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Urban Mobility and Transportation Challenges in Allahabad

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Abstract—*An urban mobility and transportation system in a city, responsive to the requirements and expectations of the users is a critical factor to be considered for enhancing the quality of life of the citizens which serve as the primary objective of a smart city.*
This paper aims to identify the challenges in the existing urban mobility and transportation infrastructure in Allahabad, the factors affecting choice over mode of commute by the citizens and their mobility behavior.
The research incorporated a survey for two commercially important areas in Allahabad city namely Civil lines and Chauk. The sample population was asked to identify the challenges in mobility and transportation infrastructure in these areas, about their mobility preference and improvement factors influencing this preference. The mobility behavior was analyzed against certain demographic factors to find out any association between the two.
The results of the survey revealed the major challenges experienced and improvements required in the mobility and transportation system in each of subject areas of the study. Further, it was evident demographic factor i.e. income affects the choice over mode of commuting. Most important factors encouraging people to use public transport were identified.
The findings of the research are significant as they reveal the status of urban mobility and transportation infrastructure in Allahabad and the opinions of the users of the system. This information can prove to be helpful for the city planners, policy makers to adopt a sustainable approach towards the development and improvisation in the existing infrastructure, providing an effective response to the requirements of the citizens and thus contributing towards an enhanced quality of life for the citizens.

Keywords*: urban mobility, transportation, quality of life, mobility behavior, smart city.*

1. INTRODUCTION

Improving mobility and transportation system remains one of the agendas in development of smart cities. It acts as a backbone for development of economy of any city or nation and plays a vital role in improving quality of life of inhabitants which serves as primary objective of a smart city.

People take transit on daily basis indulging in economic activities. Unlike other elements of physical infrastructure, ease of mobility and transit can affect the personal decisions of riders like place of residence and work. To improve the mobility in the city, local governing and developing bodies' needs to better understand the challenges existing in the current infrastructure along with public attitude towards the transit and transportation system.

Transport and mobility infrastructure remains a crucial factor in urban areas as it can have significant impact on economic activities going on in these areas. It requires a detailed understanding of the challenges faced by citizens travelling in urban areas and their preferred method of commuting, in order to introduce mobility and transport solutions which not only contributes towards economic development of a city but are responsive to and in alignment with user requirements of urban mobility and transportation infrastructure.

To achieve the aforementioned goals, a survey was carried out in two subject areas of Allahabad, namely Civil lines and Chauk. Both the areas have their commercial significance and contribute majorly in the economy of Allahabad. Both areas suffer from several mobility and transportation challenges adversely affecting the quality of life of the residents and travelers as well as businesses and other institutions located in the these areas.

The aim of the survey was to identify and assess the present challenges in existing mobility and transportation infrastructure, public opinions on measures for improvements and general mobility behavior of riders, in both subject areas.

2. LITERATURE REVIEW

"A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects."[3]

—Definition approved by ITU (International Telecommunication Union) of United Nations

From above definition, it is apparent that smart city uses technology to provide solutions to existing challenges and facilitate in improving living conditions of the city's residents. It takes a strategic approach towards the development of smart cities keeping in mind requirements of the community and implementing technology solutions to fulfill those.

Improving urban mobility and transportation system in cities require a smart approach towards managing physical infrastructure such that it fulfills the requirements of local community and contribute towards improvement in quality of life.

In Allahabad, traffic congestion and overstressed transportation infrastructure has become a major challenge in recent years with increase in population, obstructing the path of the city towards a sustainable development. [1][2] To provide an efficient and effective solution to this problem, it requires breaking away from the traditional methods in which the infrastructure is designed and allowed to function.

Intelligent traffic management, Parking Management, Integrated multi-model transport system, Pedestrian friendly pathways, fully lighted streets with energy efficient street lights are few sustainable smart solutions that comprises a smart mobility and transportation model in a city. [3] Based on the assessment of existing infrastructure and requirements of the citizens, a suitable smart solution or set of smart solutions can be implemented.

3. RESEARCH METHODOLOGY

The primary research tool used to collect data, was a survey. The survey was carried out for two different locations based in the Allahabad namely Civil lines area and Chauk, in this study. The total respondent size was 220 and the sampling method used was a non-probability sampling technique i.e. convenience sampling.

The survey was administered online as well as offline keeping in mind the respondent's convenience and preference for the method of response. Respondents were classified into different socio-economic groups based on their annual income, to analyze the differences between mobility behaviors of different groups.

The questionnaire was divided into four sections; First section contained questions to collect respondent's personal information, second section was designed to realize the issues experienced in daily transit by the respondents in the subject areas and Allahabad city. Third section was designed to measure the preferences and travel behavior of the respondents and the last section was designed to measure public opinion on improvements required in the existing urban mobility and transport system in Allahabad.

4. ANALYSIS

Depending upon the structure and spatial development different areas in a city, different areas may have different priorities while considering challenges in mobility and transportation system. Based on this assumption, respondents were asked about the mobility and transportation challenges they are exposed to, in the two subject areas namely Civil lines, Chauk and Allahabad city.

Sample Characteristics:

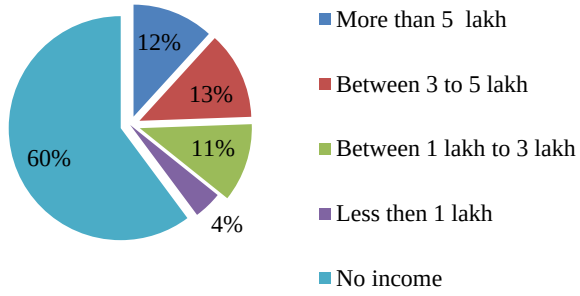

Fig. 1: Income distribution in sample size

Area-wise challenges in urban mobility and transportation infrastructure:

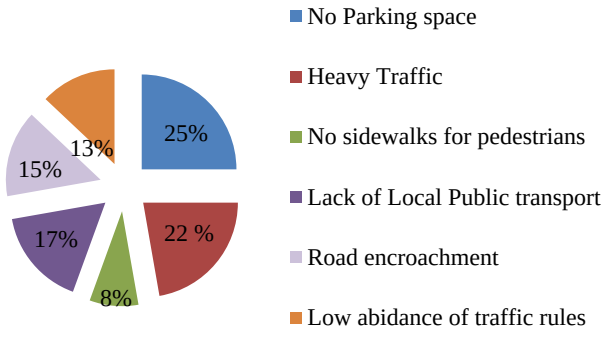

Fig. 2: Primary mobility concerns in Civil lines

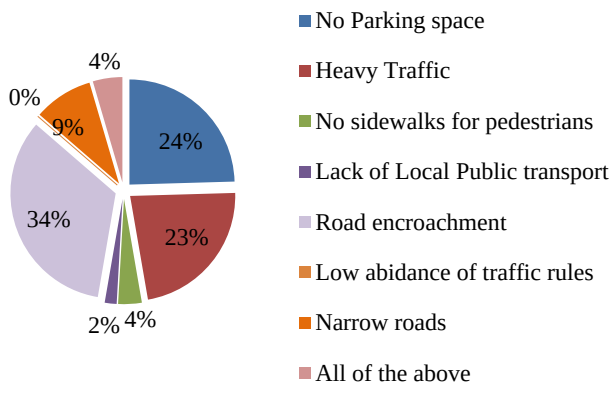

Fig. 3: Primary mobility concerns in Chauk

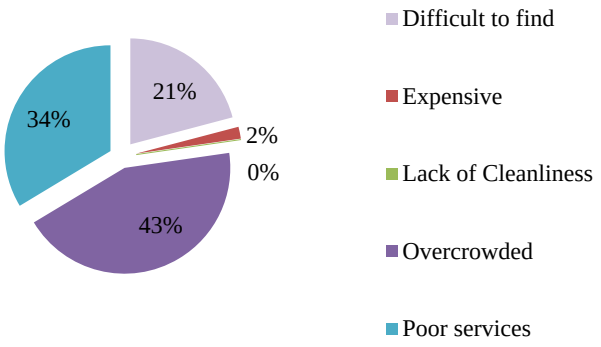

Fig. 4: Public Transport issues in Civil lines

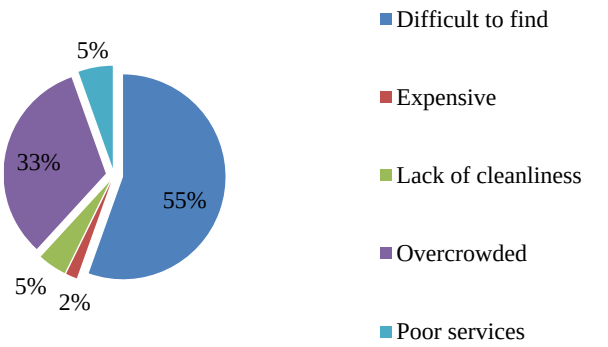

Fig. 5: Public Transport issues in Chauk

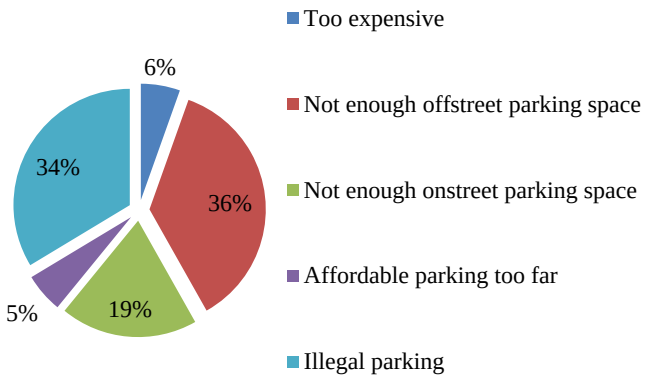

Fig. 6: Parking issue in Civil lines

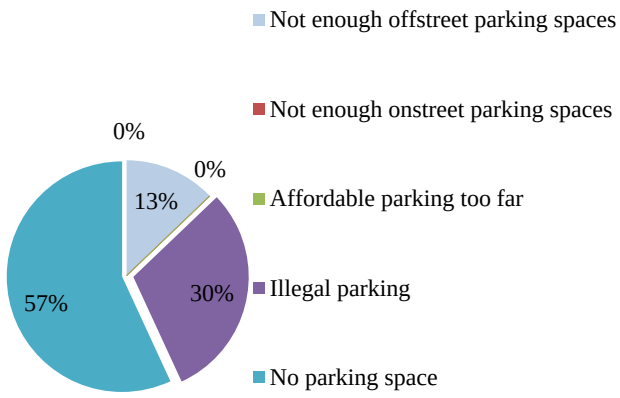

Fig. 7: Parking issue in Chauk

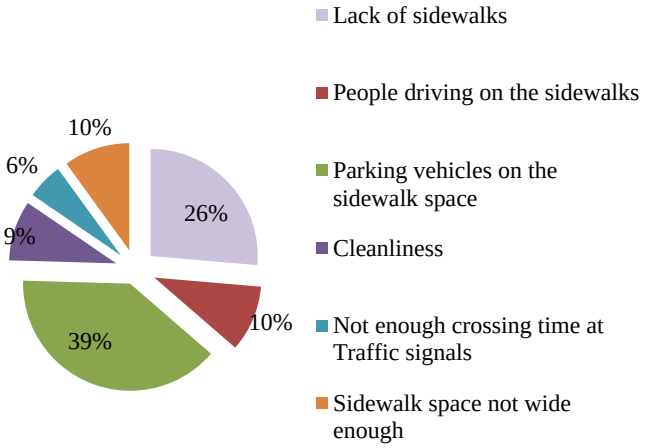

Fig. 8: Pedestrian issues in Civil lines

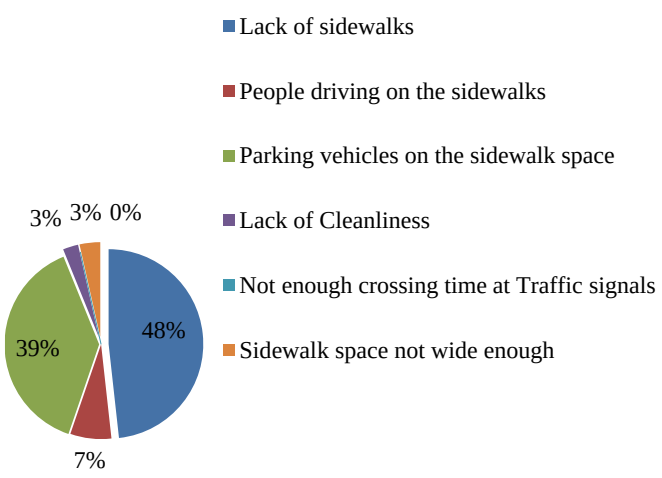

Fig. 9: Pedestrian issues in Chauk

Motivating factors affecting use of public transport:

This section looks at the factors affecting the use of public transport. Respondents in the survey were asked to give a rating out of 10 to a set of factors which can motivate them to use public transport more.

Amongst the provided set of options, travel time and proximity of Bus/Auto stops to residence or work were the highest rated factors affecting the use of public transport. Safety, availability of space, waiting time and availability of parking space for private vehicles are few significant factors motivating people to use more of public transport.

Table 1: Motivating factors behind more use of public transport

Factors affecting use of Public Transport	Average rating out of 10
Reduced commute time	8.12
Proximity of Bus stops or Auto stations to place of residence/work	6.87
Safety/security at public stops and during transit	6.83
More parking available at public transport stations	6.05
Frequent public transport services	5.8
Cleanliness in public transit modes	5.4
Extended operation hours	5.15
Low cost bearing than private transport	4.88
Comfortable transit experience	3.25

Mobility behavior:

This section provides back ground information on the transit behavior in Allahabad. It reveals various modes of transit and the frequency of their use by the community in Allahabad. This chapter also reveals data about most busy hours in the day and the demographical information about the users of different modes of transit, in the city.

Q: Which means of transport do you use on your way to work?
Public Transport

Table 2: Public Transport use with respect to income

	More than 5 lakh	3 to 5 lakh	Between 1 to 3 lakh	Less then 1 lakh	No income
Daily	0.90%	0.90%	3.63%	4.50%	12.27%
3-4 times a week	2.27%	1.36%	2.27%	3.60%	10.90%
2-3 times a week	1.36%	0%	1.81%	1.80%	13.18%
only on weekends	6.36%	1.36%	3.63%	2.27%	12.72%
Never	1.36%	0%	0%	0%	11.36%

5. MAIN FINDINGS

This study reveals the major mobility and transport challenges experienced by the riders in each of the two subject areas namely Civil lines and Chauk in Allahabad. Following are the main findings of the study with each factor/problem/challenges/improvement accompanied with the percentage of responses favoring that factor,

1. Lack of Parking Space (25%) and Heavy traffic (22%) in Civil lines are the major issues obstructing mobility. Similarly, Chauk struggles with road encroachment (34 %), lack of parking space (24 %) and heavy traffic (23%).
2. Other mobility problems constitute Lack of public transport (17 %), road encroachment (15%) and low abidance of traffic rules (13 %) while Chauk also struggles with similar problems.
3. In Chauk, lack of parking space (57 %) and illegal parking on street (30 %) remains biggest obstacles in mobility while in Civil lines not enough on-street parking space (36 %) and illegal parking (34 %) were observed as major problems.
4. Main pedestrian problems observed in Civil lines are parking on sidewalk space (39 %) and lack of sidewalks (26 %) on most of the streets while lack of sidewalks (48 %) and parking on available sidewalk spaces (39 %) forms major pedestrian issues.
5. In Civil lines, overcrowded public transport (43 %), poor services (34 %), non-availability of public transport (21 %)are main problems in public transport system while overcrowded local transit (33 %) and lack of sufficient numbers of public modes of transit (33 %) are major issues in Chauk.
6. The use of public transport was observed to be declining with increasing income level. It was observed that no income (12.27 %) preferred public transport for their daily commute while only 0.9 % of income with more than 5 lakh preferred public transport on daily basis.
7. In the survey, it was revealed that people were more inclined to use public transport if the commuting time was reduced and the Bus/Auto stops were closer to their

residence/ work place. Other high rated factors included safety and availability of parking space at public transit stops.

8. Other findings included as evening and morning constituting the peak hours of traffic rush in both subject areas.

6. CONCLUSION

Based on the findings of the survey, major urban mobility and transportation in both the areas namely Civil lines and Chauk constitute lack of parking space, road encroachment due to illegal parking and heavy traffic. These problems are found in both the areas with differences in magnitude. Further, reduced commute time appears to have the most important factor encouraging the use of public transport which ultimately relies on the traffic congestion conditions in the city. Income level of travelers appears to have an impact on their preference of mode of commute.

It is apparent from the survey results that most of the problems are related, thus, a problem can be an effect of another. The individual findings can be used to find solutions supporting higher level analysis.

7. RECOMMENDATIONS

Based on the major problems found as the result of the survey, suitable smart solutions can be intelligent traffic management and multi-level parking. These solutions are subjected to evaluation and assessment of existing challenges in current urban mobility and transportation infrastructure, by various stakeholders including but not limited to city planners, policy makers, governing body etc. A suitable smart solution must be responsive to the needs of the users in order to achieve the goals of sustainable and smart city. To successfully implement a smart solution, there is a need of citizen engagement in such initiatives, thus generating the need of awareness campaigns. The sole purpose of such campaigns should be to generate awareness of public laws e.g. traffic rules, encouraging people to embrace the changes to ensure success of any initiative.

8. LIMITATIONS AND SCOPE OF FUTURE WORK

The work presented here is an attempt to identify; the root causes of urban mobility and transportation infrastructure and factors affecting the mobility behavior in two areas of Allahabad thus eliminating any additional problems or challenges in mobility and transportation system, faced by the others areas in Allahabad. Another limitation is the lack of demographical diversity in the sample size of the survey which may not be an accurate representation of the population.

The further attempts to improve this study constitute of overcome the limitations of the study and add other socio-demographic factors affecting the mobility behavior.

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