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TRAVEL BEHAVIOUR OF STUDENTS FOR SUSTAINABLE TRANSPORT

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ABSTRACT

The study deals with travel behaviour of students for sustainable transport. In the study data was collected regarding the preferences of students for their mode choice for trips for college. The data was used to analyze using Analytical Hierarchy Process (AHP). It was observed each type of mode of transport i.e Public, Private and Personal Mode of transport were having nearly same amount of change in College trips.

KEYWORDS: Travel Behaviour, Mode Choice, AHP

1. INTRODUCTION

1.1 General

The travel behaviour of college students plays a significant role in shaping the overall sustainability of urban transportation systems. As a highly mobile group, students contribute to daily traffic patterns, energy consumption, and environmental impacts. Understanding their commuting choices—whether walking, cycling, using public transport, or relying on private vehicles—provides valuable insights for designing efficient, eco-friendly mobility solutions. In the context of sustainable transport, analysing student travel patterns helps identify barriers such as inadequate infrastructure, safety concerns, cost factors, and time constraints. By addressing these challenges, institutions and policymakers can promote greener alternatives that reduce carbon emissions, ease congestion, and improve accessibility. This project aims to explore the current travel behaviours of college students, assess their awareness and willingness to adopt sustainable modes, and recommend strategies that align with environmental goals while meeting students' practical needs.

1.2 Impact of covid-19 on Transportation

It is found that with the rapid increase in COVID-19 during the wave-1 and wave-2 of the pandemic in India, the overall mobility for various purposes as well as using various modes had decreased, while with decrease in COVID-19, the overall mobility had registered rapid increase. Second, an analysis of the perceptions of public transport commuters with respect to quality-of-service pre and post COVID-19 highlighted the declining popularity of public transport amongst the commuter's post COVID-19. Third, the mode choices of the commuters during COVID-19 and prior to it in some of the Indian cities were investigated. Fourth, various existing contactless technologies were studied considering their inherent advantages and disadvantages and how to overcome those demerits.

1.3 Need for present study

Understanding the travel behaviour of students is crucial for promoting sustainable transport within educational environments and the broader community. Students represent one of the largest daily commuter groups, and their travel choices significantly influence traffic congestion, energy consumption, and environmental quality. However, many institutions still

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lack comprehensive data on how and why students choose particular modes of transport, limiting the effectiveness of policies intended to encourage sustainable options.

A focused study is needed to identify the key factors—such as convenience, safety, cost, infrastructure availability, and environmental awareness—that shape students' travel decisions. By analysing these behavioural patterns, institutions and policymakers can design targeted interventions that shift students from private motorised travel towards more sustainable modes such as walking, cycling, public transit, and shared mobility.

Additionally, understanding student travel behaviour helps universities and city planners reduce carbon emissions, improve campus accessibility, and plan future transport infrastructure more efficiently. Since students are at a formative stage of life, encouraging sustainable travel habits now can foster long-term environmentally responsible behaviour. Therefore, this study is vital for informing sustainable transport strategies, supporting climate action goals, and improving the overall quality of life for current and future student populations.

1.4 Objectives of the present study

To assess the travel behaviour of students for daily college trips using Analytical Hierarchy Process (AHP).

2. LITERATURE REVIEW

Khaled Hamad et al. studied about the travel behaviour of students with the aim of promoting sustainable transport within educational institutions. As students form a major part of daily commuters, their travel choices directly influence traffic congestion, environmental impact, and the overall mobility of the campus. The research investigates the types of transport modes students use—such as walking, cycling, public transportation, and private vehicles—and examines the key factors that shape these choices, including safety, cost, convenience, infrastructure, and environmental awareness.

The study identifies several barriers that prevent students from adopting sustainable travel options. Common issues include inadequate pedestrian and cycling infrastructure, unreliable public transport services, long distances between home and campus, and limited awareness about the benefits of sustainable mobility. Despite many students expressing a willingness to use eco-friendly modes, their decisions are often restricted by these practical challenges.

Findings highlight that improving infrastructure, enhancing safety measures, and increasing awareness campaigns can significantly encourage students to choose sustainable modes of transport. The study concludes that educational institutions play a crucial role in influencing student travel behaviour by providing supportive facilities, better transport connectivity, and sustainability-focused initiatives. Promoting these efforts can reduce environmental impacts and contribute to a healthier, more efficient campus environment.

Giovanni Tuveri, et.al. Studied about the daily travel behaviour of university students and examines whether personalized travel plans can encourage the adoption of more sustainable modes of transport. Although young adults today show less interest in owning cars, private vehicles continue to dominate travel patterns in many countries. University students represent a significant commuting population, yet their mobility habits remain underexplored. To address this gap, the research conducted a two-wave panel survey with 50 students from Roma Tre University in Italy. Daily travel patterns were monitored using a smartphone app (IPET), which recorded trips and activities in real time. Between the two survey phases, car-using students received a personalized travel plan offering sustainable alternatives to their usual commute.

The collected data were analyzed in detail through a tour-based approach, classifying each student's travel by purpose, time of day, mode choice, and personal attributes. Results show that private modes remain the preferred option, and a significant share of students' daily tours (25%) were unrelated to study activities—indicating trip chaining that may limit the practicality of public transport. Despite this, about 30% of car users followed the recommendations provided in their personalized plan, demonstrating that informative campaigns can influence behaviour, particularly when supported by real-time travel data.

Overall, the study provides valuable insights for Mobility Managers, highlighting how targeted information and improved public transport services can support more sustainable travel choices among university students.

Nan Zhang et al. studied about This study examines how the COVID-19 pandemic affected local travel behaviour in Hong Kong, using over 570 million smart-card records from the Mass Transit Railway (MTR) between 1 January and 31 March 2020. Because social distancing plays a critical role in reducing virus transmission, understanding changes in daily mobility patterns helps explain how people respond to pandemic risk. The analysis covers different population groups—adults, children, students, and seniors—and compares travel during a non-pandemic week with a peak pandemic week.

Results show a dramatic overall decline in MTR usage, with total local travel volume decreasing by 52.3%. Children and students exhibited the largest reductions (86% and 73%), largely due to school closures. Adults and seniors also significantly reduced travel, though to a lesser extent (42% and 48%). Spatial patterns reveal substantial drops in trips to shopping areas (42%), amusement destinations like Disneyland (81%), and border stations (99%) after travel restrictions were introduced. Regular commuting behaviour became more predictable during the pandemic, and weekend travel decreased more sharply than weekday travel, indicating that residents avoided unnecessary trips.

A key finding is the strong association between COVID-19 transmission and MTR usage: the effective reproduction number (Rt) correlated most strongly with daily MTR travel—especially among children and students—7 to 8 days earlier, suggesting transit data can serve as an early indicator of infection trends.

Overall, the study provides evidence that Hong Kong residents adapted their travel behaviour rapidly during the outbreak, and it highlights the value of smart-card transport data for monitoring mobility changes and predicting disease spread.

Janianton Damanik et al. studied about the travel behaviour between Indonesian Generation Y and Generation Z across the pre-travel, during-travel, and post-travel stages, with particular attention to their use of information and communication technology (ICT). Using an online questionnaire distributed for six weeks, the study gathered 569 valid responses. The data were analyzed using chi-square tests and linear regression to identify generational differences in motives, information sources, booking behaviour, spending patterns, and post-trip actions.

The findings reveal that although both generations share similar core travel motives—primarily relaxation and seeking new experiences—they differ substantially in how they search for information and use technology during their travel cycle. Gen Z, being digital natives, depends more heavily on digital media and online travel agencies for planning, comparing prices, and making bookings. They also share their travel experiences more frequently through platforms such as Instagram, YouTube, and other social media. Gen Y, while still tech-savvy, relies relatively more on word-of-mouth and uses platforms like Facebook. In the pre-travel stage, Gen Z is more price-sensitive and more influenced by travel companions, whereas Gen Y prioritizes service quality and cleanliness, health, safety, and environmental (CHSE) standards. During travel, both generations favor cultural and culinary activities, but Gen Y tends to spend more due to higher income levels. Post-travel behaviour also differs, with Gen Y showing a higher willingness to pay for unique experiences and engaging slightly more in volunteering-related activities.

Overall, the study highlights meaningful generational differences that tourism businesses can use to tailor promotional strategies, product design, and digital marketing. It also reinforces the growing importance of ICT in shaping the travel decisions of younger travelers.

Attiya Haseeb and Raktim Mitra studied about the COVID-19 pandemic influenced the travel behaviour of post-secondary students—representing Generations Y and Z—in the Greater Toronto and Hamilton Area (GTHA) using longitudinal data collected before (2019) and after (2022) the pandemic. By comparing commute mode choices from the same 508 respondents, the study examines

how travel patterns shifted and whether these shifts are associated with socio-demographic factors or life events such as entering the workforce or changing residence. Results show a clear decline in public transit use after the pandemic, with many students shifting to private cars. While 61% used public transit in 2019, only 52% relied on it in 2022; conversely, car use increased from 10% to 25%. Active modes—walking and cycling—also saw reduced retention, marking the lowest continuation rate among all modes. The shift from transit and active modes toward cars was statistically significant.

Socio-demographic characteristics played an important role. Students working more than 20 hours weekly, those living with family, and those with car access had a higher likelihood of shifting to private vehicles. Age differences were also observed, with individuals aged 25–30 showing greater shifts to car use. Life events proved influential: students who completed their education and entered full-time employment were significantly more likely to switch from public transit to driving, suggesting that both pandemic and life-course transitions shaped behaviour.

The study concludes that these travel behaviour changes cannot be attributed solely to the pandemic; rather, they reflect the combined effect of disrupted travel patterns and major personal milestones. The findings highlight the need for post-pandemic transportation policies—such as improved transit services, targeted transit subsidies, and active transportation infrastructure—to prevent long-term reliance on cars among young adults and support environmentally sustainable travel habits.

Jonas De Vos et al. studied about how the COVID-19 pandemic influenced the travel behaviour of post-secondary students—representing Generations Y and Z—in the Greater Toronto and Hamilton Area (GTHA) using longitudinal data collected before (2019) and after (2022) the pandemic. By comparing commute mode choices from the same 508 respondents, the study examines how travel patterns shifted and whether these shifts are associated with socio-demographic factors or life events such as entering the workforce or changing residence. Results show a clear decline in public transit use after the pandemic, with many students shifting to private cars. While 61% used public transit in 2019, only 52% relied on it in 2022; conversely, car use increased from 10% to 25%. Active modes—walking and cycling—also saw reduced retention, marking the lowest continuation rate among all modes. The shift from transit and active modes toward cars was statistically significant.

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3. METHODOLOGY

3.1 General

The Study aims to understand how urban transport has been affected due to the impact of COVID-19. A Survey Form was created using Google Forms to collect the data from the study area. Under the circumstances of the lockdown measures, the online Data Collection method was best Suited. India Imposed lockdown Nationwide on 23rd March 2020.

3.2 Study Area

The study area for the current study is Guru Nanak Dev Engineering College Bidar. Overall strength of Guru Nanak Dev Engineering College bidar is around 3000 with composition of 1634 boys and 1366 girls.

Determination of Sample Size

The population of the study area is 3000. Since the population of the Study area is known, we have used Yamane's formula for calculating the sample size.

Yamane's Formula

$$Sample\ Size\ (N) = \frac{Nt}{1 + Nt * (e)^2}$$

Where,

Nt = Population of the study area

e = level of Precision
N = Sample size

This method was formulated by Statistician Tara Yamane [12] in 1967.This method is widely used for determining the sample size of given population. The margin error ranges from 0.05 to 0.10.

$$Sample\ Size\ (N) = \frac{3000}{1 + 3000 * (0.07)\text{^}2}$$

$$= 191.08$$

$$= 192$$

Data Collection: Questionnaire was prepared in Google Forms and circulated to students for data collection.

3.3 Analytic Hierarchy Process

The analytic hierarchy process (AHP) is a structured technique for organizing and analyzing complex decisions, based on mathematics and psychology.

It was developed by Thomas L. Saaty in the 1970s who partnered with Ernest Forman to develop Expert Choice in 1983, and has been extensively studied and refined since then. It represents an accurate approach for quantifying the weights of decision criteria. Individual experts' experiences are utilized to estimate the relative magnitudes of factors through pair-wise comparisons.

3.3.1 Steps involved in Analytical Hierarchy Process (figure 3.1)

1. Defining the Goal / Objective: In this step the main objective of the analysis is defined for the problem which is to be studied. For example, Buying a Car.
2. Identifying the criteria's: In this step the criteria are identified. For example, Cost, Mileage, Price etc. are the criteria's for selecting a car.
3. Determination of Alternatives: Different alternatives may be possible for solving a given problem. For example, Ford car, Maruti car, Hyundai car etc. these are the alternatives available for buying a car.
4. Data Collection: in this step the Data is collected regarding the importance given to each criteria by the buyer. The importance ranges from 1-9 on scale of relative importance.
5. Data Analysis: In this step the data is analyzed for each criteria for their importance and rank is assigned to each criteria for example price may be given more importance while buying a car.
6. Check for Consistency: In this step the consistency of the process is analyzed. If consistency is less then < 0.1 the analysis is trustworthy. If the consistency > 0.1 then the process is repeated from data collection.

$$\text{Consistency Index (C.I)} = \frac{\lambda max - n}{n-1}$$

$$\text{Consistency Ratio (C.R)} = \frac{consistency\ index}{random\ index}$$

Consistency Ratio (C.R) =consistency index/random index
Where, n is the number of attributes or criteria.

7. Assigning ranks to alternatives: Ranks are assigned based on the criteria importance to each alternative.

AHP evaluations assume that the decision maker is rational, i.e., if A is preferred to B and B is preferred to C, then A is preferred to C.
If the CR is greater than 0.1 the judgments are untrustworthy because they are too close for comfort to randomness and the exercise is valueless or must be repeated.

Table 3.1: Random Index Values corresponding to Number of Attributes

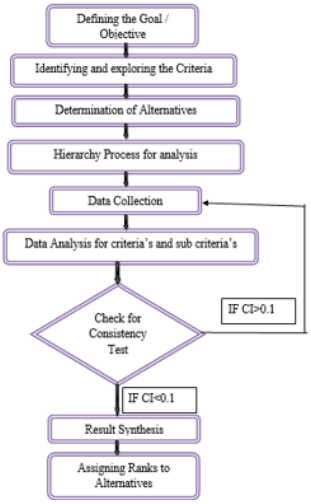
Scale	Numerical Rating	Reciprocal
Extremely Preferred	9	1/9
Very strong to extremely	8	1/8
Very strongly preferred	7	1/7
Strongly to very strongly	6	1/6
Strongly preferred	5	1/5
Moderately to strongly	4	1/4
Moderately preferred	3	1/3
Equally to moderately	2	1/2
Equally preferred	1	1

Table 3.2: Scale of Relative Importance

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

Flowchart for AHP

3.1: Flow Chart for Analytical Hierarchy Process



4. RESULTS:

- After Data Cleaning a total of 239 responses were obtained.
- Determine the relative Importance of different attributes or criteria with respect to the goal.
- Pair-wise comparison matrix is created with help of relative importance

Table 4.1: Reciprocal Matrix of Criteria

ATTRIBUTS OR CRITERIA	GOVERNMENT BUS	COLLEGE BUS	CAR	AUTO	BIKE
GOVT BUS	1.0000	2.4812	2.5858	2.7155	2.5983
COLLEGE BUS	0.4030	1.0000	0.3729	0.3849	0.3776
CAR	0.3867	2.6820	1.0000	0.3830	2.6025
AUTO	0.3683	2.5983	2.6109	1.0000	2.6025
BIKE	0.3849	2.6485	0.3842	0.3842	1.0

Table 4.2: Normalized Matrix

ATTRIBUTS OR CRITERIA	GOVERNMENT BUS	COLLEGE BUS	CAR	AUTO	BIKE
Government Bus	1.0000	2.4812	2.5858	2.7155	2.5983
College Bus	0.4030	1.0000	0.3729	0.3849	0.3776
Car	0.3867	2.6820	1.0000	0.3830	2.6025
Auto	0.3683	2.5983	2.6109	1.0000	2.6025
Bike	0.3849	2.6485	0.3842	0.3842	1.0000
Sum	2.5429	11.4100	6.9538	4.8676	9.1809

Table 4.3: Normalized pairwise Comparison matrix

Attributs Criteria	Govt Bus	Clg Bus	Car	Auto	Bike	Average
Govt Bus	0.3933	0.2175	0.3719	0.5579	0.2830	**0.3647**
Clg Bus	0.1585	0.0876	0.0536	0.0791	0.0411	**0.0840**
Car	0.1521	0.2351	0.1438	0.0787	0.2835	**0.1786**
Auto	0.1448	0.2277	0.3755	0.2054	0.2835	**0.2474**
Bike	0.1513	0.2321	0.0553	0.0789	0.1089	**0.1253**

Table 4.4: Calculating Consistency

Criteria Weights	Govern-ment Bus	College bus	Car	Auto	Bike
Attributes Or Criteria	0.3647	0.0840	0.1786	0.2474	0.1253
Government Bus	0.3647	0.2084	0.4619	0.6718	0.3256
College Bus	0.1470	0.0840	0.0666	0.0952	0.0473
Car	0.1410	0.2253	0.1786	0.0948	0.3261
Auto	0.1343	0.2182	0.4664	0.2474	0.3261
Bike	0.1404	0.2224	0.0686	0.0951	0.1253

Table 4.5: Analytic Hierarchy Process (AHP)

ATTRIBUTES OR CRITERIA	GOVERNMENT BUS	COLLEGE BUS	CAR	AUTO	BIKE	WIEGHTED SUM VALUE	CRITERIA WEIGHT	(λ)
GOVERNMENT BUS	0.3647	0.2084	0.4619	0.6718	0.3256	2.0323	0.3647	5.5728
COLLEGE BUS	0.1470	0.0840	0.0666	0.0952	0.0473	0.4401	0.0840	5.2399
CAR	0.1410	0.2253	0.1786	0.0948	0.3261	0.9658	0.1786	5.4070
AUTO	0.1343	0.2182	0.4664	0.2474	0.3261	1.3924	0.2474	5.6286
BIKE	0.1404	0.2224	0.0686	0.0951	0.1253	0.6518	0.1253	5.2013

$\lambda_{max} = 5.4099$

Consistancy Index (C.I) = (λ_{max} -n) / (n-1)

= 5.4099-5 / 5-1

= 0.1025

Where N is number of attributes

Consistancy Ratio (C.R) = consistency index / random index

= 0.1025 / 1.12

= 0.091 < 0.10 (Standard value)

Table 4.6: Mode Choice using AHP

ATTRIBUTES OR CRITERIA	CRITERIA WEIGHTS	PERCENT SHARE
GOVERNMENT BUS	0.3647	36.47%
COLLEGE BUS	0.0840	8.40%
CAR	0.1786	17.86%
AUTO	0.2474	24.74%
BIKE	0.1253	12.53%

Fig. 3.9: Current Mode Choice

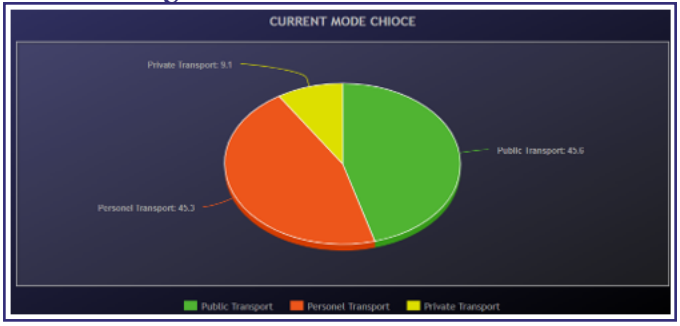


Table 4.7: Mode Choice Comparison

Mode choice	Current Share	Future Share as per AHP
Public Transport	45.60%	36.47%
Private Transport	9.10%	33.14%
Personal Transport	45.30%	30.39%

1. Based on the Analytic Hierarchy Process (AHP) evaluation, Government Bus emerges as the most preferred mode of transport with the highest weight (36.47%). This indicates that students or commuters find it more reliable, economical, and convenient compared to other modes.
2. Auto (24.74%) and Car (17.86%) follow next, showing that a considerable share of users still depend on intermediate and personal modes for flexibility and comfort.
3. College Bus (8.40%) and Bike (12.53%) have lower preference, suggesting limited usage or lower suitability for the criteria considered.

5 DISCUSSION

- Public transport remains the most preferred future mode as per AHP results.
- Personal transport share reduces, showing a shift towards more sustainable options.
- Private transport preference increases slightly due to comfort and flexibility factors.
- Overall, results indicate a future trend favoring improved and efficient public transport.

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