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Challenges in the management of urban road traffic in Himachal Pradesh

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Abstract
The management of urban traffic presents significant challenges that require careful planning and execution. The sheer volume of traffic in urban areas can lead to congestion, which causes delays and frustration for drivers, passengers, and pedestrians. This can result in decreased productivity, increased pollution, and reduced quality of life. Efficient management of road traffic must have understanding of the issues and challenges of the road traffic and must take strategic initiatives to address the issues. Geographical condition itself is the major challenge of road traffic management in Himachal Pradesh as construction of the roads is not only tough but breadth of the roads can-not be expanded in terms of frequency requirement of traffic. Further, urbanization in the hilly regions multiplies the challenges. Not only this, unplanned urban development, bunched structure of official organizations and clashing time scheduling are responsible factors for road traffic chaos. Moreover, managerial decisions on road traffic flow consist of such aspects which need to be examined and reviewed for improvements. All such issues can be efficiently managed if strategic efficient managerial decisions are taken. This research paper endeavors to understand the problems in the management of urban road traffic based upon the responses taken from the urban stakeholders and accordingly measures have been recommended.

Keywords: Road traffic management, frequency requirement of traffic, congestion

Introduction

Concept note introduction

The issue of management of traffic in urban areas presents a number of significant challenges that require careful planning and execution. Urban areas often have limited or fixed infrastructure to support traffic management, including limited road capacity, insufficient public transportation options, and inadequate parking facilities. This can make it difficult to manage traffic effectively, especially during peak periods. As urban populations grow, so does the demand for transportation services. This can lead to increased traffic congestion and make it more difficult to manage traffic effectively. Effective traffic management strategies must take into account the need to reduce emissions and promote sustainable transportation options. Implementing effective traffic management strategies often requires significant investment in infrastructure and technology. Geographical condition itself is the major challenge of road traffic management in Himachal Pradesh as construction of the roads is not only tough but breadth of the roads can-not be expanded in terms of frequency requirement of traffic. Further, urbanization in the hilly regions multiplies the challenges. Not only this, unplanned urban development, bunched structure of official organizations and clashing time scheduling are responsible factors for road traffic chaos. Moreover, managerial decisions on road traffic flow consist of such aspects which need to be examined and reviewed for improvements. All such issues can be efficiently managed if strategic efficient managerial decisions are taken. In this regard, the management needs to know about the technical hurdles in road traffic management and flaws causing congestions to deal with the situation. The research paper is meant for providing basic input of information to the road traffic managers based upon the information gathered from the travelers in three cities; Shimla, Dharamshala and Solan of Himachal Pradesh.

Table 1

Authors	Year	Title	Findings	Recommendations
1. Kango, Gaurav & Sharma, Moti	2020 [1]	Traffic Volume of Kangra -Shimla National Highway (NH 103) in Himachal Pradesh -A Case Study	Seventy percent of the vehicular traffic consisted of cars, jeeps and two wheelers, the traffic is more in morning and evening peak hours and on weekdays, the condition of roads is not good and there are no facilities for pedestrians and bicycle users.	Widening of roads, provision of separate lanes for bicycle users and pedestrians and restricted movement of heavy goods carrier vehicles.
2. Samal, S R *et al.*	2020 [2]	Analysis of Traffic Congestion Impacts of Urban Road Network under Indian Condition	Identified areas of improvement in the existing infrastructure.	Congestion mitigation measures, implementation of lane discipline and strict traffic laws. Maintaining proper coordination between policy making experts and engineers who actually execute urban projects.
3. Abhishek, Vineet	2020 [3]	Inadequate Urban Transportation Facilities Leave the Poor in India High and Dry	Planning of services and infrastructure in india is not done proactively but retrospectively. Most populous cities in the country generate forty three percent of gdp	The poor cannot afford even the cheapest mode of public transport and the policy makers should plan for walkways and lanes for non-motorised vehicles to support this

			and therefore, these cities require proper infrastructural development. Urban planning is hardly demand driven rather it is driven by political compulsions.	group of commuters. Bus transport is required in every city irrespective of its size and transport planning should be done in a manner that prioritises sustainable mobility solutions.
4. Bashingi et.al.	2020 [4]	The State of Congestion in the Developing World: The Case of Gaborone	Congestion levels in have increased because of increase in the population and rising private vehicle ownership, which are expected to increase more in future on the basis of projected growth of car registrations.	Modal shift through the incorporation ict (information and communications technology) into public transportation to improve transportation sustainability and reduction of private vehicle ownership through ict enabled public transportation.
5. Mary N Peter, M. Pushpa Rani	2020 [5]	Traffic Management for Smart Cities Using Traffic Density and Swarm Algorithm to Inform Diversion Route	Traffic density is increased in the roads, especially in the signal places. The traffic congestion has negatively affected the efficiency, aggressiveness, and adverse impact on financial development	Traffic congestion can be managed in a proper manner by using time estimation and other route diversion in a pre-informed way
6. Tufail Ahmad, Justin S. Chang	2020 [6]	Lessons Learned from the Experience of Indian Policies towards Sustainable Transport Systems	Indian transportation sector faces the severe challenges in limited expansion of relevant infrastructure, lack of integration among major transport systems and multiple institutions deal with these systems with different mandates	Multi-pronged approach to address the challenges in sustainable development
7. Eeshan Bhaduri, Arkopal K Goswami and Rolf Moeckel	2020 [7]	How Sustainable is the Growth of Mass Transit System in Developing Countries – An Indian Perspective	Policy makers are vehemently emphasizing the use of mass transit modes, primarily due to their distinct advantage in achieving congestion reduction, and for being environment friendly.	Attract people to such modes so as to make them appealing and attractive when compared to personal motorized modes of transport
8. Kumar, Surender & Bharj, R.S.	2020 [8]	Solar Hybrid E-cargo Rickshaw for Urban Transportation Demand in India	Economic transportation demand has grown worldwide in urban areas and supply chains as solar hybrid e-cargo rickshaw is fit for the home delivery of logistics in urban areas.	Shecrs is used as a feasible alternative to traditional vehicles in terms of transportation cost reduction for perishable products.
9. Yanyan, Gu, Wang, Yandong & Dong, Shihai	2020 [9]	Public Traffic Congestion Estimation Using An Artificial Neural Network	Existing public network optimization models ignore the impact of public traffic congestion on the performance of public transport service.	Use of the data based methodology for sustainable public transport improvements is needed.
10. Badassa BB, Sun B, Qiao L.	2020 [10]	Sustainable Transport Infrastructure and Economic Returns: A Bibliometric and Visualization Analysis	Sustainable transport infrastructure is not being paid due importance.	Sustainable transport infrastructure can determine the effect of countries' transport-driven economic returns.
11. Kumar R, Mehrotra S, Michael RJ, Banu H, Sudhir P.M, Sharma M.K.	2020 [11]	Risky Riding and its Correlates in Two-wheeler Riding Young Men: Pillion Riders' Perspective	Riders of two-wheeler riding young men have more aggressive behaviour.	Strategies to deal with the risky behaviour has a significant implications in minimizing risky behaviors on roads and enhancing road safety.
12. Nandini V, Kumar S	2020 [12]	Risky Driving Behaviour Among the Motorized Two-wheeler Novice Riders in Davanagere City, Karnataka- Cross-sectional Study	Common reasons for mortality among young riders due to anger, mood, and emotions. Risky driving behaviour is due to mobile phone usage while riding.	There is need for road safety education and law enforcement policies.
13. Daniel Hörcher, and Alejandro Tirachini	2021 [13]	A Review of Public Transport Economics	Efficient resource allocation is critical in its daily operations	Need of for optimal capacity provision, pricing, cost recovery and subsidies, externalities, private operations, public service regulation, and cross-cutting subjects.

Research gap

The existing literature is the evidence of identifying congestion in the cities due to structural changes and heavy traffic causing hazards and challenges related with the environment and traffic services to the users. The researchers have recommended that the primitive management of transport needs to be given a dynamic shape and there is a need to coordinate the different modes of transport and strict implementation of the rules. It is pertinent to state that one of the criteria of analyzing the management of transport system in the cities is the different occupations which prompt and compel people to have particular types of vehicles which may influence the traffic demand due to which traffic management influences. Similarly due to speedy development of the cities there are chances that the roads are constructed in compact and limited spaces which may have technical bottlenecks, parking problems and management related flaws in the form of traffic time schedule inaccuracies or improper alternative road diversion mechanisms causing hurdles in the cities. Since such aspects could not be covered by the existing researches, in order to fill this gap the research is socially

and in point of view of the management of transport, a genuine attempt to fill such gap for smooth flow of traffic in the cities.

Objectives of the study

The objectives of the present research are stated as under

- To identify the technical hurdles in the management of urban traffic congestion.
- To examine the management flaws in the management of urban traffic congestion.

Scope and methodology

The scope of the study is limited to study the challenges being faced in the management of urban traffic in Himachal Pradesh. The results and inferences drawn are based on the responses of traveler respondents from three cities in Himachal Pradesh *viz*. Shimla, Dharamshala and Solan. Data collected from the informants residing and commuting in urban areas was analyzed by using descriptive and qualitative tools of research analysis including Likert scale,

Sampling design

The sampling has been taken on the basis of stratification of the vehicles from the three cities. The clusters of sampling of the respondents from the cities have been taken on the basis of their population ratio. Further, convenience random sampling method has been applied to seek the responses from each category of vehicle holders from each city and the respondents have been taken as one respondent from each vehicle irrespective of the condition of ownership i.e. one respondent from the vehicle on convenience basis who can be the owners or others plying the vehicle. The sampling design is as shown below:

Table 2: Sampling design

Criteria of vehicles	Respondents (Ratio Shimla 70.8, Solan 16.4, Dharamshala 12.8)			
	Shimla	Solan	Dharamshala	Total
Buses	9	2	2	13
Goods carrier	59	13	10	82
Taxis	15	4	3	22
Cars	171	39	31	241
Others	22	7	3	32
Total number of respondents	276	65	49	390

Analysis and discussion

With regard to identify the technical hurdles in the management of urban traffic congestion and to examine the management flaws in the management of urban traffic congestion, the responses of the informants are analyzed as below:

Table 3: Responses regarding technical hurdles and management flaws in urban traffic congestion

Attribute	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total	$\bar{x}$	S.D.	Sk.	Ku.
Efficiency of urban planning in your city in terms of facilitating traffic related infrastructure.	22 5.6	45 11.5	167 42.8	121 31	35 8.9	390 100	2.74	.97	.324	.039
Efficiency of urban planning in your city in terms of providing convenience of travellers.	21 5.4	52 13.3	183 46.9	95 24.4	39 10	390 100	2.79	.98	.116	-.013
Efficiency of transport authorities in management of traffic.	31 7.9	50 12.8	153 39.2	95 24.4	61 15.6	390 100	2.73	1.12	.212	-.456
Efficiency of traffic management authorities in management of traffic.	37 9.5	60 15.4	146 37.4	92 23.6	55 14.1	390 100	2.83	1.14	.159	-.583
New technologies and methods are being used by traffic authorities.	24 6.2	39 10	140 35.9	122 31.3	65 16.7	390 100	2.58	1.07	.390	-.243
Stray animals create hurdles during movement of traffic.	23 5.9	32 8.2	150 38.5	124 31.8	61 15.6	390 100	2.57	1.04	.409	-.050
Driving skills and habits of people create hurdles during movement of traffic.	91 23.3	101 25.9	139 35.6	41 10.5	18 4.6	390 100	3.53	1.09	-.306	-.508
Encroachments create problems for movement of traffic.	80 20.5	92 23.6	158 40.5	43 11	17 4.4	390 100	3.45	1.07	-.170	-.466
Intersections create hurdles for movement of traffic.	40 10.3	56 14.4	228 58.5	41 10.5	25 6.4	390 100	3.12	.95	.038	.497
With increase in number of vehicles, pace of construction of roads is sufficient.	22 5.6	38 9.7	187 47.9	85 21.8	58 14.9	390 100	2.70	1.02	.117	-.082
Traffic management is satisfactory.	22 5.6	42 10.8	180 46.2	84 21.5	62 15.9	390 100	2.69	1.04	.108	-.215

For effective traffic management, facilitation of traffic related infrastructure is a prime requirement. The perception of respondents about the efficiency of urban planning with respect to facilitate traffic related infrastructure again falls in the disagreed bracket as the mean value is 2.74 with standard deviation of 0.97 depicting that the responses lie in the disagreed bracket and due to high variation it can be between neutral and strongly disagree. Further, to determine the inclination of the responses, since the value of skewness is positive at 0.324, it suggests that the distribution is fairly symmetrical and the responses are skewed towards disagree. The value of kurtosis being more than zero at 0.039, it depicts that the responses are bunched and the distribution is leptokurtic. This indicates that respondents do not agree with the statement that urban planning in their cities or towns is efficient with respect to facilitation of traffic related infrastructure.

While seeking the responses on another aspect of efficiency of urban planning in the city in terms of providing convenience to travelers, since the mean score is 2.79 with standard deviation of 0.98, it can be implied that the respondents disagree with the statement though are primarily between neutral and strongly disagreed as the value of standard deviation is high. The value of skewness is positive at 0.116 depicting that the distribution is fairly

symmetrical and skewed towards disagreed. Further, the value of kurtosis is calculated negative at -0.013 depicting that the responses are highly spread and the distribution is platykurtic. This shows that regarding efficiency of urban planning in terms of providing convenience to travelers, the respondents disagree with it.

Regarding level of efficiency shown by transport authorities in management of traffic, the mean score is measured at 2.73 with variation of 1.12 which shows that the responses are between neutral and disagree. Further, the value of skewness is positive i.e. 0.212 indicating a fairly symmetrical distribution and skewness towards negative side of the scale. The value of kurtosis as per the data is negative at -0.456 which means that the responses are spread. Therefore, it can be analyzed that the respondents disagree with the efficiency of transport authorities in management of traffic.

The mean value of responses with respect to efficiency of traffic management authorities in the management of traffic was measured to be 2.83 which is in the disagreed bracket in the five point scale and with the variation of 1.14 depicting that the responses are varied. To understand about the inclination of the responses, based upon the value of skewness which is computed as positive 0.159, it is signifying that the responses are skewed towards negative side. This indicates that the inclination of the responses is indicating towards disagreement of the respondents regarding efficiency of traffic management authorities in the management of traffic. Further, the value of kurtosis being negative at -0.583 suggests that the responses are spread and the distribution is platykurtic. Therefore, it can be stated that the respondents disagree with the statement that traffic management authorities are efficient in managing of the traffic.

Regarding the usage of new technologies and methods being used by traffic authorities to manage the traffic of the area, the responses are analyzed to be within the disagreed bracket about this statement as the mean value is calculated 2.58 and similar to the earlier statements, there has been analyzed a wide variation in the responses about this statement as the value of standard deviation is computed 1.07 depicting that the responses lie between neutral and disagreed. Further, to ascertain the inclination of the responses, since the value of skewness is 0.390 it shows that the responses are skewed towards negative side and the distribution is fairly symmetrical. This indicates that the statement i.e. usage of new technologies and methods being used by traffic authorities to manage traffic is not agreed by the respondents and the responses in this regard are spread as the value of kurtosis is at -0.243 which indicates that the frequency of responses is spread and the distribution is platykurtic.

According to the analysis drawn by applying descriptive tools on the responses of the respondents regarding the hurdles created during the movement of traffic by stray animals roaming on the roads, since the mean value is 2.57 on the five point Likert's scale with the standard deviation of 1.04 it suggesting that the responses fall within the disagreed bracket however, due to high level of variation mainly lie between neutral and disagree. Now since the value of skewness being positive (0.409) it indicates that the responses are skewed towards the positive side of the scale. However, the negative value of kurtosis at -0.050 indicates that the responses are inconsistent and spread, forming a paltykurtic distribution. Thus, the informants are neutral regarding hurdles created during the movement of traffic by stray animals roaming on the roads.

Responses regarding hurdles caused during movement of traffic because of driving skills and habits of people had a mean value of 3.53 with the standard deviation of 1.09 revealing that the responses primarily lie between agree and disagree. The skewness in this case was measured at -0.306. The skewness being negative reveals that the responses are skewed towards positive side. Also, the negative value of kurtosis at -0.508 suggests that the responses are thoroughly spread and the distribution is platykurtic. So the informants are neutral but agree with regard to hurdles caused during movement of traffic because of driving skills and habits of people.

The mean of responses regarding hurdles created by encroachments for the movement of traffic was measured to be 3.45 being neutral with the standard deviation of 1.07 suggesting that the responses lie between agree and disagree. The value of skewness in this regard is negative at -0.170 depicting that the responses are skewed towards positive side. The negative value of kurtosis being -0.466 suggests that the responses are spread and the distribution is platykurtic. This indicates that the respondents are neutral and have a strong view about encroachments causing hurdles for traffic movement.

The mean score of the responses calculated regarding hurdles caused by road intersections for the movement of traffic on five point scale was 3.12 i.e. neutral with standard deviation of 0.95 suggesting that the responses lie between agree and disagree that road intersections create hurdles for traffic movement. However, the positive value of skewness being 0.038 indicates that the responses are skewed towards the negative side of scale. The positive value of kurtosis being 0.497 indicates that the responses are highly bunched and the distribution is leptokurtic. This suggests that the respondents believe that road intersections create hurdles for traffic movement.

Regarding the perception on the pace of construction of roads being sufficient with the increase in the number of vehicles, the mean value of responses provided by the respondents was 2.70 with standard deviation of 1.02 revealing that the responses mainly lie between neutral and disagree. However, the positive value of skewness at 0.117 suggests that the responses are skewed towards the negative side of the scale. The negative value of kurtosis at -0.082 suggests that the responses are spread and the distribution is platykurtic. This indicates that the respondents are disagreed with the sufficiency of the pace of road construction with the increase in the number of vehicles.

Responses regarding the level of satisfaction of respondents with the management of traffic in their area had a mean of 2.69 with standard deviation of 1.04 suggesting that the responses lie between neutral and disagree. However, the positive value of skewness being 0.108 suggests that the responses are skewed towards the negative side of the scale. The negative value of kurtosis being -0.215 indicates that the responses are widely spread and the distribution is platykurtic. This indicates that the respondents are dissatisfied with the management of traffic in their area.

Conclusion, findings and suggestions

Based on the study, it can be concluded that there are challenges and hurdles of managing urban traffic creating hassles for the authorities and for the daily commuters.

The study finds that intersection points create hurdles in the movement of traffic. The study also finds that the respondents are not satisfied with the pace of construction of roads and the management of traffic problems by the traffic management authorities. Another factor identified in the study is of road side encroachments which cause traffic problems.

Therefore, it is suggested that the traffic management authorities should play an active role in mitigating traffic issues and should enforce law with fairness. The local governments should allocate funds to develop alternate arrangements at busy intersection points and should ensure that encroachers don't have a free run.

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