DESIGN OF PUBLIC TRANSPORT- A CASE STUDY OF KANGRA CITY, HIMACHAL PRADESH

[1]Tushar Sharma, [2]Jaspreet Singh, [1]Sagar Bhardwaj, [1]Balahbanshem Sun

[1] Research Scholar, Lovely Professional University, Phagwara, Punjab, India

[2] Assistant Professor, Lovely Professional University, Phagwara, Punjab, India

Abstract

The study deals with the analysis of the existing public transportation system. The study is fully based on the results of the studying the public transport network, its emerging requirements to make it as cost-effective and useful in other means also for the public and make the whole public transportation system as friendly with the environment. Public transportation is a key role in the progressive development and wellbeing of society. In this research paper, we learned that how public transport work in the district Kangra of Himachal Pradesh. It deals with what are the types of roads present in Himachal Pradesh. The density of single-lane road is 90% than that of double-lane road and different places have different road density like road density of Lambagaon is the highest that is 325 kilometers which is 19 times that of the block Baijnath (70.26km). To improve the quality of roads what initiative government can take is that new system can be introduced in public transport so passengers' do not have to face any problem.

1. Introduction

The public transportation is to be established by specifying the bus network designs. In this study the various transportation surveys were done and the possible outcomes for the maximum use of public transportation were procured. The state of Himachal Pradesh has uniqueness in itself those specific characteristics that make it different from other states of India. It is relatively a small state with current population of 7.5 million according to 2020 census of which 90 percentage of people live in rural areas. The total area comprises of 55,674 km out of which 37600 km is inhabited or comprises of 17,450 villages which are dispersed over narrow valleys and steep slopes. The density of population of the state is around 120 persons per sq. km, which is comparatively very less than other states which is 384 persons per sq. km.

As Himachal Pradesh is basically popular for its snow laden province as Himachal Pradesh is surrounded by beautiful Dhauladhar Mountains expect some regions or bordering states of Haryana and Punjab with varying altitudes ranging from 400 meters to 8000 meters above sea level. Large amount of portion which is two third comprises of forests which is the major reason behind less population density in state. Apart from the geographical constrictions, specific parts of the state experience severe climatic conditions restraining the accessibility and working season of these regions especially in winters.

Tourism plays a major economic role in the state and has contribution of nearly 10% to the State Domestic Product. With the tourist season of around 9 months in a year as it states that on an average, nearly 11 million tourists visit the state every year. The definite characteristics of the state in terms of its environmental fragility, difficult terrain, remoteness, huge inflow of tourists and limited working season give rise to more challenges than opportunities in context to the transport sector. Transport undoubtingly plays a major role in socio economic growth of a region or state. Accessibility of sufficient transport framework and offices accomplish vital significance for by and large development of the state in a green or manageable way.

Development of infrastructure and transport facilities has long been a focus of the state government since the declaration of full statehood in 1971.However, with an increase in population and increasing movement needs, the state Himachal Pradesh is facing severe problems in terms of depleting air quality, congestion, increase in road accidents, and others. So in an endeavor for future public transport system this case study of design of public transport in district kangra includes detail analysis of existing transport system and what are the measures which can be taken to improve it and what new technologies can be added to this system.

1.1 Objective

- Irregular plan for public Transport System:

- Lack Co-ordination between rails and roads

- Tattered and Out dated Assets of public transport system.

- Out dated technology.

1.2 Literature review

ROB VAN NES, RUDI HAMERSLAG, AND BEN H. IMMERS paper portrays the significant highlights of an advancement model which can be utilized to plan public vehicle organizations. Plan issues that can be settled with the model include the update of either a piece of an organization or a total organization furthermore, the task of frequencies. The model comprises of an added substance system in which the choice to consolidate a course in the organization or to expand the recurrence of a course is based on a financial measure which can likewise be viewed as an gauge of the Lagrange Multiplier of the enhancement issue.

A significant favorable position of the model is that the diverse plan issues are settled with one single improvement measure. Besides, the improvement cycle is kept justifiable and the model is appropriate for use on a computer. A few after effects of the model are introduced. They have basically presented the optimized model which will help in design of public transport network. This optimized model will help in simultaneous selection of routes and help in determination of number of passengers. Single process of optimization is used for various design problems ranging all type of analysis. Planner can use model independently with the help of application on his personal computer with the inclusion in a software and interactive approach. This has helped in generation of a set of possible routes which is used as contribution for the optimization model.

PK Aggarwal And AP Singh research paper states that there is a great reliance on public transport especially on bus transportation. But with time with increase in population and increase in private vehicles there is increase in amount of congestion, vehicular pollution and accidents in urban areas due to limited road space. So this study briefly comprises of the issues regarding inefficient functionality of existing bus system in India and also pinpoints some alternative solutions for enhancement in performance of the urban system of buses. This study also consists some indicators which are used to calculate effectiveness and efficiency of urban bus service. With adoption of clean and efficient technologies this system will help in improving vehicle maintenance and design. And also help in restraining use of polluting fuels and vehicles. In addition to that also 'reducing noise pollution.

Dr. K.C.Manjunath and Samatha B S, Nikhilash M, Poojitha K, Manikantha Reddy S Benal paper discusses about what can be the changes which can be made to improve the public transportation of Mysuru city till 2031 to avoid congestion on roads. Proper research has been done on road network characteristics, traffic surveys interferences, and planned location of multiple bus stands and bus rapid transport system which fully utilize existing roads and maximizes the flexibility of public transportation. This study basically indicates that how bus rapid transport system can be used as a transit system in Mysuru city. Decongestion can take place by deviating buses to other ring road. BRTS pattern can easily serve up to 30% of population in one go.

Anatolii Asaul, Igor Malygin, Vladimir Komashinskiy research paper present existing methods to develop and design intellectual multi-modal transportation system which is capable to improve the safety of society, citizens and the state, protect them from the numerous types of threats. The architecture is described in such a way that it guarantees application of main functional elements, planned model subsystem of telecommunication. Architectures of the road subsystem to manage the intelligent multimodal transport system is described fully in detailed manner. There implementation and design are able to improve general service quality, functional efficiency level of ensured safety and environmental functioning of both the international and Russian transport system. This model will basically help in improving transport safety, save life and health of many people ensure efficient management and control of intra-modal and multimodal transport systems.

Karl Rehrl, Stefan Bruntsch, and Hans-Joachim Mentz research paper basically discuss about the problems that travelers have to face due to the complexity of the multi-model transport system. So the basic goal of this research is to integrate existing information systems and to implement and design a basic prototype for multi-model travelers. This paper basically discuss about the problems and situations travelers has to face while multi-model journeys. Main sections of this paper include mobile multimodal trip management, personalized multimodal journey planning and smart-phone-based pedestrian guidance and orientation in complex public transport transfer buildings.

Luis Cadarso, Ángel Marín, Gábor Maróti paper basically studies about the disruptions which is seen in rail lines or network and this paper also deals with the effects of disruption on passengers which are travelling. The approach which is proposed is basically the combination of passenger's behavior and integrated optimization model. This paper basically includes rolling stock recovery model and an integrated timetabling. This paper is embedded by two step approach in its initial framework.

Leo Kroon, Gábor Maróti, Lars Nielsen paper we depict an ongoing moving stock rescheduling model for disturbance the board of traveler rail routes. Huge scope disturbances, e.g., because of breaking down foundation or moving stock, generally result in the scratch-off of train administrations. As a result, the traveler streams change, since travelers will Search for elective courses to get to their destination. Our model takes these powerful traveler streams into account. This is interestingly with most conventional moving stock rescheduling models that think about the traveler streams either as static or as given information. Moreover, we depict an iterative heuristic for tackling the rolling stock rescheduling model with dynamic traveler streams. The model and the heuristic were tried on reasonable issue examples of Netherlands Railways (NS), the significant administrator of traveler trains in the Netherlands. The computational outcomes show that the normal postponement of the travelers can be decreased essentially by taking into account the unique conduct of the traveler streams on the diversion courses, and that the calculation times of the iterative heuristic are suitable for an application continuously interruption the board.

SHANGYAO YAN, CHIN-HUI TANG & CHONG-LAN SHIEH paper includes numerous variables influence the presentation of impermanent timetable changes following episodes. These elements incorporate static recuperation booking, stochastic flight deferrals and 'constant' plan changes. Most exploration on recuperation booking has zeroed in on improving static recuperation planning models. None has examined these variables from a frameworks point of view. The exploration on which this paper is based proposes a structure, typifying a reenactment measure, that isn't just have the option to examine the impact of stochastic flight delays on static recuperation booking, however can likewise assist with planning more compelling adaptable cradle times and 'ongoing' plan change rules. To test the structure, we play out a reproduction utilizing information from a Taiwan homegrown carrier. The primer results show that the system could be conveniently applied via airlines in practice.

Klotildi Saliara paper basically deals with integration of intermodal as a measure to develop new transport modes into present transport system. This is basically the case study of Thessaloniki which is in Greece. It includes determination of several levels and definition of integration. It includes physical, Operational and organizational levels. Construction of metros will definitely help in transforming old bus system into bimodal transit network. Bus system detailed design is proposed in order to form a new planned network with clear roles and hierarchal structure. The layout contains three-leveled network with performance characteristics and specific functions on each level, ensuring coordination and good connectivity between the lines and modes. In this case study there have made new metro system to avoid congestion and ease in mobility of vehicles.

Malygin, I.G. Komashinskiy, V.I. Afonin, P.N. research paper basically talks about the intelligent transport system that will basically help in making transport system computerized and which will prevent accidents on roads. It basically secures road traffic, reducing road accidents and also reducing the death rate. ITS basically collect the data on road accidents and perform processing on real time scale and help in bringing new change in transport system. Combined application in cognitive technologies will definitely help in improved transport system achieving high intellectualization and saving people's life and preventing health hazards due to self-development and self-learning mechanisms of this technologies.

Dean Papajohn, MASCE, etal talks about the old transportation infrastructure in the US which they are planning to change into new infrastructure through PPP (Public private partnership) which mainly provide the connection in between government and industry for benefit of people. Public private partnership result in cost saving and time and it is beneficial for both of us. The main reason is to provide us the information about how United States has used Public private partnership to infrastructure the old transportation system to new transportation system of that city, it's had very positive effect on financial as well. It also helps to develop integrated infrastructure system for national security.

F. Ciaffi[*], E. Cipriani, M. Petrelli research paper they discuss about the road accident, traffic pollution and the role of public transportation in that area. This research paper describes the methodology for solving the issue mention above. "Feeder Bus Network Design Problem" ("FBNDP") seems very useful for solving various problems and helps to improve integration between bus system and rail networks. It also helps to design a network which cover residential area. The multimodal transit system helps to solve bus network design problem. The genetic algorithm has effective solution on various problems (There is 25% reduction of access time and decrease of 38% of unsatisfied demands

Yang Qina and Shi Jia-lianb In this research paper have discuss about the deficiency of urban transportation, As we know that the population is increasing day by day and people from rural area are also moving to urban area so there is a increment of density of population in urban area so the research paper tells how urban transportation system is important like proper bus service which full fill the demand of passengers and urban bus service helps to reduce the traffic and cost of transportation and also good for environment and also helps to save various resources. There should be a design of mini electrical car as a car polling and should be shared by multiple users can result in a less load on transportation system. We should use intelligent system which can guide to reach the destination like supermarket, shopping mall or movie complex etc. can also help to reduce load on public transportation indirectly.

GF NEWELL research paper describes minimal cost of bus services to multiple destination of passengers and also result in a less traffic load. We can improve bus service in a number of ways like we have to design a bus transportation in such a way that it can reduce the transportation like operation cost and travel cost for the population of bus traveler. It's also a problem of locating the bus stop and to find which bus is the nation express bus or local bus. If the demand is higher than better will be the service. There should be proper system which can guide passenger to choose best route (grid pattern) so that passenger can save cost and time also.

Avishai Ceder research paper is all about to preserve the environment and road related problem. It helps to provide the use of public transport and to give reason why or why not to use public transport and few factors are willingness to pay, viability and projection perspectives. There should be implementation of public transportation plan gradually the main motive is to reduce the level of pollution in a city by means of new and advance Public transport systems and in Auckland there should be a development of railway system and subway. There is a solid plan for relieving traffic congestion, improving traffic safety, and environment pollution

Sutanto Soehodho Research Paper states that Traffic accident is the major problem in the entire traffic management and entire transportation system, this paper figures traffic accidents in Indonesia, Jakarta. Three major factors are human factor, vehicle factor

and human factor (including road condition). 2 tyre vehicle accounts majority of incidents in jakatra as well. In Jakatra city human factor is the major role after figuring out the problems we found solution that there should be a development of public transportation system, increment of road ratio and the traffic management measures and the Development projects in public transportation have been ongoing in Indonesia at Jakatra.

Brian Caulfield and Margaret O'Mahony research paper is the examine the different stages of a passengers when goes through when deciding to go for public transport and i which form it required regarding journey at each stage like boarding point, during destination or reaching point and it also helps to find the opinions of information provided to traveler in different formats. It found that passengers in Dublin would like to see improvements in transportation system. With the help of RTPI displays were found to provide real time information as well as SMS and call Centre. Some passengers would like to see update of journey with the help of internet (messenger platform) and government should have to consider these factors.

Nuannuan Leng, ETH Zürich, Ulrich Weidmann, ETH Zürich States that Disruption management is the important field in transportation research field. Timetable of railway runs smoothly but somehow there may be a chance of delay of train by natural disaster or technical issue or by accident. Passenger's satisfaction is the important thing, their needs, reaching final destination within time. For the passengers there will be meet in their demand like time taken by the train somehow economical loss can be reduced. Practical train rescheduling can save the decision cost without wasting resources of railway etc.

LORITA MAUNGANIDZE and ROMANO DEL MISTRO* paper is to describe the role of BRT in improving public transport especially for the urban poor user of public transport in Cape Town. The BRT-based IRT system is not good for urban area of service levels while poor people may more benefitted for faster IRT Service, reduce travel time and these will be unaffordable in some cases. For the benefit of people, it is recommended to rationalize the BRT-based IRT system which should be adopted. BRT plays a very important role in improving public transport services in Cape Town. IRT should be affordable to poor and IRT network should be effective and efficient they have to make BRT solutions work under South Africans conditions.

1.3 Result and Analysis

Road transportation is the backbone of Himachal Pradesh. Maximum hilly terrains is being accessible with the help of road network. Roads play major role in movement of goods and people from one place to another which help in overall development and growth of human settlements in Himachal Pradesh. The area of focus of the state government since its formation was development of roads. Total number of memorable roads in the state has reached 7809 kilometers(see table no: 1 and graph 1). As far as accessibility of roads per unit area, the roads thickness at the state level is just 0.65 km per sq. km, much lower than that at the public level estimation of 1.22 km per sq. km. As observed in table no 2 road density varies from place to place as road density is highest in Lambagaon block (324.45 km) which was 19 times the lowest density in Baijnath Block that is (17.26 km). Looking across the blocks, in Sulah 71.24 percentage of villages had transport facilities are available within a distance of 4 to 5km. Followed by Bhawarna (61.39 per cent) and Panchrukhi (67.66 percent). On the other side Rait (46.38 per cent), Fatehpur (41.04 percent) and Nagrota Surian (47.64 per cent) availability of transport facilities were lowest in the district. Out of total memorable roads in Himachal Pradesh, 8% of roads are double lane whereas 92% of roads are single lane. The growth rate of double lane is less than 1% and of single lane is 4% per year.

1.4 Illustrations

Table No: 1 Types of roads in Himachal Pradesh

Year	Total length of Roads	Double Lane Roads	Single lane Roads
2010-11	33724	2404	29465
2011-12	34170	2411	30000
2012-13	34648	2415	30551
2013-14	35112	2420	31112
2014-15	35814	2430	36623

Graph No: 1 Types of roads in Himachal Pradesh

Table No: 2 Density of Roads

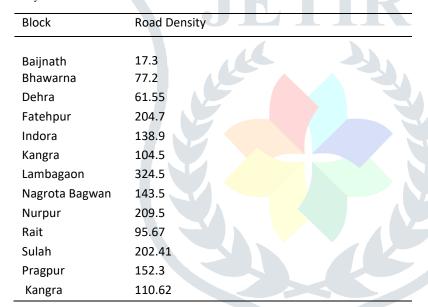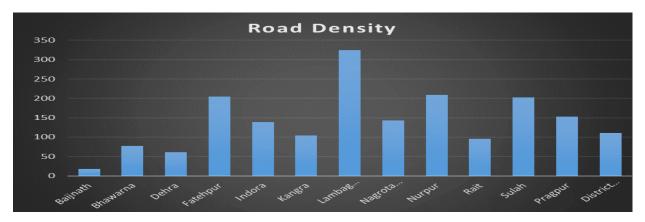| Block	Road Density
Baijnath	17.3
Bhawarna	77.2
Dehra	61.55
Fatehpur	204.7
Indora	138.9
Kangra	104.5
Lambagaon	324.5
Nagrota Bagwan	143.5
Nurpur	209.5
Rait	95.67
Sulah	202.41
Pragpur	152.3
Kangra	110.62

Graph No: 2 Density of Roads

1.5 Conclusion

The whole discussion reveals that citizens have to face problem due to non-availability of the proper public transport in Kangra city. Due to hilly terrain and extreme weather condition deterioration of roads take place and people have to face problem due to this. The survey is being conducted and the outcome of the survey was that student community have to face problem due to non-availability of proper public transport. Lockdown due to coronavirus outbreak have a severe effect on the public transport as government do not have enough money to bear the expenses of public transport. To improve this situation new techniques like Intelligent Transport System should be introduced with proper surveillance so that passengers do not have to face any problem and smooth functioning of public transport takes place.

1.6 References

1. Agarwal, P. K., & Singh, A. P. (2010). Performance improvement of urban bus system: issues and solution. International Journal of Engineering Science and Technology, 2(9), 4759-4766.
2. Asaul, A., Malygin, I., & Komashinskiy, V. (2017). The project of intellectual multimodal transport system. Transportation Research Procedia, 20, 25-30.
3. Avishai Ceder (2004), "New urban public transportation systems: Initatives, effectiveness and challsnges"Journal of urban planning and development, American society of civil engineers DOI:10.1061/(ASCE)0733-9488(2004)130:1(56)Page-56-65.
4. Cadarso, L., Marín, Á., & Maróti, G. (2013). Recovery of disruptions in rapid transit networks. Transportation Research Part E: Logistics and Transportation Review, 53, 15-33.
5. Caulfield, B., & O'Mahony, M. (2007). An examination of the public transport information requirements of users. IEEE transactions on intelligent transportation systems, 8(1), 21-30.
6. Ciaffi, F., Cipriani, E., Petrelli, M., & Uspalyte-Vitkuniene, R. (2014). A new methodology for the public transport network design. In Environmental Engineering. Proceedings of the International Conference on Environmental Engineering. ICEE (Vol. 9, p. 1). Vilnius Gediminas Technical University, Department of Construction Economics & Property.
7. Kanai, S., Shiina, K., Harada, S., & Tomii, N. (2011). An optimal delay management algorithm from passengers' viewpoints considering the whole railway network. *Journal of Rail Transport Planning & Management*, *1*(1), 25-37.
8. Kroon, L., Maróti, G., & Nielsen, L. (2015). Rescheduling of railway rolling stock with dynamic passenger flows. *Transportation Science*, *49*(2), 165-184.
9. Kunimatsu, T., Hirai, C., & Tomii, N. (2012). Train timetable evaluation from the viewpoint of passengers by microsimulation of train operation and passenger flow. *Electrical Engineering in Japan*, *181*(4), 51-62.
10. Leng, N., & Weidmann, U. (2016, May). Design of passenger oriented timetable rescheduling in railway disruptions. In 16th Swiss Transport Research Conference (STRC 2016). Swiss Transport Research Conference (STRC).
11. Leng, N., & Weidmann, U. (2016, May). Design of passenger-oriented timetable rescheduling in railway disruptions. In 16th Swiss Transport Research Conference (STRC 2016). Swiss Transport Research Conference (STRC).
12. Manjunath, K. C., Samatha, B. S., Nikhilash, M., Poojitha, K., & Benal, M. R. S. Planning of Public Transport for Mysuru City Master Plan 2031.
13. Montgomery, C. (2015). Capacity Crisis In The United States Trucking Industry, A Conceptual Model From A Theory Of Constraints Perspective.
14. Qin, Y., & Jia-lian, S. (2011, August). Research and design of public transportation system based on the classification theory on road traffic. In Proceedings of 2011 International Conference on Electronic & Mechanical Engineering and Information Technology (Vol. 7, pp. 3587-3590). IEEE.
15. Saliara, K. (2014). Public transport integration: the case study of Thessaloniki, Greece. Transportation Research Procedia, 4, 535-552.
16. Soehodho, S. (2017). Public transportation development and traffic accident prevention in Indonesia. IATSS research, 40(2), 76-80.
17. Sutanto soehodho (2016),"Public transportation development and traffic accident prevention in Indonesia,"IATSS Research doi:10.2016/j.iatssr.2016.05.001.
18. Transportation Planning and Technology Publication details, including instructions for authors and subscription information: http://www.tandfonline.com/loi/gtpt20 A Simulation Framework for Evaluating Airline Temporary Schedule Adjustments Following Incidents Shangyao Yan , Chin-Hui Tang & Chong-Lan Shieh a Department of Civil Engineering , National Central University , Taiwan Published online: 01 Feb 2007.
19. van Nes, R., Hamerslag, R., & Immers, L. H. (1988). The design of public transport networks (Vol. 1202). National Research Council, Transportation Research Board.
20. Van Oort, N. (2011). Service reliability and urban public transport design.
21. Zhang, L., Li, J. Q., Zhou, K., Gupta, S. D., Li, M., Zhang, W. B., ... & Misener, J. A. (2011). Traveler information tool with integrated real-time transit information and multimodal trip planning: Design and implementation. *Transportation Research Record*, *2215*(1), 1-10.
22. Zografos, K. G., & Androutsopoulos, K. N. (2008). Algorithms for itinerary planning in multimodal transportation networks. *IEEE Transactions on Intelligent Transportation Systems*, *9*(1), 175-184.