Study on the Need of a Green Transport System in Thimphu City

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Abstract - *Green transport system is recognized as one of the solutions to mitigate climate change. There is an enabling policy for a green transport system in Bhutan. The research was conducted in a right time as we are concern of emission from the transport sector that contributes to global warming. By switching urban transport system to green transport, an emission from the transport sector would reduce, thereby reducing global warming potential. Hence, this study analyzed the possibilities of establishing alternate mode of transport to an existing transport system with the emerging threat from climate change. A total of 1100 survey questionnaire was administered to different age groups in Thimphu city. The participants were from ten different sub-area of the study area. The willingness of people to use green transport and its fare were analyzed so that this study will not only inform people of Bhutan about demand of green transport system, but also serve as guidelines to policy makers and bureaucrats.*

Keywords: Climate change, Green transport, Thimphu city, Willingness

1. INTRODUCTION

This paper studies the need of a green public transport system in Thimphu city. To better understand green transport system, (Liu, 2001) had defined green transport as a kind of intensive, effective and environmental travelling mode with low emission, low energy consumption and low pollution. The use of urban green transportation can save energy, reduce carbon and PM2.5 emissions and improve the environment (Cao & Xia, 2015). The current mode of transport system is responsible for climate change through an emission of greenhouse gas and changing the mode of transport will address this issue.

When it comes to Bhutan, the country is doing her best to promote low-polluting transport system and the countries have an enabling policy for green transport. The Royal Government of Bhutan (2017) highlights that, there are fiscal incentives in the form of tax rebates on electric vehicles for promoting environment friendly transport or public awareness programs to improve road safety. This is a very welcome policy for the country to encourage low-pollution vehicles. Bhutan worries about environmental degradation and climate change. During the fifteenth Conference of Parties of the United Nations Framework Convention on Climate Change (UNFCCC, 2009), Bhutan has committed to remain Carbon neutral. Further, during the UNFCCC (2015) at Paris, Bhutan committed not only to be Carbon neutral, but to remain Carbon negative. Switching the mode of transport sector to the green transport system will help to achieve this goal in one way.

It is well known that, Bhutan is a very small country sandwich between two giants, China from north and India from south. Any activity from the two countries affects Bhutan. However, in a small way, Bhutan is doing her best to fight climate change, still an emission from the transport sector keep on rising. But when it comes to studies related to change in transport sectors into the green transport system in Bhutan, it is very limited. This study was further ignited from Asian Development Bank (2006), which states that Bhutan in 2040 will be very different from the Bhutan of today, and the transport system needs to respond to the changing needs and demands. This paper, therefore study the needs of Green transport that will address people's behavior on the transport system in the changing paradigm with the following objectives:

i.   Investing information on routine transport in Thimphu.
ii. Willingness to pay for public transport.
iii. Identifying public awareness on the benefits of the green transport project.

2. METHODOLOGY

Study area

The study was carried out among the residents that fall under Thimphu city. Thimphu is the capital city of the Kingdom of Bhutan and it is located at 27°28′00″N, 89°38′30″E coordinates: 27°28′00″N, 89°38′30″E and it is spread over an altitudinal range between 2,248 masl and 2,648 masl. The 26 Sq. km area of the city stretches 15 km long and 3 km wide which starts from Dechencholing from the North and ends at Babesa in the South (Royal Government of Bhutan, 2019).

Research design

There are various methods used for the research purpose. This study took the form of descriptive survey. According to Mugenda & Mugenda (2003), a descriptive survey allows for identification and description of people's opinion about a phenomenon, in this case identification of people understands to the Green Transport system. The primary data was collected through a questionnaire in the study area during the month of September 2019. For the purpose of further understanding of the green transport systems, relevant review from scholarly journal articles, books, and reports were used as secondary data sources.

The study targeted a population from areas that fall in the jurisdiction of Thimphu city. The place was chosen with the fact that, Thimphu is a largest city in the country and most of the people are residing in Thimphu. From the National Statistics Bureau (2017) report, the population of Thimphu alone was 19% of the total population in Bhutan. Therefore, it is obvious that, people of Thimphu uses more modern transport system than other Dzongkhags.

For the purpose of primary data collection, the random sampling was used with enumerating 1,100 respondents from the study area. The basic assumption of choosing this sampling procedure is due to its simplest form of collecting data and the member of the subset carries an equal opportunity of being chosen as a part of the sampling process.

The data collected were analyzed using Statistical Package for the Social Sciences (SPSS) version 22 and Microsoft excel. Before the analysis, the questionnaire was checked for completeness and consistency which was followed by numerical coding for the ease of analysis. The response was then entered into the SPSS software for analysis. The analyses involve the simple descriptive method. Descriptive statistics such as frequency counts, percentage counts and means were used to summarize the data. Cross tabulation test was also performed to generate the results. For the purpose of generating graphs and charts, Microsoft excel was used.

3. RESULTS AND DISCUSSION

Demographics Details

Of 1,100 total respondents chosen for the survey, 1084 took part in the survey and were enumerated. The maximum respondents fall under the age group of 19-25 years and only 44 respondents with age 56 years and above took part in the research. About 539 males, 543 females and 2 other respondents were enumerated. The details of respondents in different age groups and gender are given in appendix section of *table 1*.

In terms of occupation, 32% of respondents were students and 18% from private organizations. The least group of respondents belonged to the Civil Society Organization (CSO) employee and retired group. There are about 146 respondents who were reported in the other categories. These are mostly youth seeking employments, monks, armed force personnel and businessmen.

The research recorded the highest number of respondents with their income level below Nu. 10,000. This is closely related to the respondents' occupations; as maximum respondents were students. It was also found that only 1.8% of respondents with their income level more than 50,000 took part in the survey. Thus, the research targeted group of respondents mostly falling in mid and low income level as they are one who avail the public transport services the most.

Travelling Information

Purpose of transportation use

It is evident from the *figure 2* that people travel the most for work and studies. About 2.9% of them categorized in others category are mainly those who travel to drop their kids in school, visit hospitals and pilgrim sites.

Main transportation Means and Reason

It was also reported that 41% of respondents enumerated are availing public transport facilities, followed by taxi services and use of personal cars. It makes much clear from the *figure 3* of an appendix section. The reason for use of different transportation means are shown in the *table 2*.

The table shows us that people preferred using taxi mainly because of its easy accessibility. Bus services are used mainly because of inexpensive fare. Commuter using personal cars reasoned out convenience as their main reason for opting to use their own car. People who are walking are those who have shorter distance from the workplace and shopping area.

Duration and Frequency of Use

It was found that respondents are using different means of transportation to travel within the Thimphu city. Some responded that they are using more than one means of transportation in a day. It is reported that the maximum number of people surveyed are travelling in public transport. The percentage of respondents using different means of transportation by duration in a day and frequency in a week is shown in *figure 4* and *figure 5*. The figure also shows the percentage of respondents who have never availed different transportation means from the total respondents by each category.

The respondents pointed out that the existing bus service is not as effective as it is mostly inconsistent with its routine. Many are in favor of existing fare as it is cheap and affordable. Some pointed out the need of

larger bus parking as the current space is so compact. There are also comments on increasing the bus number during peak hours like after office and school timing. Some felt buses are dirty and passengers are crowded.

Overall, many suggested need for more numbers of buses and increase the duration and frequency of travel in a day.

Willingness to pay for green transport system

Of total surveyed 95% of the respondents are willing to use green transport if initiated in the city. The remaining 5% are mostly those respondents who reside in the heart of the city and who do not travel much. The reason is mainly owing to short distance travel. The figurative picture of above information is shown in *figure 6.*

The respondents are further asked their wiliness to pay per km. In average they are willing to pay Nu.2.61 per km for the use of green transport.

Awareness on Green Transportation System

It is clear from the *table 3* that the respondents recognized environmental, social and economic benefits of the green transport system. The questions were asked based on their knowledge of the benefits derived from Green Transport. The mean awareness score comes out to be 4.01 out of 5. Hence the researchers conclude that people were aware of the benefits of the green transport system.

To go with an individual variable, the mean value from CO_2 mitigation, health benefits, time saving, transport service for vulnerable people and enhancement of energy security are, 3.95, 3.90, 3.98, 4.23, and 3.97 respectively.

4. CONCLUSION AND IMPLICATION OF THE STUDY

This study revealed that, people of Thimphu city are aware of the Green transport system and its benefits. If the Green transport system is initiated in Thimphu city, they are willing to use the service at Nu. 2.61 per Km. Considering the environmental, social and economic benefits, the study finds it high time for the initiation of green transport in Thimphu city.

The researchers have conducted this study with an aim of making a clear guideline to policy makers about the environmental friendly transport system in Bhutan. We are concerned of the environmental hazards from the transport sector. This paper will be instrumental in initiating the green transport system in the country.

5. REFERENCES

Asian Development Bank. (2006). Bhutan transport 2040 strategic vision, Retrieved July 30, 2019 from https://www.adb.org/sites/default/files/publication/30268/bhutan-transport-2040.pdf.

Cao, G.H., Xia, S.G. (2015). Study on Key Issues of Green Transportation Planning - Taking Sino-Singapore Ecological Technology Island as an example, Shanghai Urban Planning, 05, 22-24.

Liu, W. (2001). Experience and Inspiration of European Urban Transportation, Urban Planning, 10, 56-60.

Mugenda, M. & Mugenda, A. (2003). Research methods in education: Quantitative and qualitative approach, Nairobi: Acts Press.

National Statistics Bureau. (2017). National Statistics Bureau, Population and housing census of Bhutan, Thimphu. Annual report, P.10.

Royal Government of Bhutan. (2017). National transport policy, Ministry of Information and communication, Thimphu. Retrieved July 25, 2019 from https://www. moic.gov.bt/wp-content/uploads/2017/08/Second-Draft-National-Transport-Policy-Bhutan.pdf

Royal Government of Bhutan. (2019). Retrieved from http://www.thimphucity.bt/node/1.

UNFCCC. (2009). *CDM Statistics*. Retrieved July 15, 2019 from http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html.

UNFCCC. (2015). 21st Conference of the Parties to the UNFCCC and 11th meeting of the Parties to the Kyoto Protocol (COP 21/CMP 11). Retrieved July 20, 2019 form https://www.unisdr.org/we/inform/events/30512.

Appendix

Table 1: The details of respondents in different age group and gender

		Age (Years)						Total
		11-18	19-25	26-35	36-45	46-55	> 56	
Gender	Male	106	171	129	59	45	29	539
	Female	86	186	128	82	46	15	543
	Others	0	1	1	0	0	0	2
Total		192	358	258	141	91	44	1084

Table 2. Reason for use of different transportation means

Transport/Reason	1	2	3	4	5	6
Convenience	118	163	104	4	3	392
Easy Accessibility	120	32	35	6	0	193
Inconvenient public transport	16	12	8	4	0	40
Time saving	37	23	69	3	12	144
Inexpensive fare	5	9	223	11	0	248
Short distance	3	7	7	44	0	61
Others	1	0	0	4	1	6
Total	300	246	446	76	16	1084

1=Taxi, 2=Personal car, 3=Bus services, 4=Walk, 5=Bike, 6=Total

Table 3: Awareness on Green Transportation System

Benefits	SD	D	DK	A	SA	Mean
CO_2 Mitigation	25	40	160	594	265	3.95
Health Benefit	17	41	200	602	224	3.90
Time Saving	12	67	152	549	304	3.98
Transport Service for Vulnerable people	11	16	97	546	414	4.23
Enhancement of Energy Security	12	33	166	640	233	3.97
Mean Awareness Score						4.01

SD=Strongly disagree, D=Disagree, DK=Don't know, A=Agree, SA=Strongly agree.
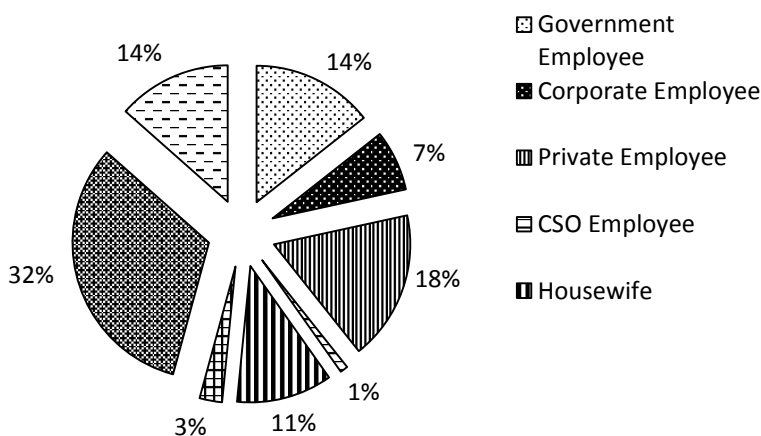

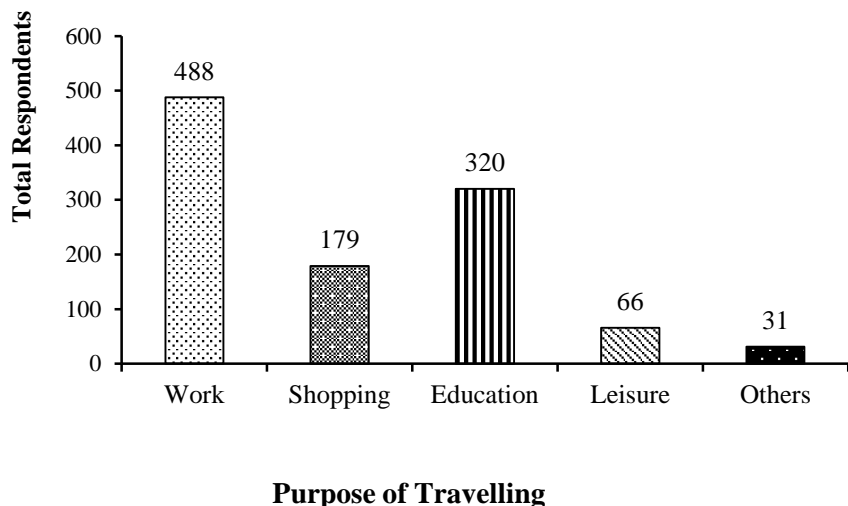*Figure 1: Occupation of Respondents*
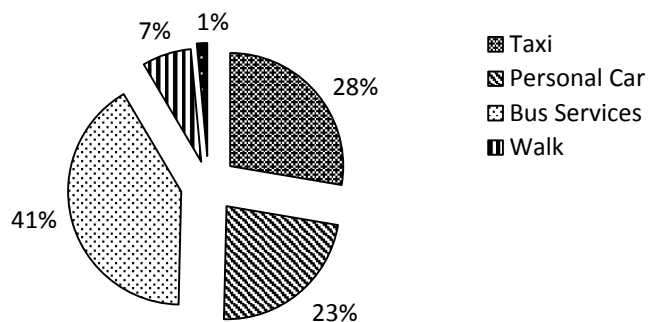
Figure 2: Purpose of Transportation used.

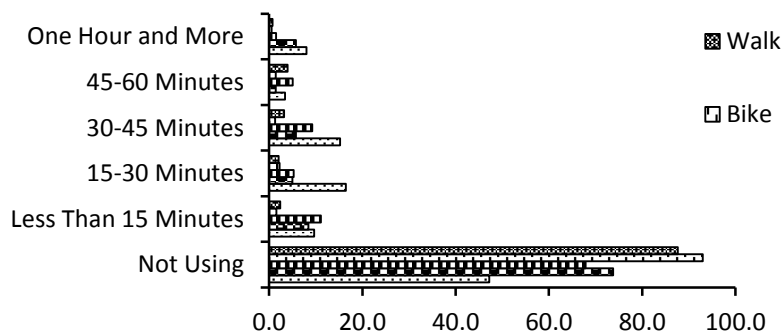*Figure 3: Means of transportation*

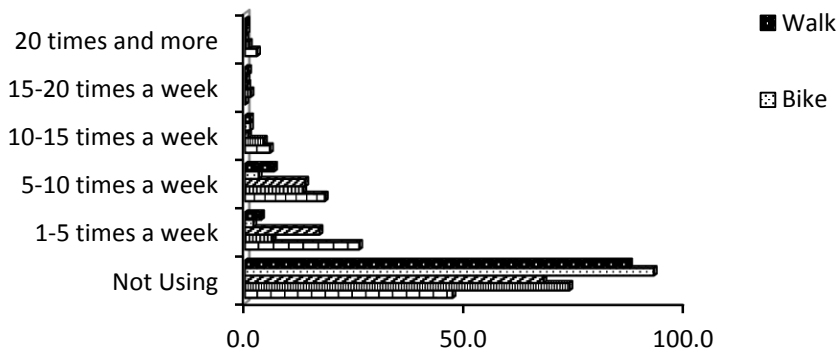*Figure 4: Duration of use of each transportation in a day in percentage*

Figure 5: *Frequency of different transportation use in a week by percentage*
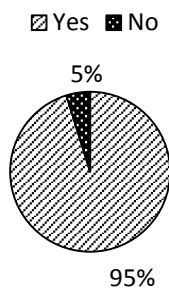

Figure 6: *Willingness to pay for green transport*