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BUS BODY FABRICATION AND PUBLIC TRANSPORT SERVICES

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ABSTRACT

Nepal is not yet a vehicle manufacturing country. However, buses and trucks are built in the local workshops on imported chassis. The quality assurance regarding safety and convenience of that body building workshop is not well regulated by the concerned authorities.

The study focuses on the comparison of existing dimensions of local buses with bus body fabrication standards maintained by legal framework in Nepal. This study aims at analyzing the suitability of locally fabricated bus body used for public transport service in Kathmandu Ring Road.

Key Informant Interview was taken with DoTM engineers, workshop personnel, bus owners and drivers and conductors. Bus body fabrication workshops were visited to acquire data related to the fabrication procedure and other technical parameters. Technical parameters of locally fabricated bus body were compared with the prevailing legal standards in Nepal. In addition to this, a questionnaire survey was conducted to determine the comfort level of public transport service related to bus body parameters.

Data obtained from Key Informant Interview and field measurement were analyzed by using descriptive qualitative analysis. Also, the data collected from questionnaire survey was analyzed statistically to determine the comfort level.

The study unveiled that there are no proper regulations for age of bus body and standardization process for bus body fabrication. Most of the bus bodies fabricated in the local workshops didn't meet the standard set in Motor Vehicle and Transport Management Regulations, 1997 such as height of first step, legroom space, passenger seat width and depth. Most of them did not have emergency exit. Except Sajha buses, no separate space and ramp on service door for wheel chair users were provided. The largest percentage of respondents indicated that the comfort level of passenger seats, service door, steps, handrails and handholds, gangway and locking system of window are either fair or uncomfortable and very few percentages responded as comfortable or very comfortable. Also, it was found that 53% of respondents felt Sajha Yatayat to be comfortable compared to other buses.

Technical parameters of buses measured were found to differ from the prevailing standards and the dimensions of the bus body parameters were insufficient to provide comfort to the passengers. Bus body fabrication standards are very important regulatory measures for providing comfort transport service. Furthermore, the standards are key elements for setting the standard procedure for bus body fabrication and introducing it into the transport service.

Guidelines and directives related to the age of bus body and standardization procedure for bus body fabrication should be worked out and implemented. Road worthiness test should be done for vehicle registration. Bus body parameters which are not mentioned in regulations can be obtained from AIS-052.

1. INTRODUCTION

Public transport is a system that operates at regular schedules on fixed routes and is used by the public. It is an undeniable fact that mobility is the part of daily round of activities and as such an essential component of the life of every human being (Albalate & Bel, 2010). In satisfying the need for mobility, public transport has been in recent times become the most commonly used mode of transport. Therefore, the ways public transport services are delivered as well as their qualities are important because of their effect both on the attitude and behavior of travelers and the demand for services (Sam et al., 2014).

Polat (2012) argued that "public transport services are specific and important". They are among the very basics of people's lives in modern times and that is why they are not only demanded but also required by people. It is very basic instrument of mobility for a big percent of the population almost in all countries, where it forms one of the driving forces of economic

and social life. Fare, travel time, service quality, comfort, reliability, availability and cost of alternative travel modes, time of travel, purpose of travel and lastly the level of public transport dependency has been identified as public transport demand determinants by this study.

Degree of overcrowding also affects the public transport service. Overcrowding can be expected to affect comfort and invariably create unpleasant and uncomfortable conditions. Furthermore, the seating arrangements in the vehicle and leg room space as well as general vehicle cleanliness are other aspects of comfort a vehicle should provide (Sam et al., 2014). It is even thought that elements with the most physiological importance to comfort are those which affect quality of a ride as well as the effort of driving such as noise, vibration, ventilation, glare, odor and seating arrangements (Neumann et al., 1978).

Thus, for efficient and effective transportation system, one of the measures is quality of service. The hierarchy of quality determinants in public transportation in Europe, which is proposed by European Commission, as cited in the Transportation Research Board, consists of several classes, in which safety and security have been included (Joewono & Kubota, 2005). The safety and security aspect in public transportation operation is very important, as public transportation closely relates with human lives on a larger scale or in greater numbers. Also, the perceived safety and security orientation of a transport service provider by travelers may also play active role in the decision of which service provider to patronize.

Nepal being a landlocked country, roads are the major transport mode. In urban areas, public transport comprises of buses, mini buses, microbuses, tempo, three wheelers etc whereas for long route travel or in rural areas, buses are the major mode of public transport. Road transport safety requires multi-dimensional approach for reduction of Road Traffic accidents. In 2010, UN General Assembly established the decade of action for road safety (2011-2020), the goal of which was to stabilize and reduce the predicted levels of road traffic fatalities around the world. As per Action Plan, the five pillars for safer roads included: road safety management, safer roads and mobility, safer vehicles, making road users safer and improved post-crash response and hospital care (WHO, 2015). Thus, safer vehicles are one of the important pillars for road safety. Therefore, any program regarding road safety should begin with the improvement of vehicle parameters related to the safety. Vehicle safety features are broadly categorized into primary and secondary safety features. Primary safety features are ones that help the driver to avoid having a crash like anti-lock brakes, traction control,

electronic stability control etc. whereas secondary safety features are ones that help reduce the consequences of crash such as air bags and body engineering that directs the force of a crash away from the occupants.

Bus being the major mode of public transport in Nepal, it is necessary to determine the safety related characteristics. Bus safety issues are related with bus characteristics such as physical dimensions, dynamic characteristics such as brakes, accelerator etc., operational conditions and others. In 2013, 325 accidents occurred due to technical fault of vehicle (DoR, 2013). Half of the RTA in the country occurs in Kathmandu Valley but fatalities are less pronounced than in rural areas. In Urban areas, motorcycle accidents are major whereas in rural areas, truck and bus accidents play a significant role. Bus accidents along the long distance routes are of serious concern accounting for 13% and 31% of all the fatalities and serious injuries, respectively (Thapa, 2013).

A bus is prepared in two stages viz. manufacturing the chassis and building the body as per requirements like the space capacity, space planning and other structural framework. Bus body is built for the specific purpose of transport service based on the given chassis specification. Most of the safety components can be built for the safer vehicle use during its body fabrication. Thus, bus body fabrication procedure and physical dimension affect the safety of passengers.

For the management of vehicles plying on roads and public transportation, the first vehicle act was enacted in 1964 followed by Transportation Management Act, 1970. Later, a combined Motor Vehicle and Transportation Management Act (MVTMA), 1993 and Motor Vehicle and Transportation Management Regulation (MVTMR), 1997 replaced them. Besides these acts, the Public Road Act, 1974; Local Self Governance Act, 1999; and Road Board Act, 2002 also considers some part of Road Safety such as implementation and management of traffic flow, vehicle axle load and right of way (Shrestha, 2006).

2. METHODOLOGY

2.1 Research Design

It is the conceptual plan for any research. It includes research study, data collection, data analysis, result of the study and recommendation. Research design for this study is shown in

Figure 2.1.

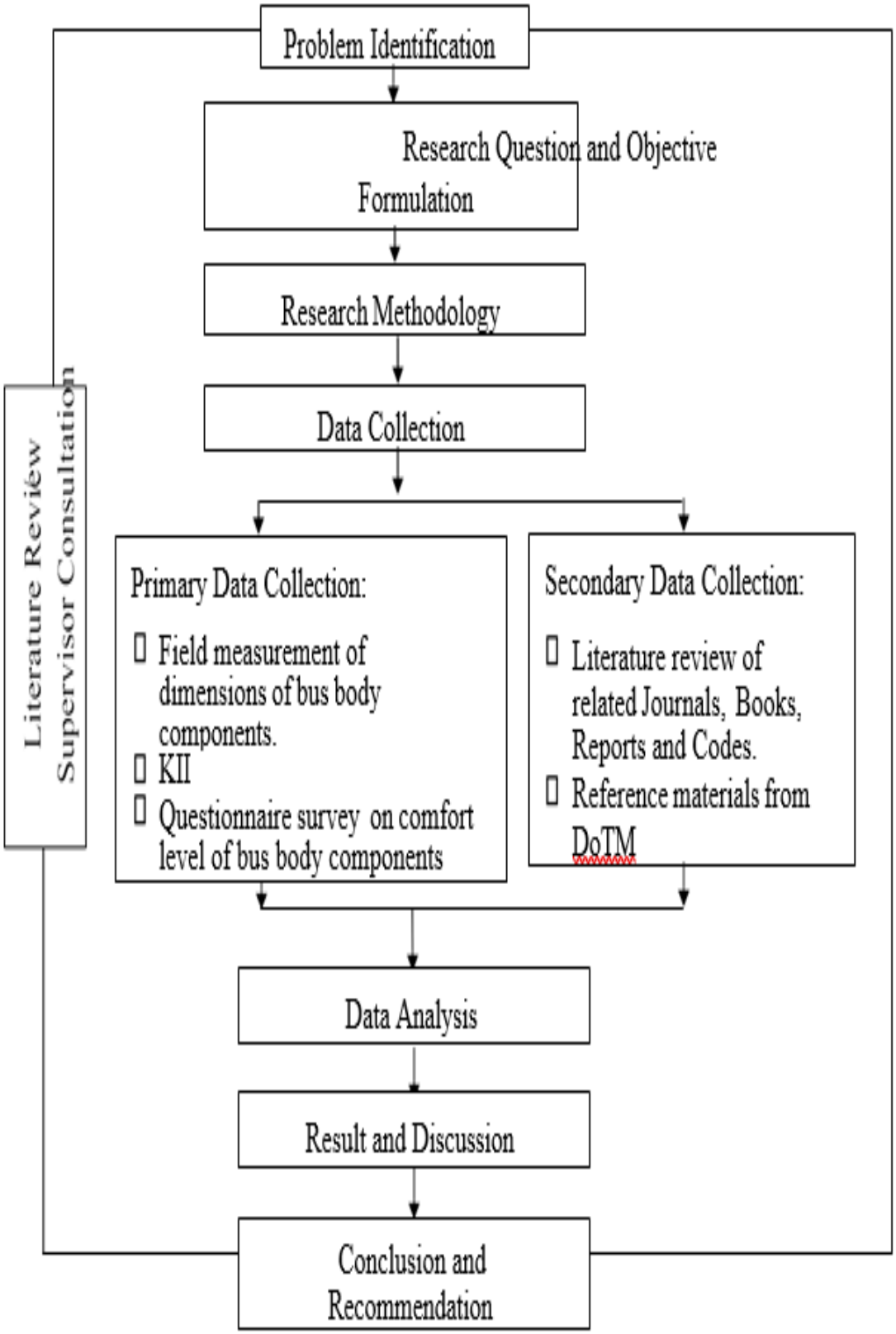

Figure 2.1 Flow Chart of Research Design.

2.2 Study Area

Ring Road was taken as the study area. Ring road falls under NH16 and has total length of 28km. It has traffic volume more than 30,000 Average Annual Daily Traffic (DoR, 2013). Map of the study area is shown in Figure 2.2.

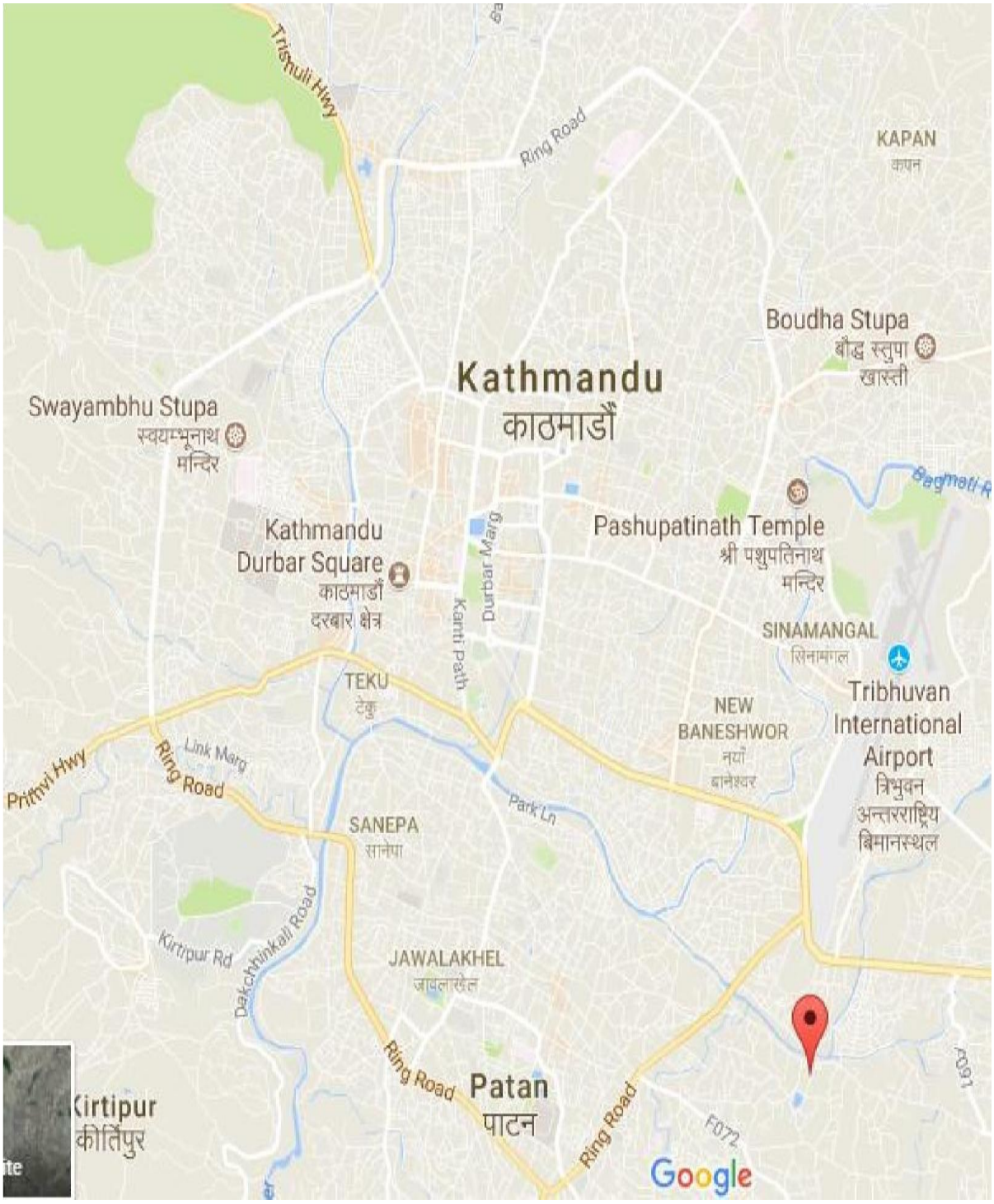

Figure 2.2: Map showing Ring Road in Kathmandu Valley (Source: Google Maps)

2.3 Data Collection

2.3.1 Primary Data

Primary data were collected by field measurement, questionnaire survey and key informant interviews. Field measurement and key informant interviews were done simultaneously.

Key Informant Interviews: Key Informant Interview was carried out with DoTM engineers, workshop manager and technician (Chyassal Workshop), bus owner of Karya Binayak Mount Everest Yatayat, bus drivers and conductors. Key Informants were told about the purpose of the study and the interview questions were prepared related to bus body fabrication. The interview questions involved following issues:

How bus body fabrication is done?

What is the age of public transport service?

What is the standardization process of bus body fabrication?

2.3.2 Secondary Data

Secondary data on types of buses, its services and standards, vehicle approval process, vehicle testing of Nepal and abroad were reviewed on related literature i.e. journals, reports, books, codes to fulfill the objective of the study. Also, the reference materials from Department of Transport Management (DoTM) were collected.

Table 2.3: Total number of Public buses measured.

S.N	List of Bus Association	Number of buses surveyed (Nos)	Number of seats
1	Nepal Yatayat	2	22 & 35
2	Mahanagar Yatayat	3	32 & 38
3	Orange Bus Sewa	1	55
4	Sajha Yatayat	2	41 & 55
5	Karya Binayak Mount Everest Yatayat	1	32
6	Dhunche Sangh	1	32
7	Swayambu Yatayat	5	23, 26, 32 & 42
8	Lalitpur Yatayat	3	24, 26 & 32
9	Kantipur Yatayat	2	22 & 30
10	City Yatayat	2	23 & 32
	Total	22	

2.4 Data Analysis

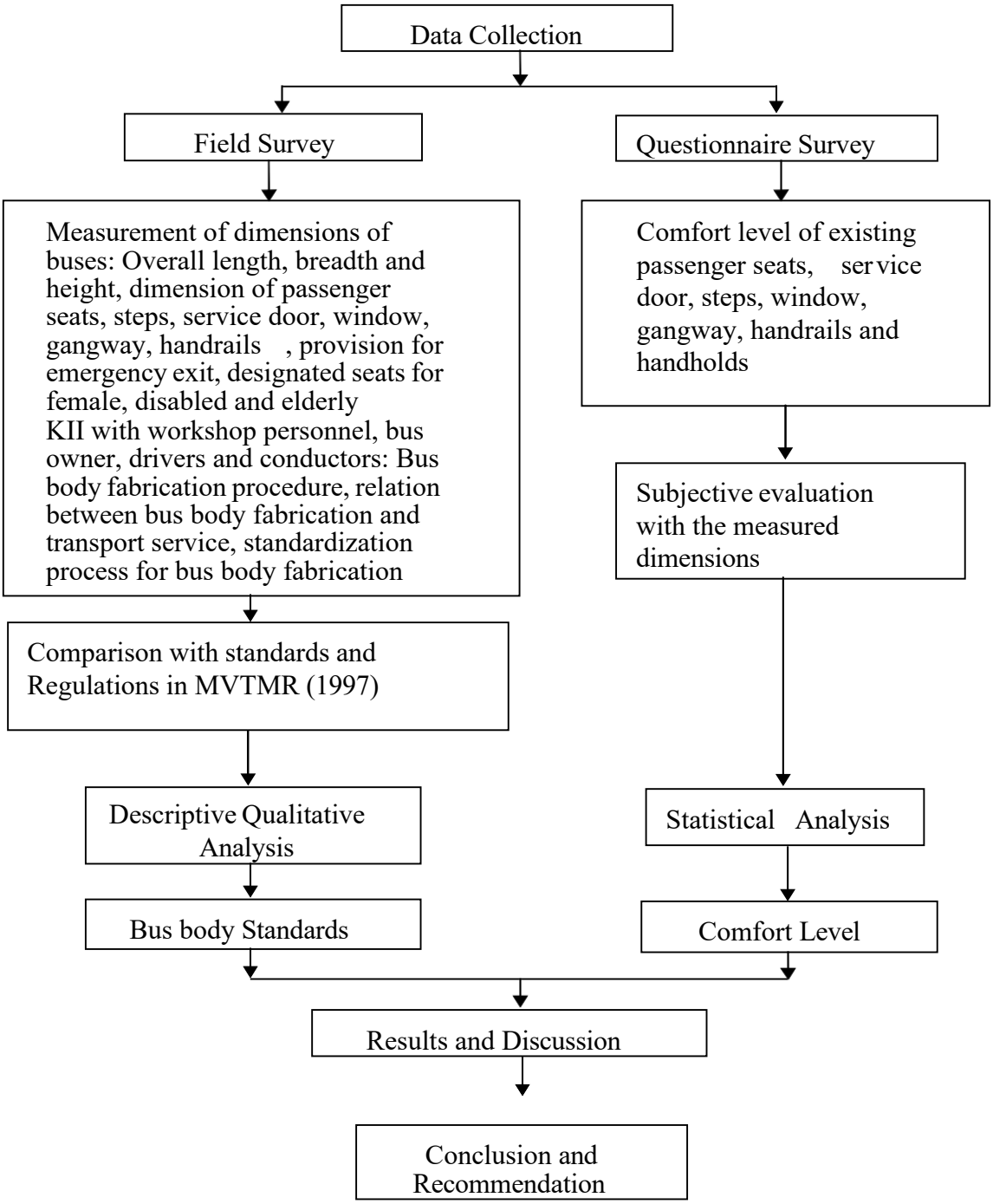

Figure 2.4 Conceptual Framework of Study.

3. RESULT AND DISCUSSION

3.1 Standardization Process for Bus Body Fabrication

In MVTMA, 1993, there is provision for registration of imported vehicle. But in context of Nepal, generally chassis of buses are imported from India paying custom duty and bus body construction is done in local workshop. As per KII, chassis of the buses imported are registered by bus companies in Transport Management Offices. During registration, model

number, chassis number and engine number are entered. Then these chassis are sold to bus operator. Bus operator gives the chassis to local workshops for body construction. After the construction of bus body, bus operator enters the bus colour and number of seats in the chassis registered office. In the Act, there is provision for road worthiness test before vehicle registration but in actual condition, registration is done based on the test certificates sent by bus companies.

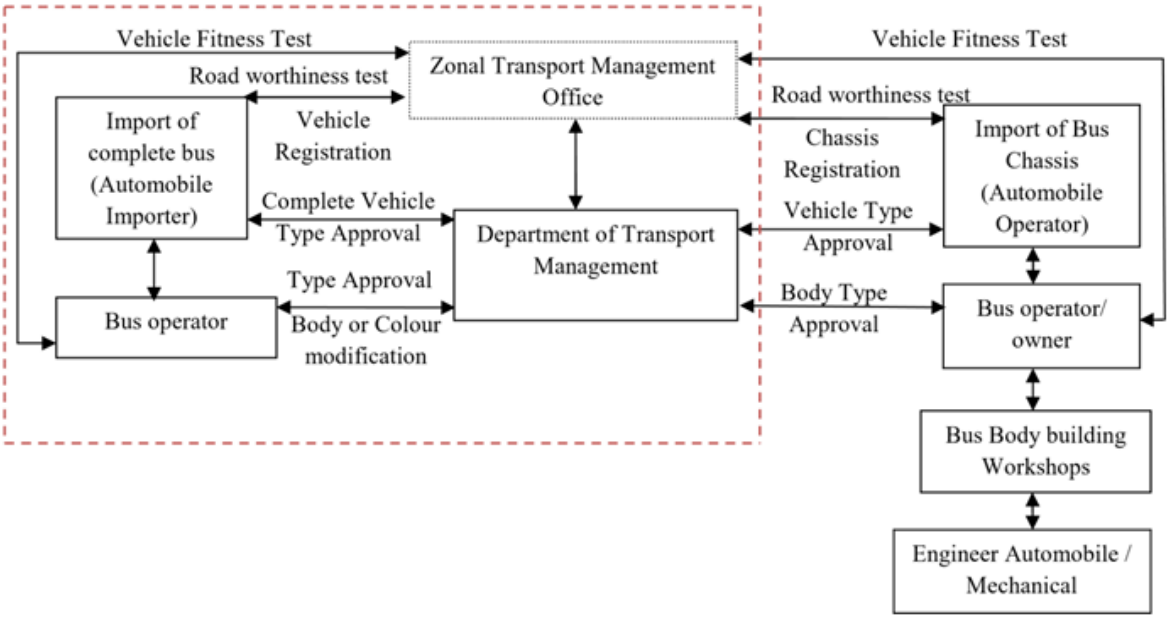

Figure 3.1 Modified Bus Body Fabrication and Type Approval.

3.2 Comfort Survey of bus body parameters

Questionnaire survey was done to find the comfort level of existing bus body components. Sample for questionnaire survey comprised of 244 males and 140 females with no physical disabilities. The age of respondent ranged from 18 to 58 years. Most respondent answered the bus body parameters comfort level to be either fair or uncomfortable. Few percentages only found it to be comfortable or very comfortable.

In the case of locking system in window, largest percentage found it poor and second largest very poor. Responses of questionnaire survey are shown in pie chart from Figure 3.2 to 3.12

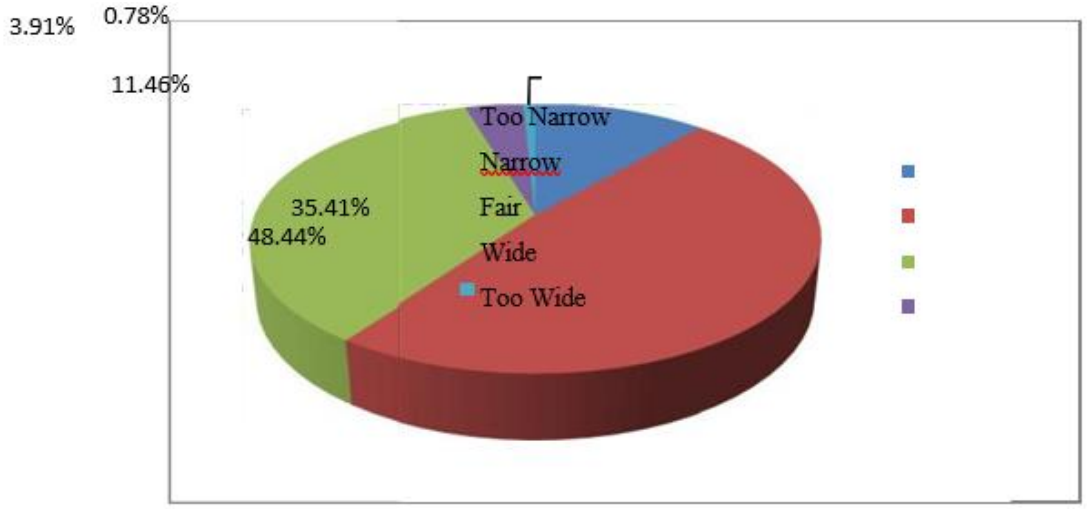

Figure 3.2: Response of survey on passenger seat width.

48.44% of respondent replied the passenger seat width to be narrow followed by 35.41% who found it to be fair. Only 3.91% and 0.78% found it to be wide and too wide respectively.

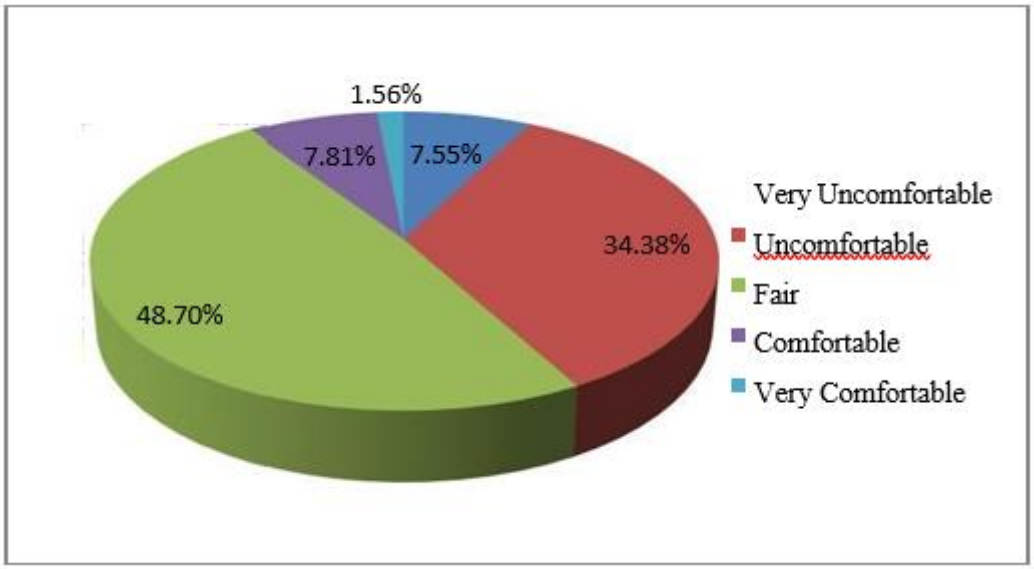

Figure 3.3: Response of survey on passenger seat base height.

Highest percentage (48.70%) answered the height of seat base to be fair and 34.38% answered it uncomfortable. Very few 7.81% and 1.56% of passenger answered the seat base height to be comfortable and very comfortable respectively.

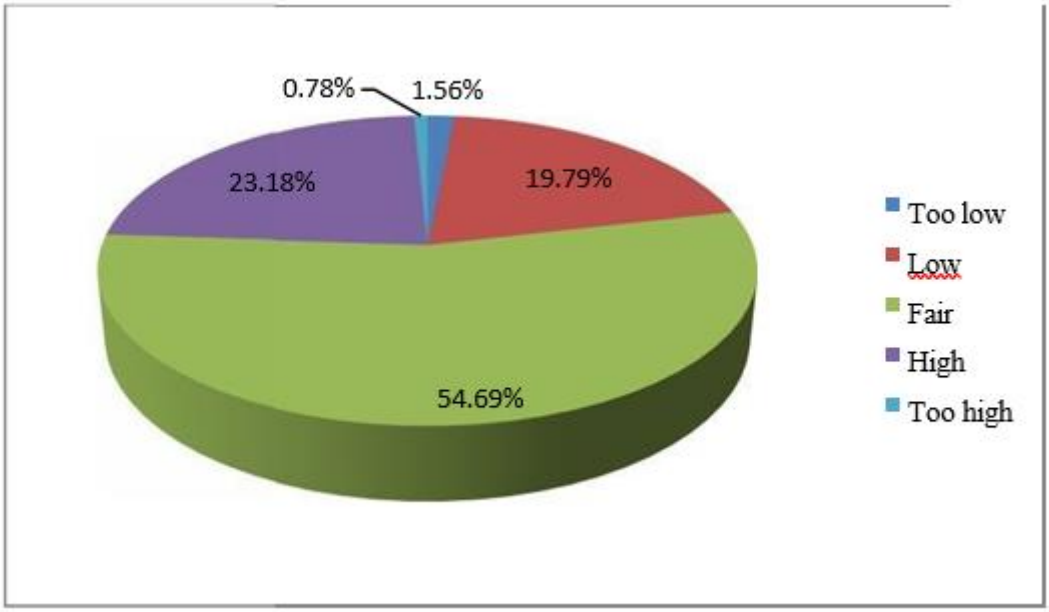

Figure 3.4: Response of survey on backrest height.

54.69% passenger responded backrest height to be fair followed by 23.18%, 19.79%, 1.56% and 0.78% who responded it as high, low, too low and too high respectively.

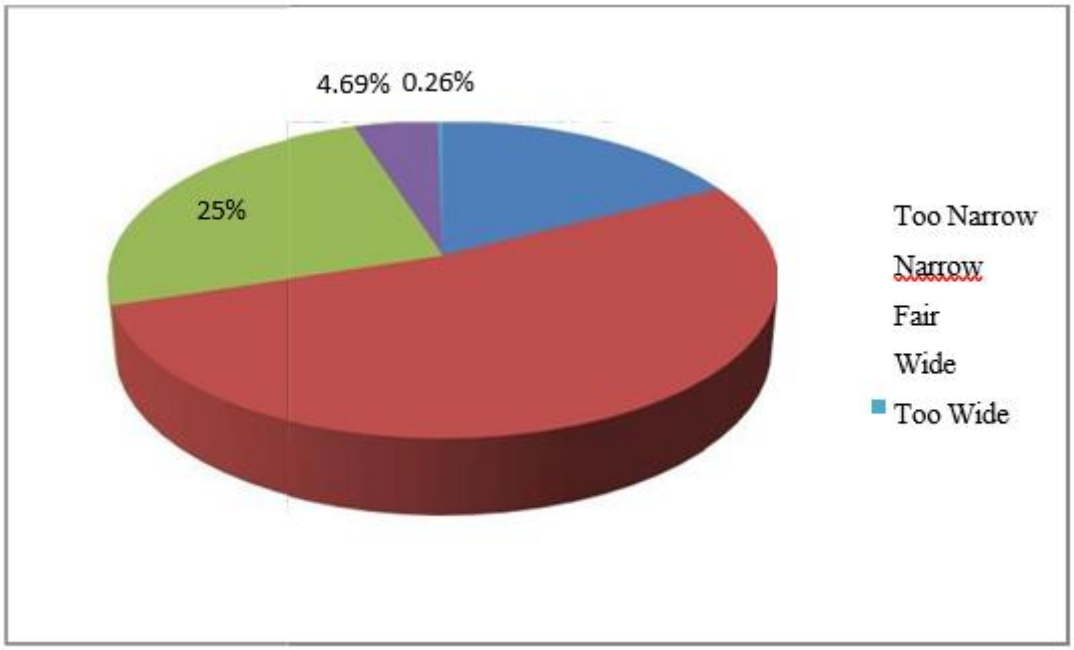

Figure 3.5: Response of survey on spacing between two seats.

52.60% passenger feel spacing between two seats to be narrow, 25% feel it as fair, 17.45% as too narrow and only 4.69% and 0.26% feel it as wide and too wide respectively.

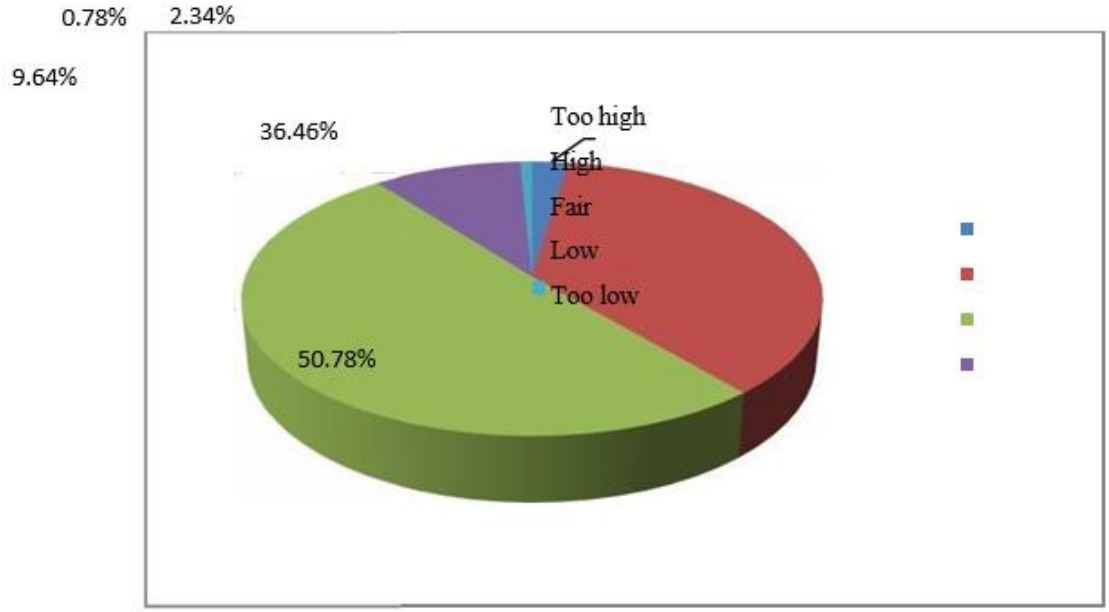

Figure 3.6: Response of survey on height of first step height at service door.

50.78% passenger responded height of 1st step at service door to be fair, 36.46% as high, 9.64% as low, 2.34% as too high and 0.78% as too low.

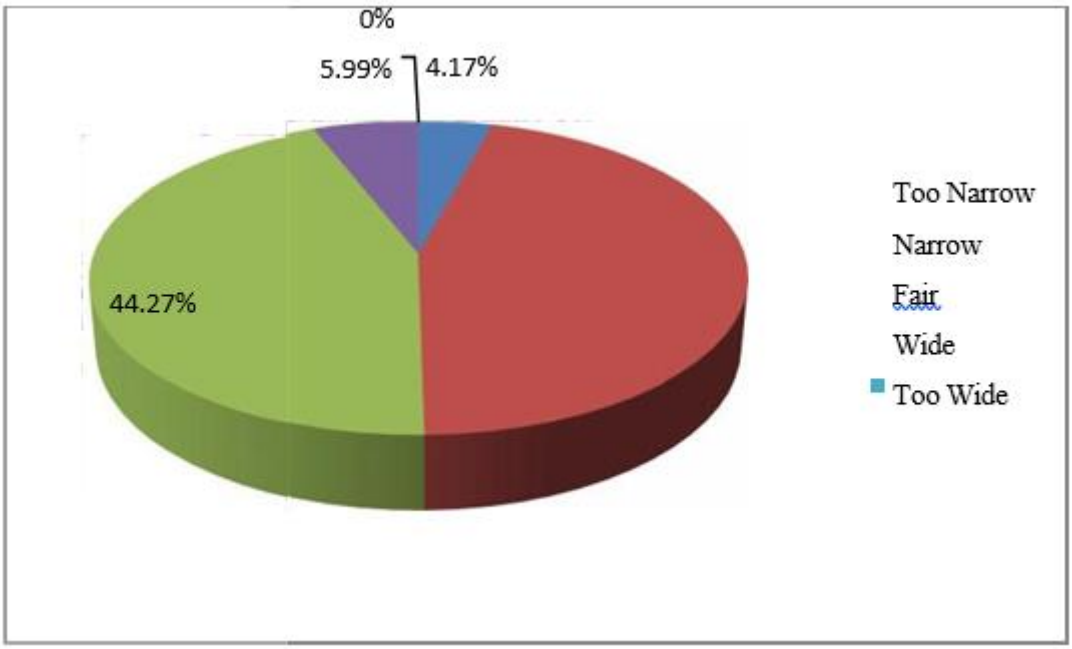

Figure 3.7: Response of survey on service door width.

45.57% and 44.27% responded the service door width to be narrow and fair. None of the passenger feels the door to be too wide.

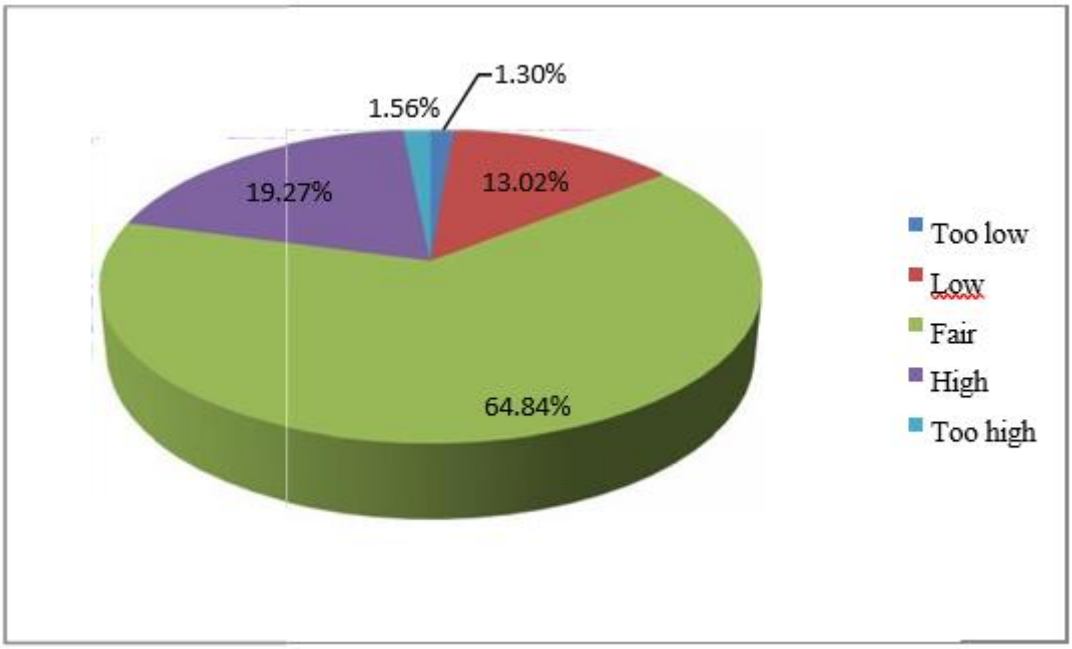

Figure 3.8: Response of survey on height of service door.

64.84% respondent feel the door height to be fair, 19.27% answered it as high, 13.02% as low, 1.56% as too high and 1.30% as too low.

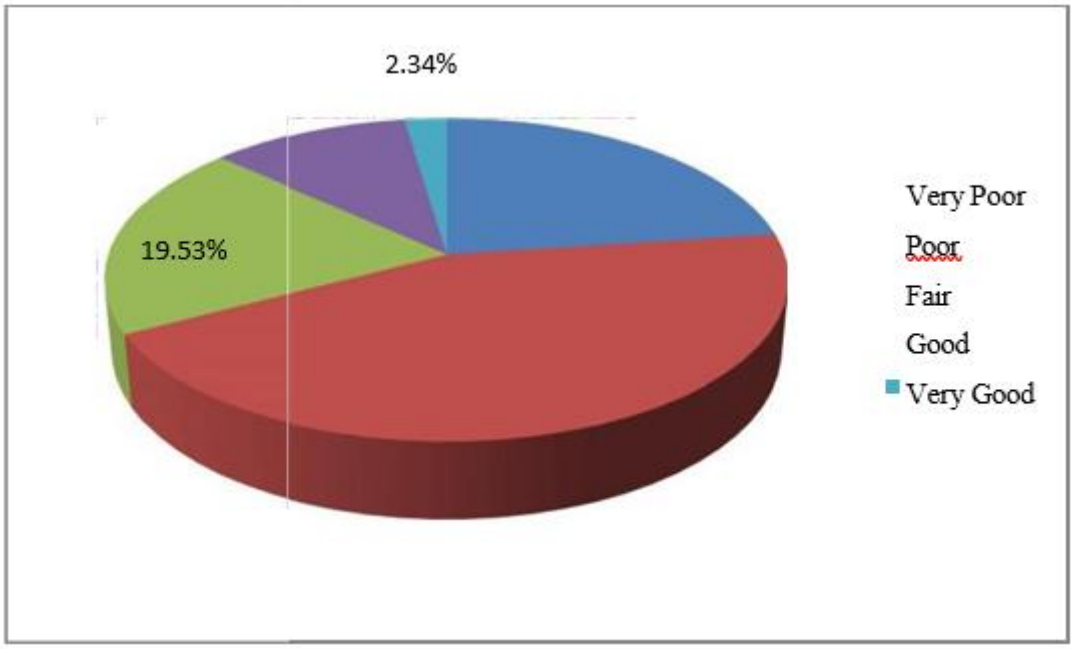

Figure 3.9: Response of survey on locking system in window.

44.27% respondent answered locking system in window to be poor followed by 22.92% who answered it as very poor. Only 19.53% feel it to be fair, 10.94% as good and 2.34% as very good.

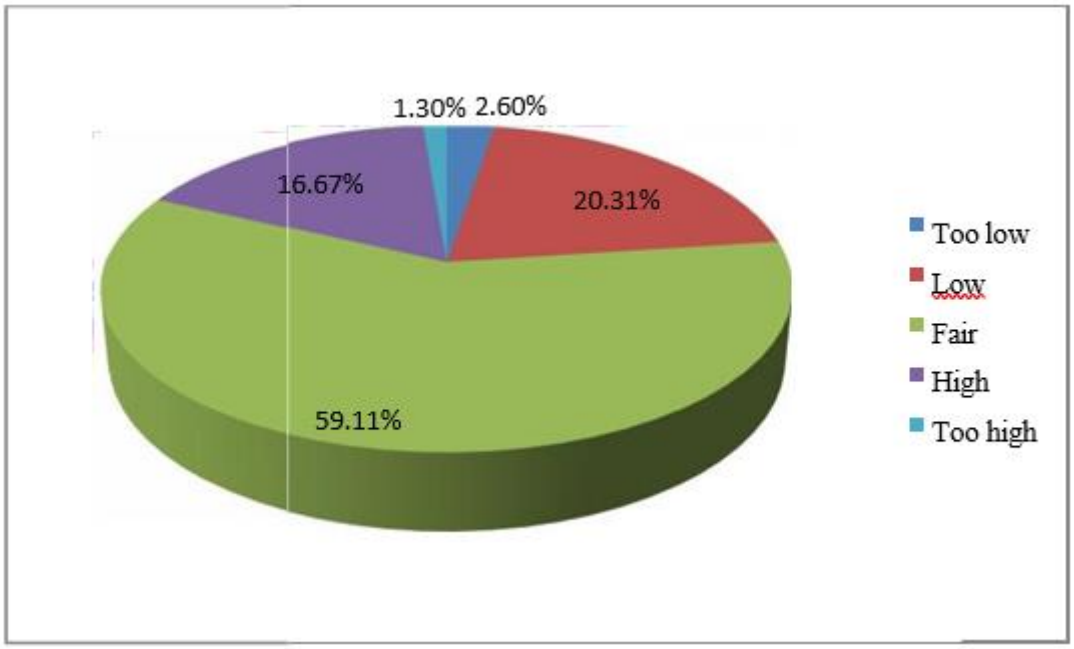

Figure 3.10: Response of survey on inner height of bus.

59.11% passenger responded inner height of the bus to be fair, 20.31% as low, 16.67% as high, 2.60% as too low and 1.30% as too high.

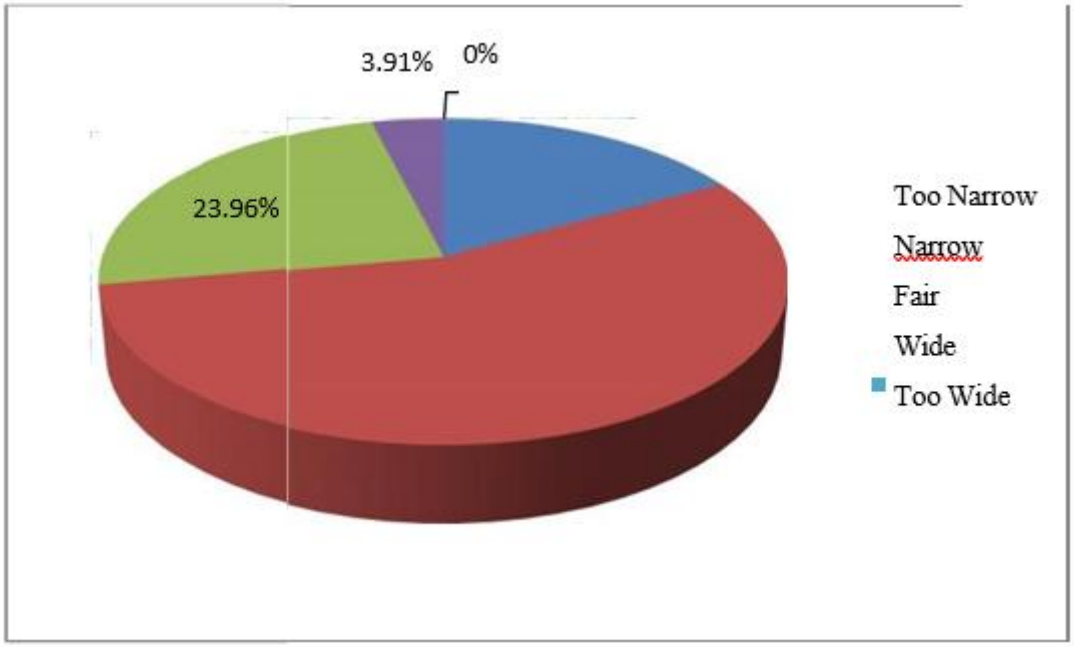

Figure 3.11: Response of survey on gangway width.

55.21% respondent found gangway width to be narrow, 23.96% as fair, 16.93% as too narrow and 3.91% as wide. None of the respondent answered gangway width as too wide.

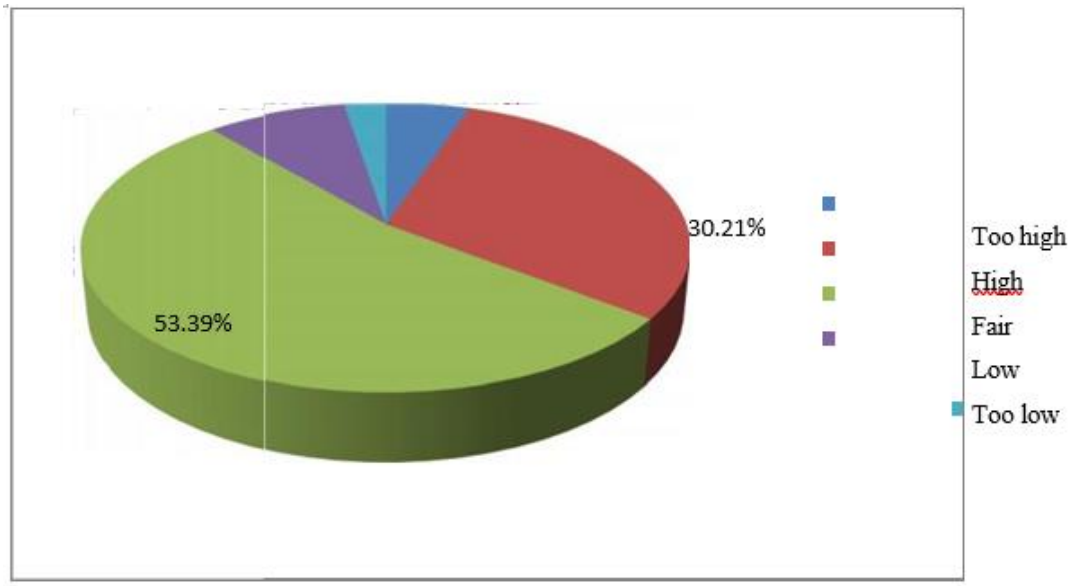

Figure 3.12: Response of survey on position of handrails and handholds.

4. CONCLUSION

The study was conducted in the context of Nepal related to the issues of bus body building standard and public transport services. Research was concentrated on the comparative study of technical parameter of buses built in local workshops and provisions mentioned in legal document i.e. MVTMR (1997).

For providing safer and comfort transport service, age of bus bodies and standardization procedures for bus body fabrication are important regulatory measures. But there are no provisions for these in MVTMR, 1997. Also, no provision is provided regarding registration of imported chassis and body fabrication in local workshops. There is a clause that road worthiness test should be done before vehicle registration. But in actual condition, it is not done. Currently, regulation related to age of vehicles has been made by Government. But the age of vehicle is determined on the basis of route length, road condition and quality of material used. Also, the quality of materials used for body fabrication is depended upon the quality required by bus operators.

There are no sufficient standards related to bus body parameters in MVTMR, 1997. The buses measured were not found to meet the prevailing legal standards like height of first step at service door, passenger seat width, seat base depth and legroom space. Eight out of twenty two buses measured had emergency exit. Not a single bus had fire extinguisher and passengers seat belts.

Though, there are designated seats for disabled, elderly and female but no consideration has been given to their comfort during bus body fabrication.

Dimensions of passenger seats width, seat base height, spacing between two seats, legroom space, service door width and height, inner height of bus and gangway width are not sufficient enough to provide comfort to the passengers. Locking systems of windows are poor. Hence, safety and comfort of passengers are not considered during bus body fabrication. Also, Sajha Yatayat was found to be the most comfortable.

4.1 Recommendations

Based on the study, following recommendations are made:

- Directives and regulations should be prepared and implemented including provisions for age of vehicle and standardization process for bus body fabrication.
- Road worthiness test need to be done before vehicle registration to check the feasibility of imported buses or chassis on Nepal's road.
- The buses fabricated in local workshop need to meet the legal standards and standards set by bus manufacturing companies.
- Bus body parameters need to be improved in order to improve their comfort level. Buses like Sajha Yatayat should be added.
- Bus body fabrication parameters which are not mentioned can be adopted from AIS052 as all buses chassis are imported from India provided that terrain nature and road design are similar.

Also, for future studies following recommendations are made:

- Buses built for long distance might be considered for identifying the suitability of bus body for respective service.
- The study of this kind may be conducted for freight vehicles whose body fabrication is performed in Nepal.

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