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Sustainable Transport for a Central Business District

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ABSTRACT

It's high time to shift from Conventional Planning to Compressive and Multi Modal Planning. The present paradigm shift in Europe to focus on mobility as a service has to be acknowledged and incorporated in the Transportation system of developing country such as India. The travel has to be now smarter and sustainable. All the three pillars of sustainability i.e. economic, social and environmental have to be equally carried forward. Proper planning or design is the one which always takes into account the needs of people and also the environment associated with it. The sole purpose of a Central business district is economic activity and any measure should depict this. The paper looks at the transportation system of the Kashmir valley in depth in relation with the central business district. Modal share and variation of Mass transit in the morning and evening peak hour is determined and studied. Based upon the analysis and keeping in view the ageing population as well as needs of disabled a new smarter and sustainable transport is designed for the Kashmir valley having its own bespoke bus service. The bus service is then designed for headway, seating capacity as well as field and management staff. This paper emphasizes that public transport is the only solution to the various transportation problems and their allied effects such as Environmental Impact, Social Inclusion, Old aged population, etc.

Keywords: Sustainable Travel, Smarter Travel, Buses, Modal Share, Headway, Bus staff, Economic activity.

I. INTRODUCTION

John F Kennedy said that "It is not our wealth that lead to our transportation Infrastructure but it is our excellent transportation infrastructure that lead to our wealth". The three pillars of sustainable development are Economic, Environment and Social justice. The earlier concept was to focus primarily on economic activity which has affected

the necessary balance between the three pillars. Bell (1976) noticed that buses are the most preferred mode of travel for short distances whereas for long distances trains are preferred. Various researches have shown that busses and taxis are the preferred modes of travel for disabled people. From the post-world war era in almost all countries all over the world there has been a relative decrease in the mode share of buses in most of the countries. In a developing country like India it has far reaching consequences than in developed world. Bus service quality, patronage and the number of passengers follow a cyclic path in which one follows another. For a good service quality it needs a high patronage and a high demand. High demand needs good service. It is a stick and carrot type problem.

"Public transport is not an option, but it is the option". Urban transport consists of a family of modes ranging from Pedestrian, bicyclists to buses as well as metro and Regional rail System. Based on the type, operation and use, these modes are classified into Private Transportation, Para-Transit (IPS) &Mass-Transit.

II. LITERATURE REVIEW

"The earlier concept of sustainability was to focus primarily on economic development and as there will be rise in the economy as well as wealth of the country as a whole, then there will be what is known as tickle down effect to the rest of the population which will ensure social development. Then there will be enough resources for cleaning up the environment. It was realized way back in 1987 by The Brundtland Report (1987) that this approach needs to be readdressed and a more balanced approach is needed".

"Papa and Bertolini (2014) demonstrated how urban form is related to accessibility. Improving the accessibility can have far reaching benefits rather than just economic benefit to the centre, it can bring about overall wellbeing for the people especially for old aged people, disabled and help them be a part of society as it has various leisure amenities as well.

The major step towards climate change was Kyoto Protocol (1992) of United Nations Framework on Climate Change (UNFCC) which committed to reduce the Green House Gas emission. COP 21 or 21st Conference of Paris is considered the landmark event of the 21st Century. It was pledged to limit the change of temperature to 2^{0}C whereas desirable to limit only up to 1.5^{0}C. In 2015 the earth was warmer by 0.89^{0}C. India ratified COP 21 on October 2nd 2016, on the birth anniversary of Gandhi ji. India is the 4th largest production of CO_2 emission of 2,341,000 kt.

Transport and the economy are linked to each other and are essential for well-being of all the sections of the society. In future there is going to be a heavy concentration of people in the cities as well as old travelers. The travel need of the present old aged people is different from that belonging to 1960's or 80's. The new standards makes the transport imperative to account for needs of disabled. Age distribution of population is changing as well as their demand. The social aspect of transportation have to be included in the transportation system. Needs and demands of people are now changing and also the lifestyle. The shift to non motorized modes of travel are essential

but it will require a lot if investment as well educating people about its benefits. In the present scenario the immediate focus has to be on Public transport which looks as the only way forward in the Indian system.

III. METHODOLOGY

The area of study was divided along the main route. The area was divided into requisite distance of the main line. The whole area was mapped using theodolite and plotted on CAD. The accessible area of a Bus stop was taken as 400m which is a standard worldwide. The whole Transportation system of the valley was evaluated and studied to get an in depth analysis on how interchange is going at present from one part of the valley to another. The problems in the interchange were examined in depth, as passengers always associate a high penalty with the interchanges. Then the influence that CBD could have on the transportation system was evaluated. First the Economic (to the user), Environment and Social impact were evaluated and then the economic benefit to the CBD was also evaluated. The underlying concept was that the transportation system should be smarter as well as sustainable.

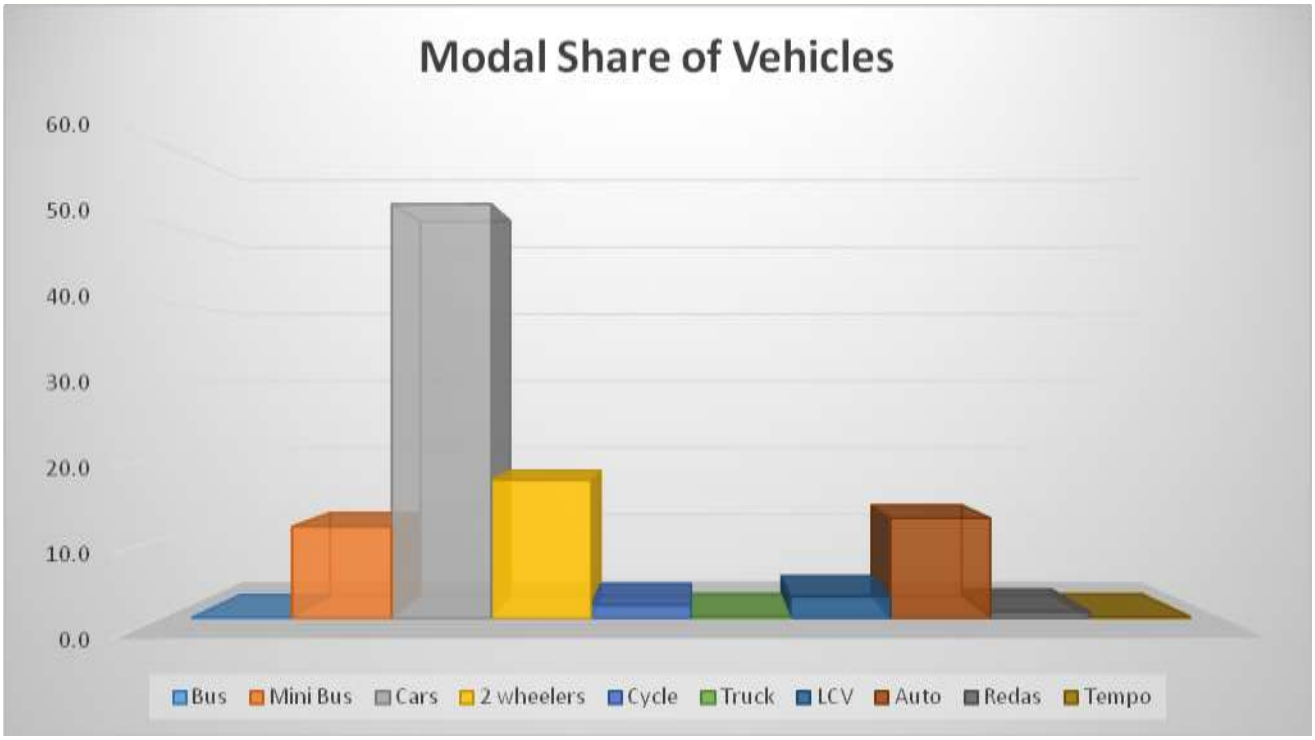
IV. RESULTS

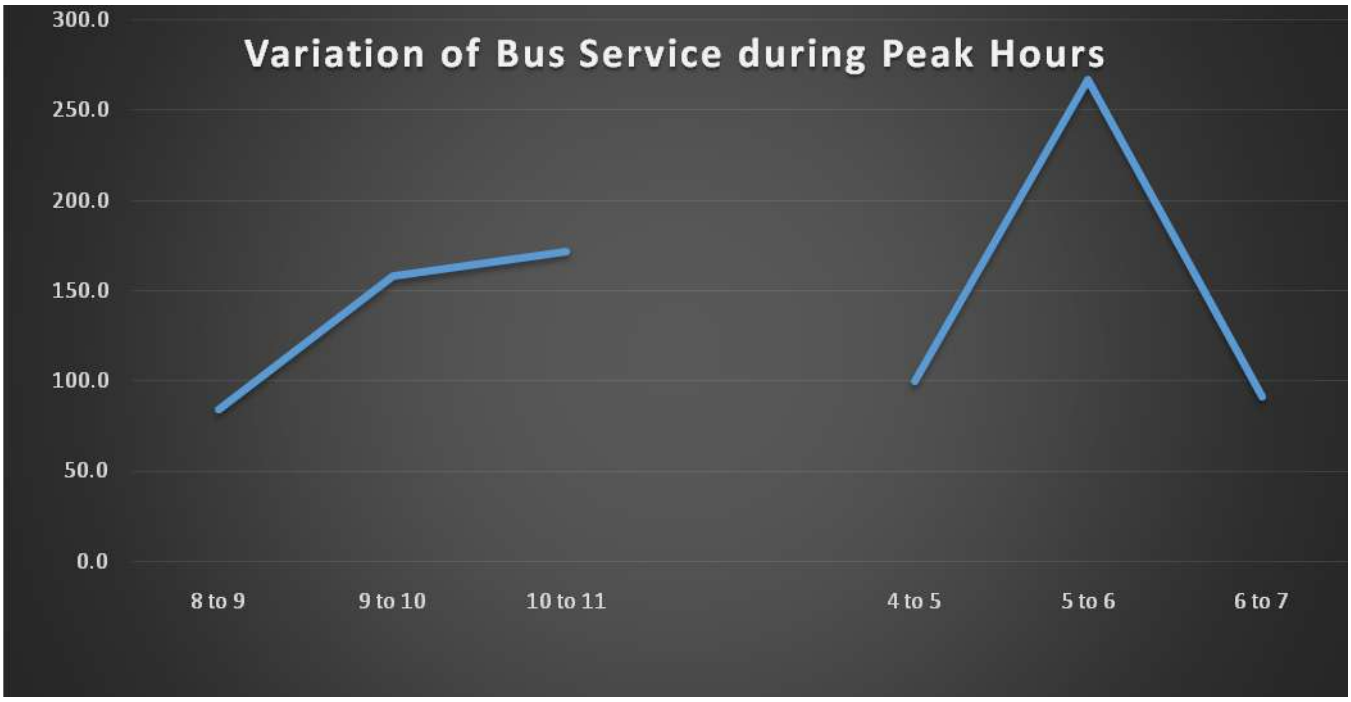
The present area was mapped up to a high level of accuracy with the starting point on the main road line being designated as R.D (Reduced Dimension) 0.00 and the End point as R.D 1949.00. The cross section elements were measured at every 30m interval.

The Traffic survey

The traffic survey was conducted as recommended by IUT and then averaged to get a design flow and the requisite modal share was calculated.

Vehicle Type	Modal Share Percentage
Bus	0.1
Mini Bus	11.6
Cars	52.3
2-Wheelers	17.5
Cycle	1.7
Truck	0.3
Light Commercial Vehicle (LCV)	2.8
Autos	12.7
Redas (Hand Cart)	0.8
Tempo	0.2
Total Vehicles	100





Present Public Transportation System

As such there is no proper interchange facility between the passengers from North to South Kashmir or to and fro. Also for people wanting to use public transport from CBD to go to south Kashmir or adjoining areas of

Srinagar city they have to either walk back to R.D 0.00 or use the long route from the Buses to R.D 1949.00 and then Periphery of residential area and then to R.D 0.00. This increases the generalized cost of the public transport journey, therefore making it unattractive and not feasible sometimes. As mode choice is dependent upon the relative generalized cost, therefore it makes Car the preferred mode of travel.

V. DISCUSSION

The present modal share of the Busses equal to just 11.6% is quite alarming. The national trend has been decreasing at a rapid rate also from 11.11% in 1951 to meager 1.3% in 2009. Other mode of Mass transit (Railways) is around 10 Km from R.D.0.00 . The absence of an efficient public transport in the CBD makes the railways also ineffective for long distance. Bell (1976) had shown how the interchange service is affected by even one small aspect such as improper Bus stop. An in efficient bus service in the CBD therefore affects the transportation system of the state as a whole. Statistically going by the national trend the relative percentage of buses is expected to decrease significantly in the coming years. After investigating on our stretch of study, we arrived at the following reasons for busses being unattractive and ineffective:

- Low Speed, busses usually crawl and make frequent stops. There are no demarcated stops therefore busses stop at their will and at the location of their choice for their desired time interval.
- Overloading makes ride uncomfortable with even some passengers forced to ride on the outskirt of the vehicle, as the buses arrive at random without any order.
- There is a lack of passenger information
- Low status of service provided.
- No timetable available.
- There is no specific service on this stretch. It is the services of other stretches which are extended to CBD. Almost all of these sites have congestion black spots which affect the journey time as high as 90 minutes. In such a scenario there may not be any busses for around 40-60 minutes and suddenly a cluster of busses may arrive. As the fare system is distance based therefore the patronage is mainly concerned with the distances away from CBD, therefore no attention paid to the CBD. This makes interchange penalty between the route even higher. All these factors may public transport unattractive and results in unsustainable travel.

Para-transit transport system are in a depilated state, old, uncomfortable as well as are not able to meet the demands of a central business district in terms of carrying of shopping bags or suitcases or even small cardboard cartons. The percentage of Para transit (12.7%) is higher than that of busses. In an ideal system they are supposed to feed the passengers to the mass transit (buses).These are basically meant to carry people to and fro from the bus stop and for very short distances. These are not capable of handling the shopping trips for which bus is the only option. The failure of the bus system is evident from their relative percentage being 1.1% less than the busses.

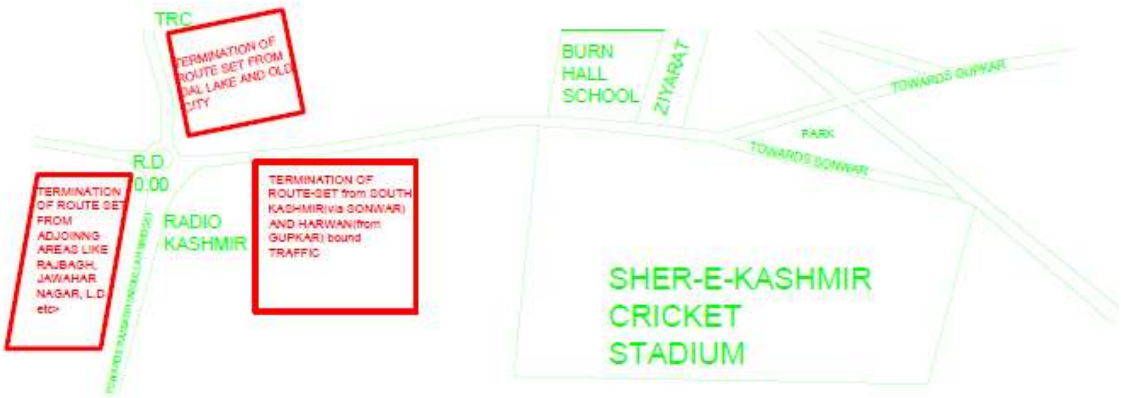
Variation of busses in the morning and evening peak show a spread out peak in the morning whereas a single peak in the evening from 5-6. This is a clear indicative that the services are dependent upon other areas rather than focused on CBD and also a more spread out peak is expected in the evening as the number of shopping trips are quite high in the evening up to late hours.

These factors combined make public transport as a whole unattractive and promote unsustainable modes of travel through high car dependency. We have seen that building the way out of congestion is not a long term strategy e.g. in United Kingdom in 1980's the focus was to build more roads so as to mitigate the congestion, but there were also forced to change the approach from 2000's. The countries like Netherlands focused on modal shift away from cars and as a result they are now have more efficient and effective transportation system.

VI. RECOMMENDATIONS

After having identified the causes of unsustainable travel, a new transportation system for Kashmir division is designed with CBD at the heart of it. This system has the same route set as earlier with the only difference that CBD will have its own Mass transit which will ply only in the CBD. This will ensure that these buses stick to the time and also these buses with high frequency will serve as the interchange between the two parts of the division. This will also promote Public transport as any measure in the CBD has a branding effect elsewhere which paves the way for the same type of development elsewhere. This will also pave the way for a modal shift to more sustainable modes of travel. Such a system is expected to have far reaching social impacts also especially for old aged and disabled people. Various researches have shown that for old age and disabled people bus is the preferred mode of travel.

VI.I NEW TRANSPORTATION SYSTEM OF THE VALLEY



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VI.II Development of Bus Service from R.D. 0.00 –R.D.1929.00 (to & fro)

For the Purpose of Designing of a Bus Service, Bus System Toolkit proposed by Ministry of Urban Development, Government of India.

$$Cycle\ Time\ (in\ minutes) = \frac{2 \times L \times 60}{S} + Layover\ Time$$

$$Number\ of\ Vehicles\ \{NV\} = \frac{Cycle\ Time}{Headway}$$

$$Peak\ Point\ Demand = \frac{Seating\ Capaccity \times Load\ Factor \times 60}{Headway}$$

Number:-	A	B	C	D
Average Speed in K.M.P.H	25	25	25	25
Headway in minutes	2 minute 36 seconds	2 minute 36 seconds	3 minute 15 seconds	3 minute 15 seconds
Number of Vehicles:-	5	5	4	4
Seating Capacity	60	80	60	80
Peak Point Demand i.e. passengers in one Hour	1385	1846	1111	1481

Number:-	E	F	G	H	I	J
Average Speed in K.M.P.H	30	30	30	30	30	30
Headway in minutes	3 minute 49 seconds	3 minute 49 seconds	2 minute 52 seconds	2 minute 52 seconds	2 minute 18 seconds	2 minute 18 seconds
Number of Vehicles:-	3	3	4	4	5	5
Seating Capacity	60	80	60	80	60	80
Peak Point Demand i.e. passengers in one Hour	945	1260	1111	1481	1575	2100

For achieving these results it is imperative to employ the Appropriate Staff for this purpose.

	Per Bus	3	4	5
Mechanic	0.95	2.85 = 3	3.8 = 4	4.75 = 5
Drivers + conductors	3.7	11.1 = 12	14.8 = 15	18.5 = 19
Administrative Staff	0.1	0.3 = 1	0.4 = 1	0.5 = 1
Total		16	20	25

For this scheme of Transportation to function effectively and serve its desired purpose it is imperative to provide Parking Lots at the Periphery of the CBD so that the Vehicles can be parked there and then the Public Transport can be taken to reach the desired location. For making public transport effective and efficient it is essential to reduce its generalized cost for which proper infrastructure in the form of Bus stops, shelters, passenger information system, etc. should be provided.

VII. CONCLUSION

It is essential to shift to a smarter and sustainable modes of travel without compromising on the economics of the area. This has to start from the central business district as it paves the way forward. Each location is different and should be dealt accordingly. The above set of recommended measures will gather a lot of public support and save time and money from public inquiries and court cases. It has direct as well as indirect benefits for both the commuters as well as transport planners as well as environmental protection agencies. In a developing country such as India having built up central business district usually buses are the preferred mode for achieving modal shift as no extra land is required. For most of the population per capita income is not significant and they can't bear the upfront cost of a vehicle and busses are the only way option for them. This therefore helps in overall social development as well as gathering support for the scheme.

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