	Junctions & Vehicular Traffic
Airport Road	22	26	4	Horizontal Curve and Junction
Bhadbhada Road	28	42	14	No Speed Limit Board
Kolar Road	35	34	-1	-

ANALYSIS (IMPACT ON TRAVEL TIME- INDORE)



Legends
TTC Point
TTC_API
TTC_ Speed
TTC
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Railw
Planr

Source: Author generated



Legends
TTC Point
Planning boundary
TTC-PSL
PSL Length (kmph)
20 30 40 50 60
Travel Time (min.)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33

Source: Author generated

Travel Time Differences

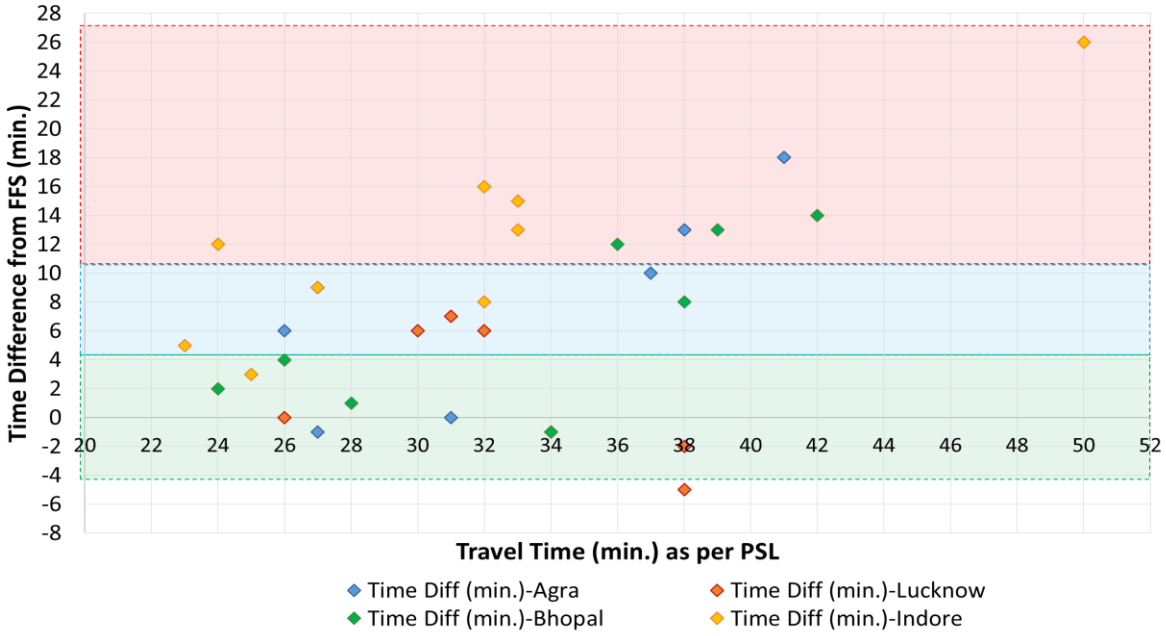
Road Name (Indore)B	Time (min.) As per Ideal Speed	Time (min.) As per PSL	Time Diff (min.)	Reason
Ujjain Road	18	23	5	Less & Undivided Carriageway
Depalpur Road	18	27	9	Less & Undivided Cariageway
Kahadia Road	22	25	3	Less & Undivided Cariageway
AB Road	24	32	8	Junction & High Traffic
Khandwa Road	24	50	26	2-way Carriageway/ Construction

Road Name (Indore)	Time (min.) As per **Ideal Speed**	Time (min.) As per PSL	Time Diff (min.)	Reason
Mumbai Agra NH	18	33	15	Junction & High Traffic
Nemawar Road	16	32	16	Horizontal Curve & Punctures
Pipiliyahana Road	12	24	12	High Traffic
Dhar Road	20	33	13	High Traffic in Core Area

CONCLUSION

Identification of Stretches (With more time difference)

Type I Road	Travel Time (TT) with PSL = TT with Ideal Speed (near to FFS)
Type II Road	TT (PSL) > TT (Ideal Speed) up to 10min. difference
Type III Road	TT (PSL) > TT (Ideal Speed) more than 10min. difference



No. of Stretches in each category

City	I Type Roads	II Type Roads	III Type Roads
Agra	2	2	3
Lucknow	4	3	0
Bhopal	3	2	3
Indore	1	2	6

Findings

- **In Indore**, most roads have an **ideal speed close to free-flow speed** (FFS) exceeding PSL.
- In **Lucknow**, most roads align PSL with the ideal speed.
- **Bhopal** and **Agra** show mixed conditions, with fewer roads having significant differences between ideal speed and PSL.
- Lucknow has sections where PSL is higher than the ideal speed.
- One road in Agra and Lucknow shows equal travel time for both ideal speed and PSL.

Recommendations

- The research identified areas where speed limit signs do not match actual conditions.
- Authorities should address overspeeding, assess safety implications, and prioritize appropriate measures.
- Government and NGOs need to implement public training on posted speed limits.
- Further research is necessary on how spatial and geometric factors influence speed limits in urban areas.

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Thank You.....