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Thesis title: Factors Explaining Level of Preference for Non-Motorised Travel for Commuting to School: A Case Study of Dehradun City, India

Name: Ashish Kumar Srivastava (644248)

Supervisor: Somesh Sharma

Specialisation: Urban Environment, Sustainability, and Climate Change

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I. Summary

The parent's travel choice regarding their children's school trips is a complex decision-making process that largely depends on the built environment, socioeconomic and psychological factors. Parents' preferences can be divided into non-motorised (active travel) and motorised (passive travel) based on travel choices. Active travel to school (ATS), commonly used for NMT in school trips, is widely studied in the developed world; however, fewer studies were conducted to explore factors determining the NMT in school trips in developing countries, especially India. Thus, the present study provides first-hand information on factors deciding the level of NMT as per actual use and desired preference to continue it in school trips in the tire-II city. The determinants of travel choices and barriers related to non-motorised travel (NMT) in school trips in Dehradun were explored. The cross-sectional study was focused on quantitative data collection through a survey questionnaire and triangularisation of finding through qualitative in-depth interviews and focus group discussion (FGD) of the respondents (parents of the students) based on action planning tools from two public and two private schools.

Results revealed that built environment variables like distance from home to school, number of major crossings on the way, and socioeconomic factors such as gender of the child, the income of the household, and education of father and mother were negatively correlated with the NMT. However, the quality of NMT infrastructure (where present) and school status were correlated positively with the level of NMT. Among the psychological factors, safety from traffic and the presence of stray animals were the significant determinants against NMT. Male students preferred to switch from other modes to NMT more in comparison to female students. NMT is good for health and the environment and a good solution to traffic congestion, but it is a time taking commuting mode, was agreed by most respondents. These determinants were also identified in the interview and FGD. However, respondents from public schools identified the presence of stray animals and financial constraints as determinants of NMT, while private schools FGD recognised unavailability of NMT-friendly infrastructure and having a car as social status after traffic-related issues as inhibitors of NMT. Thus, determinants of NMT were different for respondents of public and private schools, which largely depended on household income and social status in Indian culture. Due to many factors discussed in the thesis, NMT was used in school trips as a compulsion, but respondents prefer electric vehicles in the future in Dehradun.

Keywords: *Active travel to school (ATS), Built-environment factors, Non-motorised transport (NMT), psychological factors, Socioeconomic factors, Travel choices*

II. Acknowledgements

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III. Foreword

The present thesis is focused on sustainable travel choices like walking and cycling, commonly known as non-motorised transport in school trips in India's eco-sensitive city of Dehradun. The analysis is based on the actual level of NMT and the desired preference for it in school trips, especially of the students from classes 6th to 12th in both public and private schools. The study is very relevant because NMT not only provides economic and health-related benefits but also a solution for current traffic congestion in the city. Due to its country-wide famous schools, Dehradun city faces massive traffic jams twice daily. The selection of this topic for the current thesis is based on my personal experience as a parent and professional experience as the District Magistrate of Dehradun, the top administrative position in the district. The methodology involved both quantitative survey and triangulation by qualitative interviews and focus group discussions. An innovative strategy based on Action Planning Principles was adopted to operationalise the FGD. The proposed methodology can be a guiding procedure for other similar cities in India.

The results can be generalised to the population as it involves a sample size of more than the threshold level. The findings suggest that NMT in the city depends on built-environment factors like distance and crossing on the way from home to school and socioeconomic factors like the gender of the child, the income of households, and the education level of both parents. Male and female students have different psychological attributes for the use of NMT. Female students preferred walking, and males liked cycling. Students were willing to use NMT in general but not walking. Interestingly, respondents use NMT not because of physical and environmental benefits but because of financial compulsions. The thesis is the first step to provide a significant amount of data for NMT choices as per current use and desired preference for school trips in Dehradun, which may open new vistas of policy discussion for sustainable travel choices in cities in India.

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VII. List of Abbreviations

ANOVA	Analysis of Variance
ATS	Active Travel to School
CMP	Comprehensive Mobility Plan
FGD	Focus Group Discussion
GGIC	Government Girls Inter College
GIC	Government Inter College
MGB	Model of Goal-Directed Behaviour
MMR	Mumbai Metropolitan Region
MT	Motorised Transport
NAM	Norm Activation Model
NMT	Non-Motorised Transport
SGRR	Sri Guru Ram Rai Inter College
SJA	St Joseph Academy
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action

1. Introduction

1.1 Background and Context

Trips in cities are mainly attributed to travel from home to schools and workplaces and return (Cervero, 2003). Standard modes of travel can be generally classified into motorised (passive) and non-motorised (active) travel. The choice of travel options to school by parents and children depends on their attitude towards different travel modes. Therefore, the attitude toward different modes of choice can be explained through decisions based on parents' and students' current use and preferences of mode. Several studies have shown that parents' attitude is one of the significant factors to decide the mode of travel of their children to school (Helbich, 2017; Huertas-Delgado et al., 2017). Land use patterns, transport and education policies, safety concerns related to traffic and surroundings, built environment, and socioeconomic conditions are contributing factors in their decision ((Fusco, Moola, Faulkner, Buliung, & Richichi, 2012; Kingsly et al., 2020; Reimers, Jekauc, Peterhans, Wagner, & Woll, 2013). The analysis of the attitude of travel choices is more complicated in India than in developed countries due to poor public transport, strict zoning regulation, lack of neighbourhood school concept, and revenue-driven transport policy resulting in more extended trips. Recently, it has been observed that using motorised transport, such as private cars and motorbikes, for school travel has increased due to personal and traffic safety-related issues among parents and children (Oluyomi et al., 2014).

Frequent use of motorised travel has resulted in massive traffic congestion leading to air pollution through vehicular emission (Dirks, Wang, Khan, & Rushton, 2016). Motorised transport is one of the most significant complex contributors to the greenhouse gas emission in the world. Many solutions, such as efficient public transport, encouraging walking and cycling efficient infrastructure, carpooling, etc., have been applied in many cities worldwide (Das, Kalbar, & Velaga, 2021; Lukenge & Siu, 2021). However, Non-motorized transport (NMT) like walking and cycling is one of the most promising and sustainable solutions to this problem, though it is decreasing in many countries (Fusco et al., 2012) especially USA (Kim, Y. & Lee, 2020), United Kingdom (Kelly & Fu, 2014), China (Fan et al., 2018), Spain (Huertas-Delgado et al., 2017) and India (Kingsly et al., 2020).

It is necessary to understand the reasons for decreasing trend of active travel to school (ATS), the commonly used terminology for NMT to school. Most studies have categorized them into (i) reasons related to the built environment, (ii) factors associated with society, like crime rates and the social status of the family, and (ii) threats associated with traffic conditions and road safety. The first reason was investigated in detail in the global north but was not found to be the sole factor determining NMT. The ATS was reduced to less than 10% in 2020 compared to 47.7 % in 1969 (Oluyomi et al., 2014) in the USA, though the country has all the required built environment infrastructure. Similarly, developing countries like Iran have reported the contribution of passive travel to school as high as 60 % (Aliyas, Lak, & Cloutier,

2022). The second factor related to traffic is widely studied and found to be one of the significant reasons, along with the country-specific social considerations contributing to the increasing pattern of use of private vehicles for school trips. As mentioned earlier, it has been studied that emotional perception of children (Ramanathan, O'Brien, Faulkner, & Stone, 2014) and the attitude of parents toward walking and cycling to school (Kingsly et al., 2020; Sirard & Slater, 2008) are the most significant and overarching attributes for NMT. This approach has led to a paradigm shift in research related to sustainable travel choices like NMT for school trips focused on the decision-making of people (Yang & Markowitz, 2012). The attitude toward NMT is mainly dependent on climatic conditions, urban patterns, traffic volume, personal safety, crime rates, distance from school, and unavailability of walkways (Huertas-Delgado et al., 2017; Kelly & Fu, 2014; Oluyomi et al., 2014). Empirical research emphasised that attitude toward NMT (preference for walking and cycling) is the most influencing factor among many studied parameters (Aliyas et al., 2022; Oluyomi et al., 2014).

The literature review suggests that several studies have been done to analyse different factors affecting NMT in school trips and how different interventions related to the built environment, socioeconomic factors, and urban transport planning affect the attitude to adopt NMT in developed countries. However, significantly less is known about factors affecting level of NMT and preference in India. Although, few studies were done in Chennai (Kingsly et al., 2020), Prayagraj (Meena, Tripathi, & Agrawal, 2022), and Rajkot (Mahadevia & Advani, 2016) related to one or the other aspects of ATS. Surprisingly, little emphasis was given to Dehradun, which is considered the school capital of the country, as many famous schools attracting students not only from different parts of India but also from around the world are located there. As per Comprehensive Mobility Plan, trips related to schools are the second major contributor to traffic congestion in the city (UKMRC, 2019) (Figure 1.1).

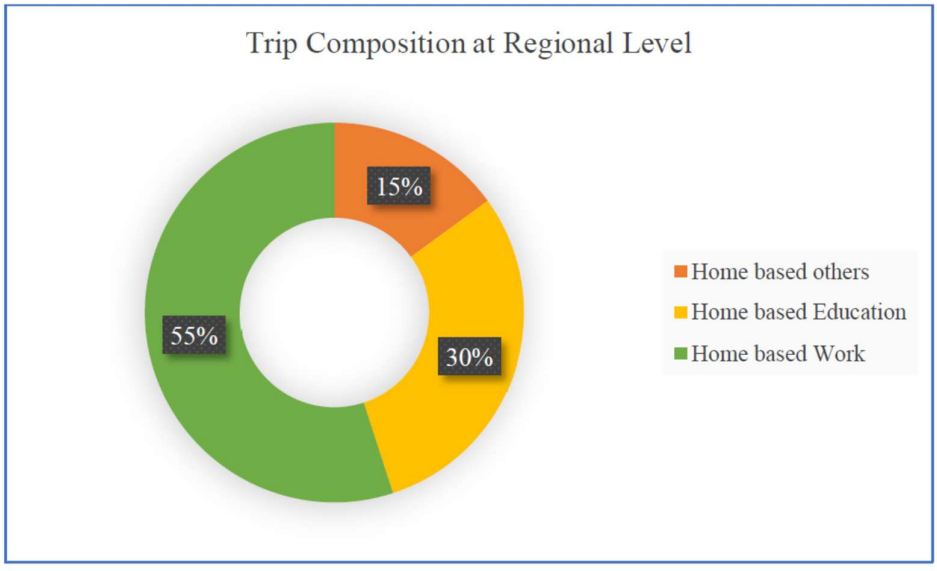


Figure 1.1. *Trip Composition in Dehradun*
(Source CMP, UKMRC 2019)

Dehradun City has taken several steps, like a smart road with a footpath, and implemented ITS in 2021 to improve NMT and reduce vehicular emissions, but problem still persists. The current research will focus on providing empirical evidence on factors affecting parents' choices of NMT for children and how city initiatives are mitigating these factors to increase desired preference to adopt NMT.

1.1.1 Problem Statement

NMT in school trips is reducing in the world, especially in developed countries. India is also not an exception to this problem. The travel choice of students to school largely depends on parents' perception about above-mentioned factors. Due to multiple stakeholders, interdependence on transport policy, education policy, and land use, parents' decision-making about travel choices is complicated. Many children are taken to school by private cars and motorbikes due to perceived safety concerns of parents, and longer trips because of urban sprawl, thus resulting in traffic congestion. However, the perceived safety of parents varies based on the gender of the children, income of household, and the working time of parents (Reimers et al., 2013; Tudor-Locke, Ainsworth, & Popkin, 2001). It is evident from the literature review, that NMT in school trips depends on many factors, such as distance between home and school, availability of footpath and cycle tracks, climate conditions, socioeconomic parameters, crime rates, traffic conditions, and presence of stray animals. Many recent studies, especially in developed countries, have reported that the above factors directly affect parents' preferences, ultimately deciding travel choices for school trips. The decision making for mode choice in school trips is a complex process and depends on combination of these factors (Huertas-Delgado et al., 2017; Kingsly et al., 2020). Existing studies from the global north included decision making of both parents and children, but in India largely parents make decision for children regarding travel to school. Therefore, in-depth critical analysis is required to know about the barrier related to parents' level of preference for NMT in school trips in India. The societal and cultural norms in India demands specific methodology or tool to access the city-specific problems in preferences of sustainable travel choices, especially in school trips.

1.1.2 Relevance of the research topic

There is scanty information available on travel choices in school trips in India, which has the largest population in the world. The travel choices for school trip also depend on social and cultural norms; thus, the finding will add knowledge to the existing academic literature on school-related travel choices, which are mainly pertaining to global north. Given the current mobility infrastructure, NMT is the most sustainable way to address the mobility issue in Indian cities. Additionally, NMT is beneficial for the physical and mental growth of children. Thus, the present study will be relevant to provide a guiding methodology in similar cities like Dehradun to increase NMT in school trips to address both pollution and traffic congestion. The

city governments may use the anticipated recommendations based on the findings of this thesis to provide policy support to increase NMT through relevant interventions.

1.1.3 Research Objectives

The objective of present study is to identify the determinants responsible for preferences of NMT by the parents during school trips as per actual use and desired preference in Dehradun City.

1.1.4 Main research question and research sub-questions

The main question of the present research is

Which factors explain the level of preference of people for non-motorized transport (walking and cycling) in school trips?

Sub questions

1. Which built environment factors explain the actual level and desired preference for NMT in school trips?
2. Which socioeconomic factors explain the choice of NMT by parents?
3. Which psychological factors determine the decision of parents to prefer NMT?

1.2 Structure of the Thesis

To answer the above questions, present thesis is structured in four chapters except for the introduction, viz. literature review, methodology, results and discussion, and conclusion. Literature review includes theories of travel behaviour and factors affecting NMT. Results and discuss provide insight on level of NMT as per actual use and desired preference to continue NMT in future in school trips. Conclusion includes scientific and policy level recommendations.

2. Literature Review

This chapter is focused on the status of research related to travel behaviour and the factors affecting the travel behaviour with special reference to NMT. The chapter is divided into two major sections first evaluation of different theories and conceptual frameworks followed by factors explaining the level of NMT. Finally, the conceptual framework of present study is mentioned.

2.1 Theories of Travel Behaviour and Conceptual Models

2.1.1 Analysis of Existing Theories of Travel Behaviour

Conventionally till the late 1960s, travel behaviour research was based on micro-economic utility-maximisation theory involving the indirect evolution of behaviour based on an individual's attributes. It did not include attitude (Bohte, Maat, & Van Wee, 2009), which is the core of social psychology. Eagly and Chaiken (1993) stated that attitude is " a psychological tendency that is expressed by evaluating a particular entity with some degree of favour and disfavour." Norm Activation Model (NAM) by Schwartz and Howard (1981) was based on moral behaviour and widely used to study eco-friendly travel behaviour like NMT. Further, the theory of Reasoned Action (TRA) postulated that behaviour is a function of rational choices by human beings (Fishbein & Ajzen, 1977).

The most widely used Theory of Planned Behaviour (TPB) by Aizen (1991) involved the effect of attitude on travel choices. The theory emphasises the social-psychological aspect of behaviour and is based on the expectancy-value theory, which is

Expected Value of behaviour = Attribute of a Choice X Effective Evaluation of Attribute (Benefit)

Therefore, TPB is based on three beliefs (i) behavioural outcome resulting in a particular behaviour attitude, (ii) expectation and motivation based on societal norms, and (iii) presence of enabling and restraining factors resulting in perceived behaviour. Many travel behaviour studies are based on TPB but also involve habit in addition to attitude (Gardner & Abraham, 2008). The habit is inversely related to the attitude-behaviour relationship (Van Acker, Van Wee, & Witlox, 2010). However, TPB is denounced for ignoring the "affect" and "desire" of behaviour, which are addressed by the Model of Goal-Directed Behaviour (MGB) by Perugini and Bagozzi (2001) by adding "anticipated behaviour," "past behaviour" and "desire" to TPB. Further, Ronis, Yates and Kirscht (1989) derived the Theory of Repeated Behaviour (TRB), which formulated that initial behaviour results from attitudes and beliefs,

but repeated behaviour becomes a habit, and thus decision-making no longer depends on attitude.

Voluntary Behaviour Change Method was another method used in Australia and Europe to explain travel behaviour. This method motivates people, targets behaviour change, and develops changes that appeal to people. Ampt (2004) defined voluntary change as "change that occurs when individuals make choices for personal reward without a top-down mechanism, regulation of any sort, or a feeling of external compulsion," as shown in Figure 2.1.

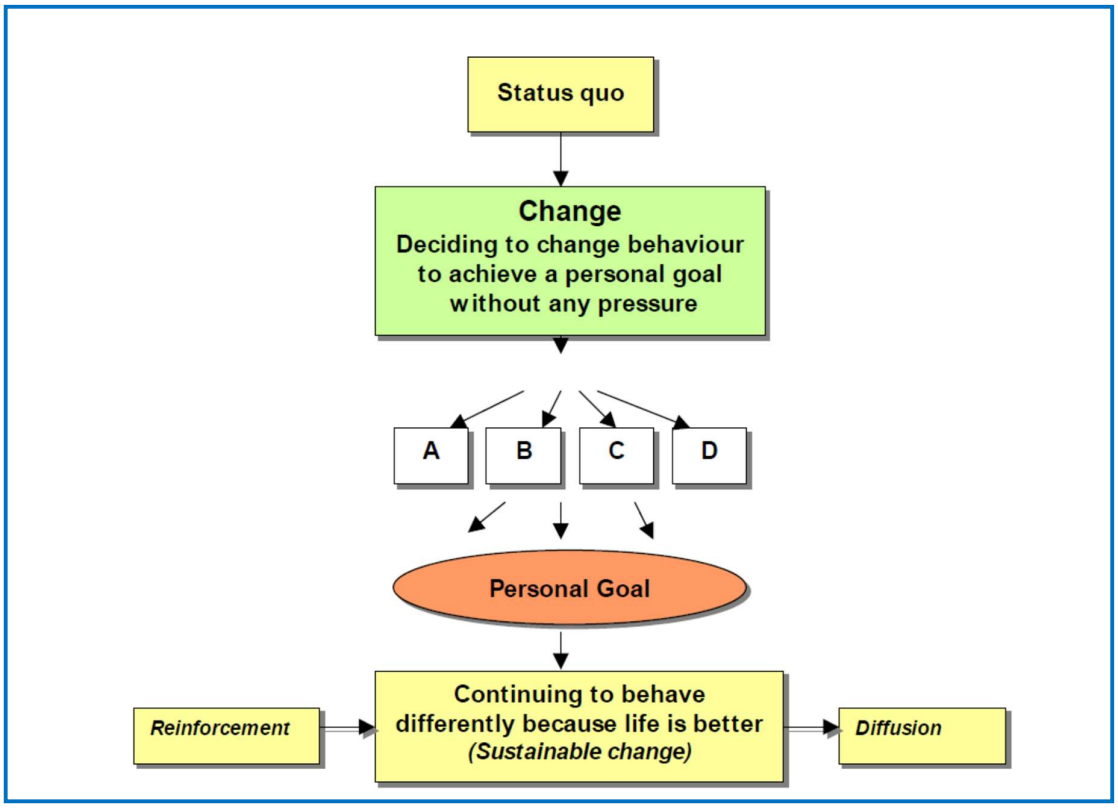


Figure 2.1. *The core process of sustainable voluntary trave behaviour change*
Source: Ampt (2003)

Empirical researches suggest that residential self-selection and its interaction with built-environment and travel behaviour result in different attitudes toward travel choices. Therefore, it is essential to analyse different theories of behaviour explicitly involving attitudes and factors affecting such attitudes to understand the travel choices made by people. Spatial policies like New Urbanisation in the USA and Compact City Policy in Europe are primarily based on the built-environment impact on travel behaviour to impact the attitude toward travel choices. However, many studies have overestimated the influence of built-environment on travel behaviour due to ignorance of residential self-selection (Bohte et al., 2009). Residential self-

selection can be defined as opportunities and constraints of people's residential location, corresponding to their travel choices.

However, both opportunities and constraints are directly linked with socioeconomic variables like household income, and gender of children and psychological variables like societal perception, safety concerns and relationships in neighbourhood. It is vital to include psychological factor “perception” and social factor “habit” to measure travel attitude. Perception includes cognitive belief (outcome) of a behaviour (or alternatives) (Ben-Akiva et al., 2002), and habit can be defined as “situation-specific sequences that are or have become automatic, so that they occur without self-interaction” (Triandis, 1977). Anable (2005) studied travel behaviour in the UK based on TPB. Therefore, for a better understanding of the complex mechanism of behaviour, it is indispensable to include both built-environment-based approaches like transport geography and activity-based approach and social psychology such as TPB. Adjei and Behrens (2012) resented a detailed comparison of different behaviour theories based on how, what, when and response to the behaviour (Figure 2.2).

		Category of theory			
		How are behavioural choices made?	What factors affect choice-making?	When does behavioural change occur?	How do decision-makers respond to behaviour change interventions?
Rational choice theory (including bounded rationality and deficit model)	*(Becker, 1976, Simon, 1957),*	X			
Prospect theory	*(Kahneman and Tversky 1979)*	X			
Habit formation theory	*(Gärling, Fujii and Boe 2001)*	X		X	
Theory of planned behaviour (including theory of reasoned action)	*(Fishbein & Ajzen 1975, Ajzen 1991)*		X		
Theory of interpersonal behaviour	*(Triandis 1977)*	X	X		
Norm activation theory	*(Schwartz 1977)*		X		
Cognitive dissonance theory	*(Festinger 1957)*			X	
Stages of change model	*(Prochaska and DiClemente 1986)*			X	
Self-perception theory	*(Bem 1972)*				X
Goal setting theory	*(Latham and Locke 1991)*				X

Figure 2.2. *Comparison of different behaviour theories and their categories based on aspects of behaviour*
Source: Adjei & Behrens (2012)

2.1.2 Evaluation of Existing Conceptual Frameworks

Van Acker et al. (2010) proposed a conceptual model for travel behaviour (Figure 2.3), which included the customary theories of transport geography along with "lifestyle",

"perception," "attitudes," and "preferences". All terminologies except "lifestyle" are defined above in this section. As per van Acker et al. (2010) lifestyle can be defined as "individual's opinions and orientations toward general themes such as family, work, and leisure orientations".

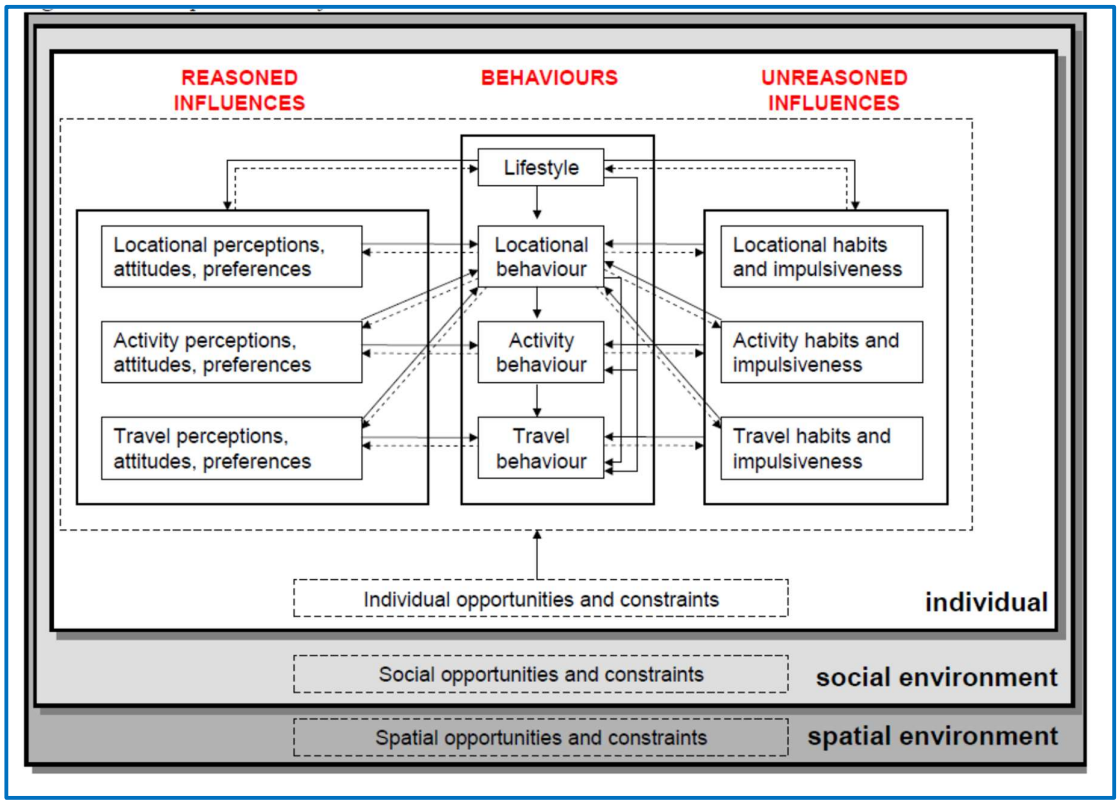


Figure 2.3. *Conceptual framework of van Acker et al. (2010)*
The lines depict the influence and dotted lines refer to the feedback mechanism. Source: van Acker et al. (2010)

Aliyas et al. (2022) used the children's school travel behaviour model, a comprehensive decision-making model for school travel (Figure 2.4). The model consists of built environment, socioeconomic and psychological factors deciding the travel behaviour for school trips.

The conceptual framework of Rahman, Moore, Smith, Leiswyn, and Mandic (2020) has mainly identified built environment and traffic safety factors to be considered to promote NMT (Figure 2.5). They have identified psychological factors as mediating factors and urban forms, including natural and built environments, as the main NMT influencing factors.

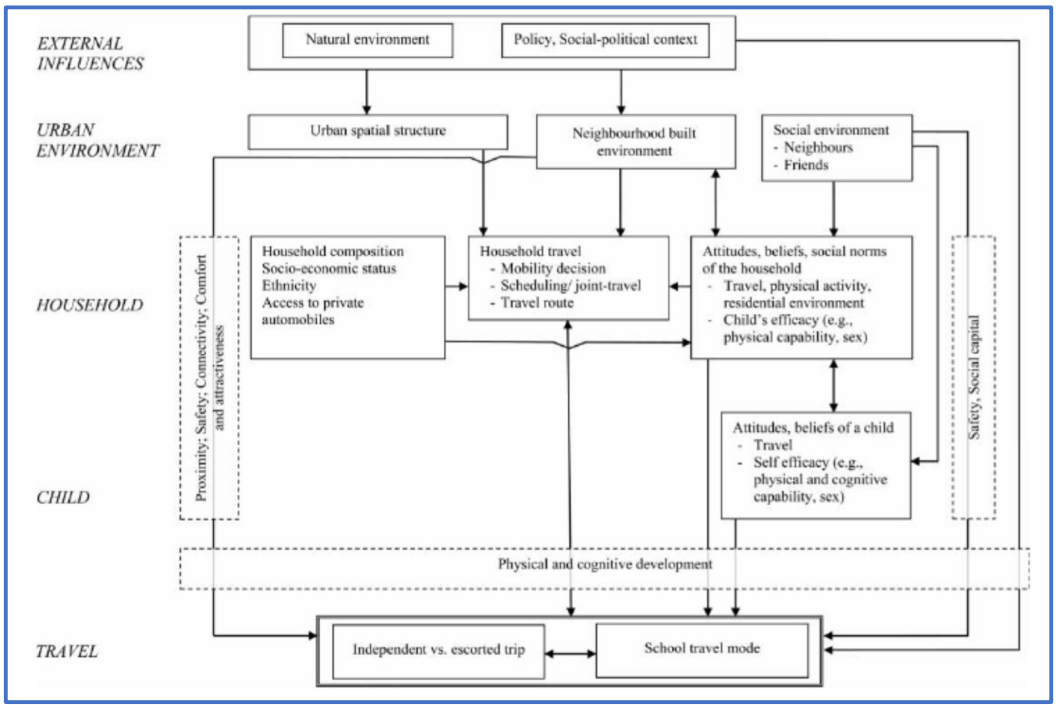


Figure 2.4. *Children's school travel behaviour model used by Aliyas et al. (2022)*
Source: Aliyas et al. (2022)

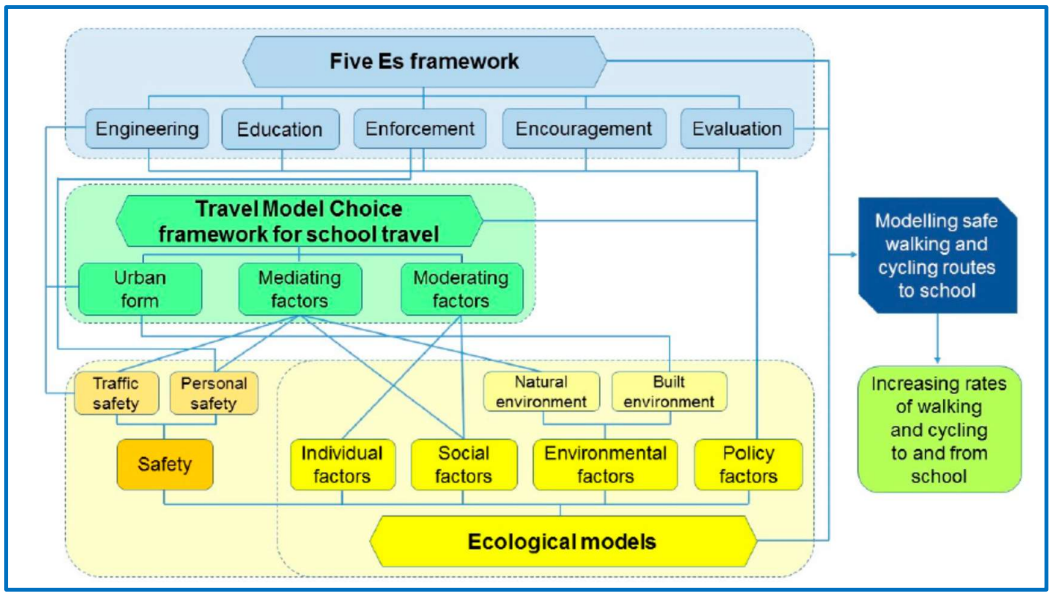


Figure 2.5. *Conceptual framework for modelling safe walking and cycling routes*
Source Rehman et al. (2020)

Further, Pont, Ziviani, Wadley, and Abbott (2011) also proposed the model of children's active travel (M-CAT) to explore children's active travel (Figure 2.6). This model included the environment, perception, and decision of parents and children regarding active travel.

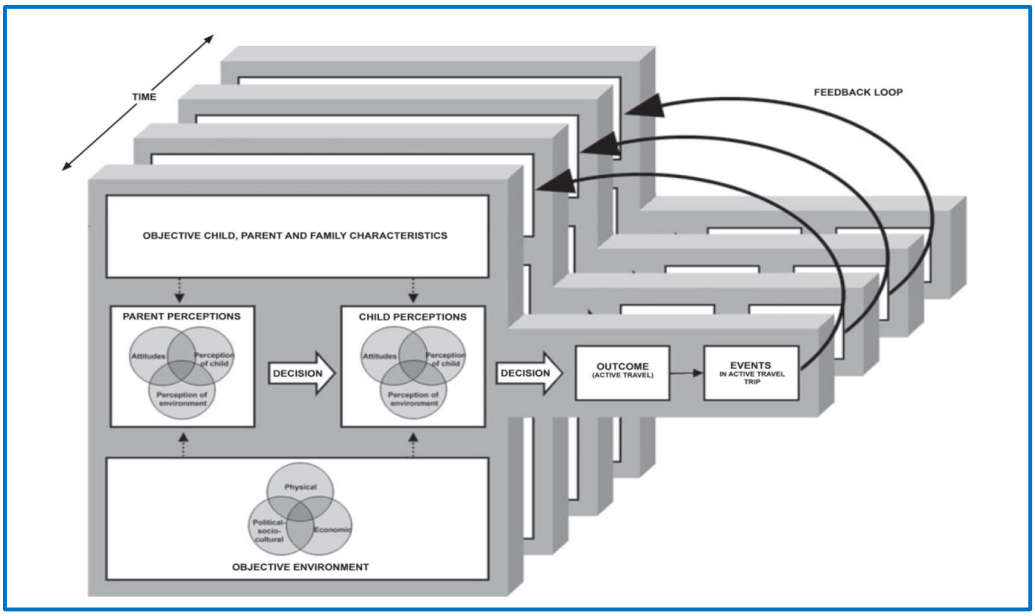


***Figure 2.6**. M-CAT conceptual framework proposed by Pont et al. (2011)*
Source: Pont et al. (2011)

The existing frameworks identified the importance of built-environment, socioeconomic, and psychological factors in some form. However, psychological indicators like perception and preferences were given special attention in the light of social psychology. Since the present thesis is focused on factors explaining the level of NMT in school trips, above mentioned three factors are discussed in detail.

2.2 Introduction to NMT

Non-motorised transport is generally defined as walking or cycling. According to Ravishankar and Sharma (2021) NMT has many environmental, social, and economic benefits. Equitable accessibility, improved physical and mental health of children, better public transit, high road safety, and aesthetic are some of the social benefits of NMT. The economic benefits like urban regeneration, affordability, less medical expenses due to improved mental and physical health, and cost-effective trips because of reduced dependency on fuel, less carbon emission, and low traffic congestion leading to reduced air and noise pollution, resulting in sustainable development. However, as urbanisation increases, the walkability in the cities decreases (Fan et al., 2018) due to urban sprawl and economic growth. Most of the studies on active travel include both walking and cycling jointly; however, it has been observed that walking is ordinary in many countries like Australia (Leslie, Kremer, Toumbourou, & Williams, 2010), Canada (Larsen et al., 2009), Ireland (Murtagh, Dempster, & Murphy, 2016),

New Zealand (Mandic et al., 2017), Spain (Chillón et al., 2009), and United States (McDonald, 2007). Cycling is a preference over walking in countries having flat topography like Belgium (Van Dyck, De Bourdeaudhuij, Cardon, & Deforche, 2010), Denmark (Cooper et al., 2006), and The Netherlands (Helbich, 2017).

Active travel to school (ATS) is an excellent alternative to physical activities, including outdoor exercise (Kingsly et al., 2020). Many governments are now focusing on increasing ATS to mitigate the challenges of obesity in children (Davison, Werder, & Lawson, 2008; Faulkner, Buliung, Flora, & Fusco, 2009; Fusco et al., 2012) and cardiovascular risk factors (Timperio et al., 2006). The "Safe Routes to School" Programme has been implemented in Europe, Canada, the USA, and Australia (Tudor-Locke et al., 2001). Another such programme is "Walking School Buses," where parents are volunteers and engaged on a rotation basis to escort children to school from a joint meeting point, generally the bus stop. There are empirical-evidences that children who walk or cycle are more active than those who use motorised transport (Martin, Kelly, Boyle, Corlett, & Reilly, 2016; Tetali, Edwards, & Roberts, 2016).

In the classical study, Rapoport (1987) proposed that people travelling in motorised vehicle experience less of a travel environment than those who walk and cycle. Thus, the interaction between mobility, especially ATS, the environment, and people, is crucial to promote sensitivity towards the environment as "seeds of estrangement" (Kahn Jr, 2002) can be planted in childhood. ATS also promotes social interaction among children and awareness of cultural geography (Fusco et al., 2012). In addition to children's physical fitness, NMT also reduces greenhouse gas emissions from vehicles (Sims et al., 2014) and thus can be proven as a promising solution to mitigate climate change effects (Mandic et al., 2017).

2.3 Current Scenario of Level of NMT in School Trips

Carlson et al. (2014) reported that only 10-25% of middle school students use active modes of travel in the USA. Walking to school by children has been reduced by 20% in the United Kingdom from 1970 to 1991 (Tudor-Locke et al., 2001). Surprisingly, almost 60% of primary school student travel by car in Ireland, which is more than in the United Kingdom (42%) and the USA (47.5%) (Kelly & Fu, 2014). In Australia, active travel to school has declined from 58% in 1971 to 35% in 2008 (Schoeppe, Duncan, Badland, Oliver, & Browne, 2015); however, travel by car has increased from 23% to 67% (Van der Ploeg, Hidde P, Merom, Corpuz, & Bauman, 2008). In contrast, walking to school is almost constant in New Zealand, which was 26% in 1989 and slightly increased to 28% in 2010-2014, but cycling to school reduced from 19% to 3% in the same period (Ministry of Transport, 2015). The ATS level was found to be higher in German-speaking regions than in French and Italian-speaking regions in Switzerland (Bringolf-Isler et al., 2008). Reimers et al. (2013) reported that 60% of adolescents in Germany use motorised transport to school. In India, ATS in cities varies from 23% in Coimbatore (Schoeppe et al., 2015) to 65% in Chennai (Shridhar et al., 2016). However, among adolescents, ATS is only 23.5% and 28.1% of the school in Chennai (Kingsly et al., 2020) every day a week. As per an estimate, NMT will generally reduce to 23.3% in 2050 compared to

44.7% in 2018 in Mumbai Metropolitan Region (MMR) (Das, Kalbar, & Velaga, 2022). Thus, level of NMT is decreasing world over, but the reasons might be different depending on local culture and society norms related to safety, age and gender.

2.4 Factors Affecting the Level of NMT in School Trips

In order to improve active travel to school, it is essential to understand people's decision-making process. Such decision-making depends on physical factors like the built environment and socioeconomic and psychological factors like attitude, preferences, and willingness to change. Recent studies have suggested that psychological factors play a crucial role and have more impact on travel decision in addition to the built environment and socioeconomic factors in school trips (Kim, Y. & Lee, 2020; Yang & Markowitz, 2012). The psychological factors directly reflect the behavioural attitude, like the willingness or non-willingness to do any given activity. Kingsly et al. (2020) and Sirard & Slater (2008) have reported that parental perception is most important in deciding on travel mode for children. However, children also perceive through household conversation (Sirard & Slater, 2008). Thus, a better understanding of parents' complex decision-making process related to travel choices is inevitable (Helbich, 2017; Huertas-Delgado et al., 2017; Mitra, 2013). The following subheadings will discuss all three main factors separately.

2.4.1 Built Environment Factors

These factors include man-made infrastructure such as footpaths, cycle tracks, distance, land use, etc., and natural attributes like weather, green spaces, landscape, etc. In the USA, it has been observed that distance is the most influential factor in deciding travel choices (Oluyomi et al., 2014), which largely depends on land use, education policy, and environmental factors (Lee, Zhu, Yoon, & Varni, 2013). The perceived and actual distance to school also plays an essential role in deciding travel choices.; for example, the children who live closer to school perceive fewer barriers in ATS in the USA (Carlson et al., 2014). Kelly and Fu (2020) reported a 2 KM critical barrier for deciding on ATS or motorised transport to the school in Dublin. Students staying more than 2 KM away from the school generally travelled by car. However, Hatamzadeh, Habibian, and Khodaii (2017) observed that 0.25 miles (0.40 KM) are the critical distance between school and home for walking preference by students in Iran, which reduced by 14.8% among boys and 10.5% in girls if the distance is increased by 0.5 miles. Salmon, Salmon, Crawford, Hume, and Timperio (2007) have recommended that children should be admitted to schools within walking distance to promote ATS vis-à-vis a healthy lifestyle.

In absence of neighbourhood school policy, distance becomes a secondary consideration due to the reputation of schools, which is decided based on the use of technology in teaching, physical and extracurricular facilities, security, and building (Meena et al., 2022). This school-related perception contributes to longer trips to school and negatively impacts ATS (Kingsly et

al., 2020). Parents generally tend to choose better academically rated schools without considering the distance from the home. Furthermore, urbanisation has resulted in urban sprawl resulting in longer distances between home and school. The decrease in NMT is mainly due to longer distances being travelled at least twice daily.

Besides distance, dangerous road crossings and high traffic volume are also perceived as important factors affecting travel choices (Oluyomi et al., 2014). It has been observed that the lack of association between infrastructure and ATS leads to more traffic on roads; thus, it requires awareness and capacity building of both government agencies and school commuters (Fusco et al., 2012). The absence of major road crossings, availability of footpaths, and bike infrastructure were positively associated with the ATS in the Netherlands (Helbich et al., 2016; Helbich, 2017). They further found that urban forms like mixed land use and well-connected street patterns in cities encourage walking and cycling among the children by increasing the route choice and accessibility to the school. However, there is still a difference of opinion about the relationship between urban forms and the level of ATS in children (Helbich, 2017; Loon & Frank, 2011; Mitra, 2013).

Weather conditions also impact travel choices. The cold and wet weather in New Zealand was found to affect adolescent travel negatively (Mandic et al., 2017). An urban design like green spaces during walking, the presence of tree cover, pedestrian-friendly street design, traffic light-assisted crossings, etc., also significantly impact deciding the mode of travel to school (Timperio et al., 2006).

In India, the NMT infrastructure was found less in the Tire I cities (Megacities) in comparison to Tier III cities (smaller cities) (Guttikunda & Jawahar, 2012), which may be because NMT infrastructure available are not able to match the demand of population in megacities (Das et al., 2021). Verma, Harsha, and Subramanian (2021) have recommended moving away from supply-centric policies to policies promoting NMT and restraining the use of private vehicles.

2.4.2 Socioeconomic Factors

Gender, family income, parental education level, ethnicity, and residential status are the determinants of socioeconomic factors (Reimers et al., 2013). Many studies have suggested that active travel to school is not gender neutral as boys take more ATS than girls who prefer bus or private cars (Guliani, Mitra, Buliung, Larsen, & Faulkner, 2015; Johnson, Brusseau, Darst, Kulinna, & White-Taylor, 2010; Marten & Olds, 2004; McDonald, 2008; McDonald, 2012; McMillan, Day, Boarnet, Alfonzo, & Anderson, 2006). In contrast, other studies found no significant gender specificity in ATS (Bopp, Kaczynski, & Besenyi, 2012; Ermagun & Samimi, 2012; Wilson, Marshall, Wilson, & Krizek, 2010) . It has been reported that boys cycle more than girls, and girls walk more than boys in Chennai, India (Kingsly et al., 2020). Other studies also suggest a similar pattern of girl's preference for walking and boys for cycling (Bere, van der Horst, Oenema, Prins, & Brug, 2008; Chillón et al., 2011; Nelson, Foley, O'gorman, Moyna, & Woods, 2008; Timperio et al., 2006). Hatamzadeh et al. (2017) reported that the

travel choices among males and females differ due to cultural factors in Iran. Even boys in primary and middle school walk to school less than high school boys in Iran. Huertas-Delgado et al. (2017) found that the perception of crime on the street was a significant factor impacting NMT among girls' parents more than boys.

Huertas-Delgado et al. (2017) also reported that the perceived barriers to NMT by parents change with the age of their children, as traffic volume was a common barrier among the parents of children, and distance was ranked highest by parents of adolescents; however, both groups reported dangerous intersections as another barrier. The parents of an adolescent girl perceive more traffic safety concerns, especially traffic speed, volume, and intersections in New Zealand (Esteban-Cornejo et al., 2016), leading to less social support for cycling over walking in Dunedin, New Zealand (Mandic et al., 2017).

Students from families with high socioeconomic status avoid NMT in the USA (Oluyomi et al., 2014). Private cars and carpooling are as high as 34.5% and 26.2%, respectively, in school trips in Iran (Aliyas et al., 2022). Family income and migration background correlate with active school travel in Germany (Reimers et al., 2013). In addition, Mitchell, Kearns, and Collins (2007) have reported that low socioeconomic neighbourhoods have high safety concerns because children of such families use NMT more frequently. Kim and Lee (2020) also report a similar finding, as the low socioeconomic neighbourhood has a high prevalence of crime and accidents due to fewer sidewalks. Interestingly, Timperio et al. (2006) have explained that children of the family having a car and going to private schools do not walk or cycle to school in the USA. In contrast, they found that children living in a neighbourhood with many children tend to walk or cycle to school more due to company.

Carpooling and school buses are significant modes of travel to school; however, the success of both modes depends on initiative, community initiative, and cooperation (Kelly & Fu, 2014). However, the route rationalisation and pick-up point optimisation still need to be improved in school bus service (Kim, B., Kim, & Park, 2012). Parents' actual and perceived traffic-related safety in local areas play a significant role in deciding travel choices, suggesting that social norms and neighbourhood culture are significant (Nevelsteen, Steenberghen, Van Rompaey, & Uyttersprot, 2012).

Children of both working parents are less likely to walk (Aliyas et al., 2022). McDonald (2008) has reported that NMT of the child is negatively related to the mother's commute for work in the morning, however, it is not reacted with the father's travel for work in the morning. Race et al. (2017) reported that the inflexible work schedule of parents is negatively related to ATS in Canada. Children of a household having car are less likely to walk or cycle to school (Mackett, 2011; Wilson et al., 2010). A decreasing trend of active travel is also due to increased car affordability by middle-class families, contributing a significant percentage in India (Das et al., 2022; Verma et al., 2021).

2.4.3 Psychological Factors

Safety concerns related to NMT can be divided into road safety comprised of traffic safety concerning walking and cycling and personal safety attributed to crime and stray animals-related parameters. Parents' safety perception is more influential in deciding travel choices than student perception (Huertas-Delgado et al., 2017). Studies have shown that road safety determinants are more related to active travel than those related to personal safety.

Lack of active travel in parents is one of the most critical barriers to NMT by their children (Carlson et al., 2014). Kim and Lee (2020) have proposed four attitudinal factors of parents (a) it is good exercise, (ii) its daily routine, (iii) enjoy walking with a child, and (iv) my family and friends like the idea of walking. The presence of traffic police/warden to help students to cross busy roads and speed restrictions in school zone have a positive influence on NMT; however, children may face heavy traffic near home, which may require safe road crossing training for the students (Timperio et al., 2006). Meena et al. (2022) assessed that regulating vehicle speed limits during school opening and closing time positively relates to ATS. Based on the spatiotemporal analysis, Hensher (1998) suggested that exposure to injury during school commuting is the highest risk. Kingham, Sabel, and Bartie (2011) also reported increased crash rates during school hours leading to safety concerns. Traffic-related safety concerns also depend on the quality and prevalence of ATS-supportive infrastructure in the USA (Kim, Y. & Lee, 2020). However, they are not significantly related to ATS in the Netherlands due to the omnipresent sidewalks and cycle tracks (Helbich, 2017). Interestingly, Mandic et al. (2017) have found that the safety concerns of the parents are different for walking and cycling in Dunedin, New Zealand, leading to a preference for walking over cycling.

Crime prevalence was a crucial factor related to parents' perception of children using active travel to school in Spain (Huertas-Delgado et al., 2017). The study further revealed that the parents of passive commuting children are more perceived barriers in NMT than children using active modes of travel. Race et al. (2017) found that safety concerns related to bike theft, vandalism, and abduction by bad people were common safety-related concerns among children related to NMT in Vancouver, Canada. According to Milam, Furr-Holden, Cooley-Strickland, Bradshaw, and Leaf (2014), parents also felt insecure in the presence of alcohol and tobacco outlets and illicit drugs around the school. Thus, they do not allow children to walk or cycle on their own.

Parents' perception of the ability of the child to walk independently also plays a crucial role in deciding travel choices (Bennetts et al., 2018). However, Frömel et al. (2020) have reported that walking and cycling are associated with greater autonomy, personal freedom, and self-confidence in children leading to positive emotions and awareness in adulthood. Ramanathan et al. (2014) have shown that positive emotions of students promote walking to school. Romero (2015) found that the street patterns' effectiveness, safety concerns, and perception related to traffic are different for both parents and children in Sydney, Australia. Further, recreational activities like playgrounds, swimming pools, libraries, etc., and retail activities like shops, café, food courts, etc., also play a significant role in travel mode choices by children (Hume et al., 2009).

2.5 Policy Requirement for NMT

It is evident that governmental policy is critical to promote walkability in the cities (Fan et al. 2018). However, policymaking related to NMT at the city, regional, state, or national level rarely considers the experience and perception of commuters and parents and children (Fusco et al., 2012). Policymakers must make school trip-specific policies and child-friendly commuting infrastructure (Faulkner et al., 2009). Kim and Lee (2020) concluded that it is easier to mitigate environmental barriers than socioeconomic and policy-related barriers. Thus, to increase NMT, it is crucial that policies should focus on the safety concerns of parents related to environmental concerns. Huertas-Delgado et al. (2017) recommended improving the parental perception towards ATS to promote walking or cycling to school by mitigating the barriers.

2.6 Gap in Existing Research

A critical perusal of existing literature suggests that the ATS has been studied worldwide, especially in developed countries. However, more is needed to know about the factors underpinning the NMT choices of the parents for school travel in India. Few studies used the GIS-based assessment of students' travel behaviour in India. The societal norms related to NMT and cars and psychological factors related to the safety of children affecting parents' decision-making are unexplored in the Indian context. In addition, the comparison of experience and perception of parents related to children's school travel in India is also still being determined. Therefore, the current study will focus on (1) factors affecting the choice of parents for the travel mode of children to school, (2) factors affecting the NMT in travel to school, and (3) parental experience and preference related to NMT in children.

2.7 Conceptual Framework

Based on the literature review, it was found that social psychological theories like TPB (Aizen, 1991), NAM (Schwartz & Howard, 1981), and TRA (Fishbein, 1980) and built environment based residential self-selection (Bohte et al. 2009) are equally important to understand the complex travel behaviour. Therefore, the conceptual framework proposed by van Acker et al. (2010) and Aliyas et al. (2022) were found most suitable for the present study. There are many variables related to the built environment, socioeconomic and psychological factors determine the parents' attitude, which finally lead to travel choices (Figure 2.7). It is pertinent to mention that not a single factor but a combination of these factors contributes to parents' final decision, especially for school-going children in Indian culture (Kingsly et al., 2020). Thus, cultural aspects of India, especially school status (decided by household income

and considered as status of family in society) and gender (female students are more vulnerable to crime) demands some modification in the indicators adopted in conceptual frameworks mentioned above. Further, the conceptual framework was used for level of NMT as per actual use and desired preference for NMT in present study. The dependent variable preference for level of NMT includes actual use and desired preference for NMT. Thus, present conceptual framework was applied in two scenario actual use of NMT and desired preference of NMT. Since NMT includes walking and cycling, both scenarios were applied separately for walking and cycling as well.

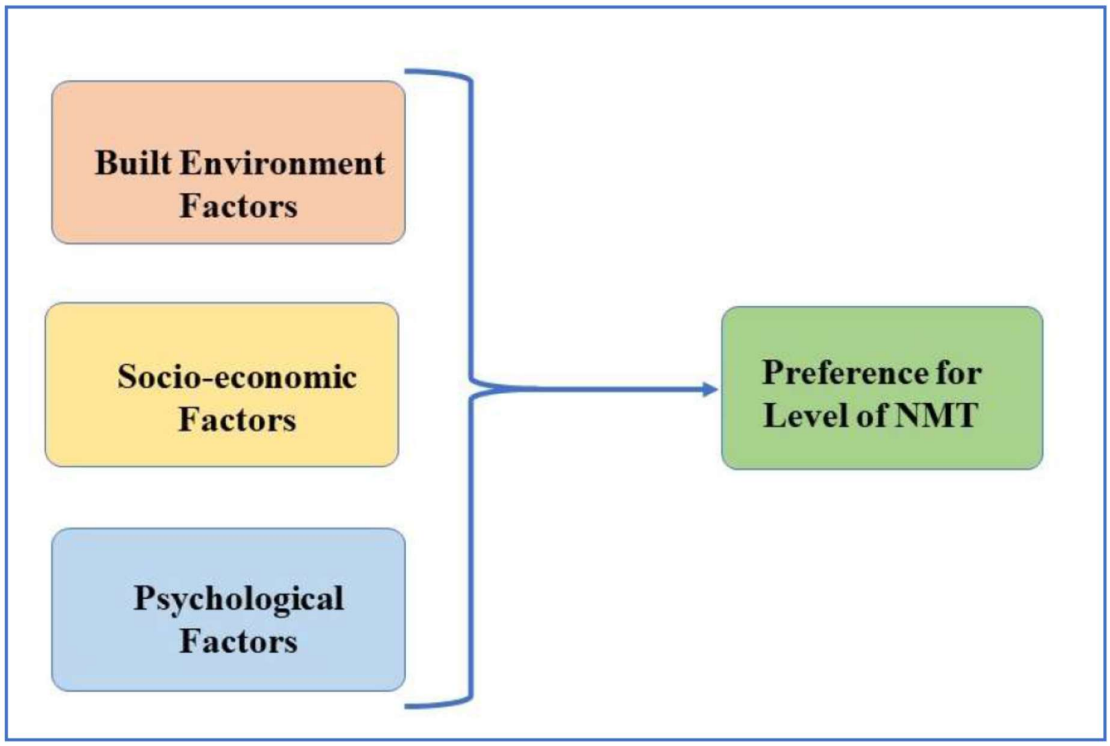


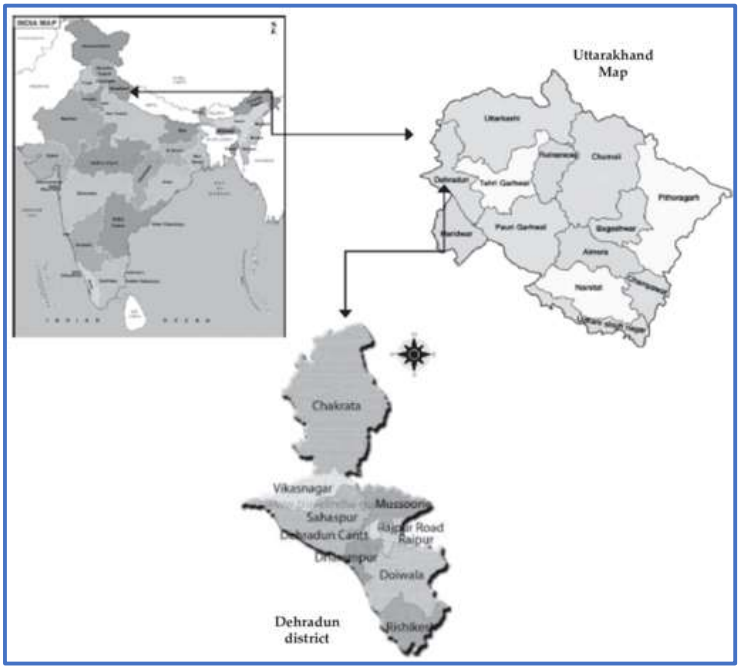
Figure 2.7. *Conceptual framework of the present research depicting independent and dependent variables*

3. Research Design and Methodology

3.1 Introducing Dehradun – locus and focus of research

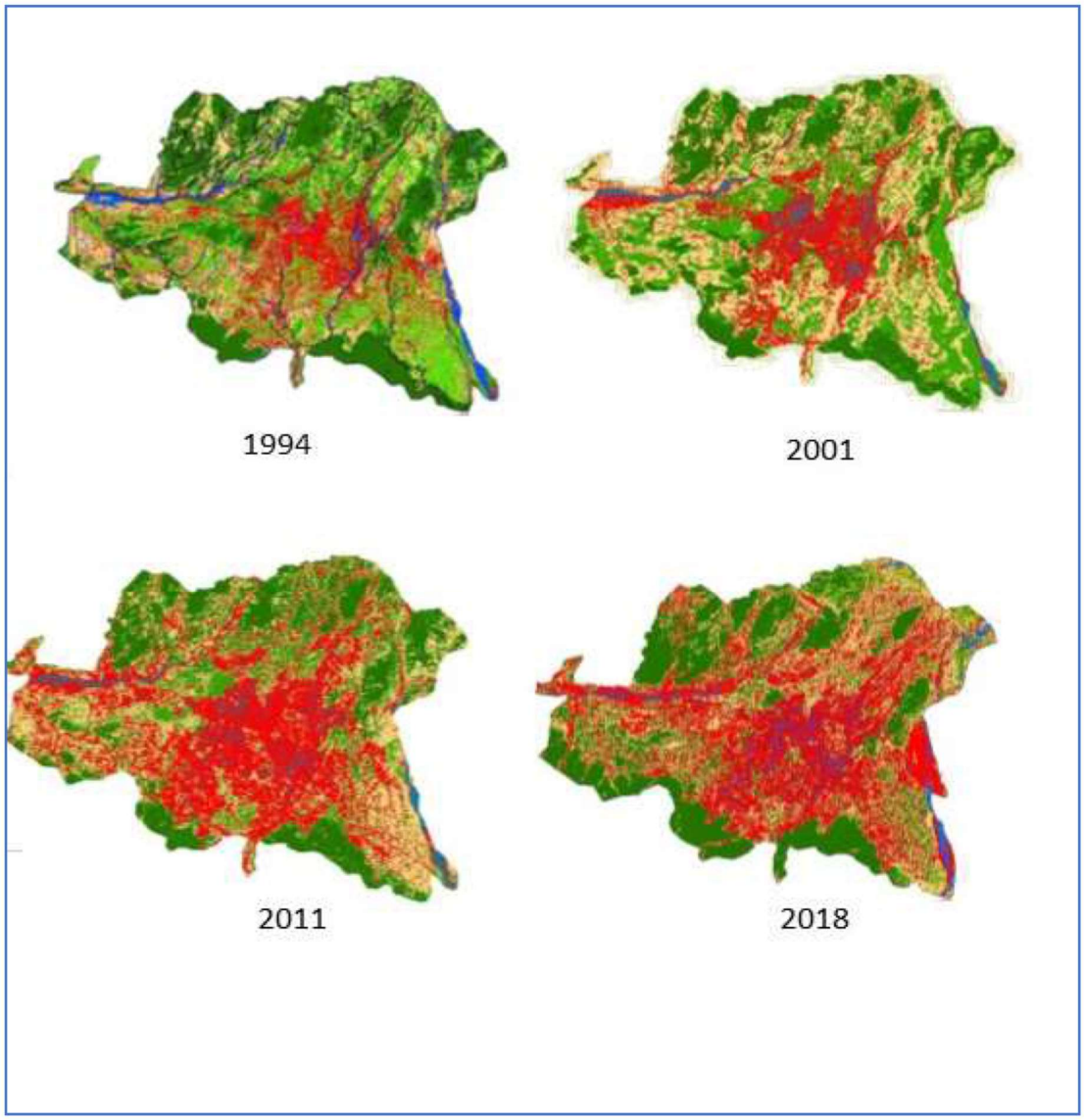
For the present study, Dehradun City was selected to collect the data. It is situated in the Doon Valley of the Shivalik range, which is an eco-sensitive zone declared by the Government of India in 1989, resulting in various restrictions on developmental activities. Dehradun became capital of the Himalayan state of Uttarakhand in India (Figure 3.1) in 2000 resulting in massive increase in population due to migration. The population of Dehradun city increased from 426,000 in 2001 to 574,840 in 2011 (Census of India, 2011), and a projected population 784,000 at present (https://www.census2011.co.in/census/city/23-dehradun.html). Urban sprawl due to rapid growth has resulted in longer trips related to work and school.

Figure 3.1. *Location of the research area Dehradun in India*



The master plan of the city also failed to stop unplanned growth (Figure 3.2). Further, the city is considered as school capital of the country due to the presence of top schools in the country. The British established many schools here before India's Independence. Dehradun not only attracts students from different parts of India but also from other countries. Population growth in city demanded more school in first two decades of 21st century. The city has 85 schools, of which 29 are public, and 56 are private. A total of 43,246 students were enrolled in classes 06th to 12th in these schools in the academic year 2022-23. The total number of boys and girls was 22,701 and 20,545 respectively (Department of School Education, Government of Uttarakhand, personal communication on May 05, 2023). Augmentation of

public infrastructure especially roads, footpaths and public transport did not match the growth rate of population resulting in increased private vehicles use for commute. Almost 62% roads in Dehradun do not have footpath, complete lack of dedicated cycle tracks and pedestrian friendly road crossing making the city unfriendly for ATS (Figure 3.3). These factors collectively pose a threat to NMT users especially students (Photos 3.1 and 3.2).



Red colour denotes the built-up area of city. (Courtesy Mussoorie Dehradun Development Authority, Personal Communication).

Figure 3.2. *GIS maps showing growth of city from 1994-2018*

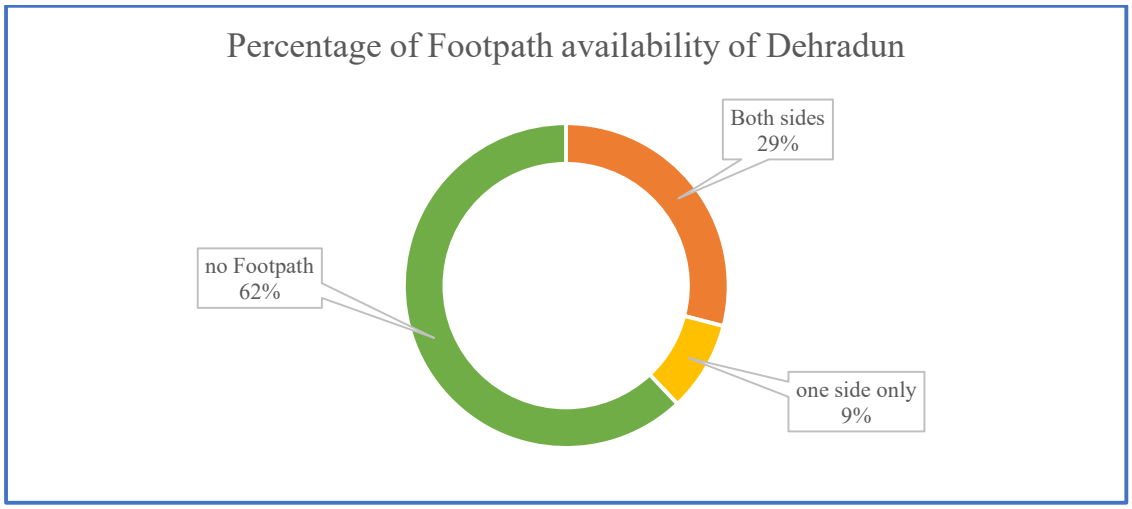


Figure 3.3. *Percentage of footpath availability in Dehradun City*

(A) Rickshaw taking children more than the capacity, (B) Motorised three-wheeler, (C) walking on dedicated and graded footpath, and (D) cycling on common path without proper demarcated lane. (Courtesy Dehradun Smart City)

Photograph 3.1. *Different aspects of travel to school*

(A) Demarked road crossing without zebra crossing, (B) Bus stop without dedicated lane, (C) and (D) students crossing road amidst of running traffic showing the threat, and (E) Footpath blocked by the commercial signage making it inaccessible. (Courtesy Dehradun Smart City, Personal Communication).

Photograph 3.2. *Traffic scenario in Dehradun and current position of road safety*

3.2 Operationalisation of Conceptual Framework

The conceptual framework was operationalised through different indicators of all three independent variables: Built Environment, Socioeconomic, and Psychological Factors. Based on the literature review findings, the independent variables were converted into measurable indicators. The definition of each indicator, its value, and its unit of measurement were decided and compiled (Table 3.1).

Table 3.1. *Operationalisaton table showing different variables and respective indicators*

Variable	Indicators	Definition	Values	Unit	Source
A. Mode of travel choices					
Level of NMT	Use of non-motorised transport	Active mode of travel like walking and cycling	Walking (Yes or no) Cycling (Yes or no)	Number of respondents	Kelly & Fu (2014)
	Use of other than non-motorised transport	By car, two-wheeler or public transport	Yes or no	Number of respondents	
	Preferences about travel modes	Priorities of different modes of travel to school by parents based on frequency/ month	Prioritisation from 1 (top) to 13 (least) as per actual use and desired preference	Absolute number-based score calculation	NA
	Willingness for walking or cycling by those who are using MT at present	Likelihood to continue /switch from MT to NMT	Measured on five-point Likert scales, ranging from 0 'not willing' to 5 'agreed to change'.	Number of respondents	N.A.
B. Barriers to NMT					
1. Built environment factors	a. Distance travelled to reach school	The distance required to travel from home to school in kilometres	0-1 KM 1-2 KM 2-3 KM 3-4 KM 4-5 KM > 5 KM	Kilometre	Kelly & Fu (2014)
	b. Major traffic crossing in the route	Number of crossings of major district roads	In term of absolute number like 0, 1, 2, 3 …….	Absolute numbers	Oluyomi et al. (2014)
	c. Alternate route to the	If any alternate	Yes or no	NA	Kingsly et al. (2020)

	school is available	street or road is available to avoid major crossings			
	d. NMT-friendly infrastructure is available	Availability of good quality footpaths, cycle track, and pedestrian-friendly crossings	Yes or no	NA	Oluyomi et al. (2014)
2. Socioeconomic factors, including demography	a. Gender of child	Male, female, or other	Male = a Female = b Other = c	Number of Children	Bringolf-Isler et al. (2008)
	b. Occupation of parents	Whether parents are in service or in business	Government service = a Private service = b Self-employed/ Business = c	Number of respondents	Aliyas et al. (2022)
	c. Both parents are working	Father and mother both have to go to work place	Yes or no	Number of respondents	Aliyas et al. (2022)
	d. The income of household	Collective annual income of household including all earning members in the family.	< INR 100000 INR 100001 – 500000 INR 500001 - 1000000 INR 1000001 – 2000000 > INR 2000000	Indian Rupees	Kingsly et al. (2020)

	e. Education level of the father	Highest level of education completed	Less than High School High School Intermediate Bachelor Degree Master Degree Ph.D.	Number of individuals having a specific level of education	N.A.
	f. Education level of mother	Highest level of education completed	Less than High School High School Intermediate Bachelor Degree Master Degree Ph.D.	Number of individuals having a specific level of education	Bringolf-Isler et al. (2008)
	g. Household having motorised vehicle	Whether any parent owns a vehicle	Motor cycle Car e-Bike Scooty	Number of particular vehicle	Kelly & Fu (2014)
	h. Household structure	Family having any siblings	Having no sibling = 0 With sibling = 1	Number of families	N.A.
	i. The sibling study in same school	Whether all sibling study in same school	Yes or no	Number of respondents	N.A.
3. Psychological factors	a. Safety concern perceived by parents	The safety barriers related to school trip	Road safety Traffic	Number of respondents	Oluyomi et al. (2014)

	by students through NMT	Crime on street Stray animals Weather conditions		
b. Emotional perception of students for NMT (to be filled in consultation with child)	The feeling of the student during travel from home to school	Excited Curious Relaxed Happy Tired Bored Worried Rushed	Number of children selecting specific option	Ramanathan et al. (2014)
c. Social norm	Use of private vehicle is due to societal perception of being higher class	Measured on a five-point Likert scales in which 1 indicated 'definitely not', 2 'probably not', 3 'neutral', 4 'probably yes', and 5 'definitely yes'.	Number of respondents	Yang & Markowitz (2012)
d. Personal attitude of the parent	Use of car is due to personal reasons	Measured on a five-point Likert scales in which 1 indicated 'definitely not', 2 'probably not', 3 'neutral', 4 'probably yes', and 5	Number of respondents	Yang & Markowitz (2012)

		'definitely yes'.		
e. Perceived safety in the city to attitudinal change for NMT	The safety measures installed in the city such as traffic lights, AI enabled traffic violation detection, CCTV camera etc have improved the safety.	Measured on a five-point Likert scales in which 1 indicated 'strongly disagree', 2 'disagree', 3 'neutral', 4 'agree', and 5 'strongly agree'.	Number of respondents	N.A.

NA depicts the variables decided for this study based on discussion in academic papers and the Indian context.

3.3 Sample Size and Data Collection

3.3.1 Sample Size and Data Collection Points

The respondents under consideration in this study were parents of students studying in classes 6th to 12th in Dehradun city. According to Department of School Education data, Dehradun City has 43,246 enrolled students in these classes. Considering the confidence level of 95% and the error of 5%, a sample size of 381 was estimated sufficient (Hulley, 2007); however, a sample size of 400 respondents was finalised (Table 3.2). A total of four schools, two public and private schools, each situated within a kilometre radius of the city centre, were considered as data collection points. Government Girls Inter College, Rajpur Road (hereafter GGIC), and Government Inter College, Kurbuda (hereafter GIC) were selected among the public schools (Photograph 3.3). The two most prestigious private schools, namely St Joseph Academy, Rajpur Road (hereafter SJA) and Sri Guru Ram Rai Inter College (hereafter SGRR) were chosen as private schools (Photograph 3.3). All four schools were selected because students from all across Dehradun city come to study in these schools based on education merit and the financial status of their parents. The schools were asked to select students from classes 6 to 12 randomly, with a maximum of 100 students per school. Half of the students must be girls was the only criterion applied. The students were asked to approach either of the parents to be respondents of this research because, in the Indian scenario, the parent's decision is more critical for the travel choice of children.

Table 3.2. *Details of sample size considered for quantitative and qualitative data collection*

School Status	Data Collection Points	Type of Analysis	Respondents Approached	Respondents Replied
Public	Government Girls Inter College	Survey	100	100
		Interview	10	8
		FGD	4	4
	Government Inter College	Survey	100	93
		Interview	10	6
		FGD	4	4
Private	St. Joseph Academy	Survey	100	97
		Interview	10	10
		FGD	4	4
	SGRR Inter College	Survey	100	100
		Interview	10	9
		FGD	4	4

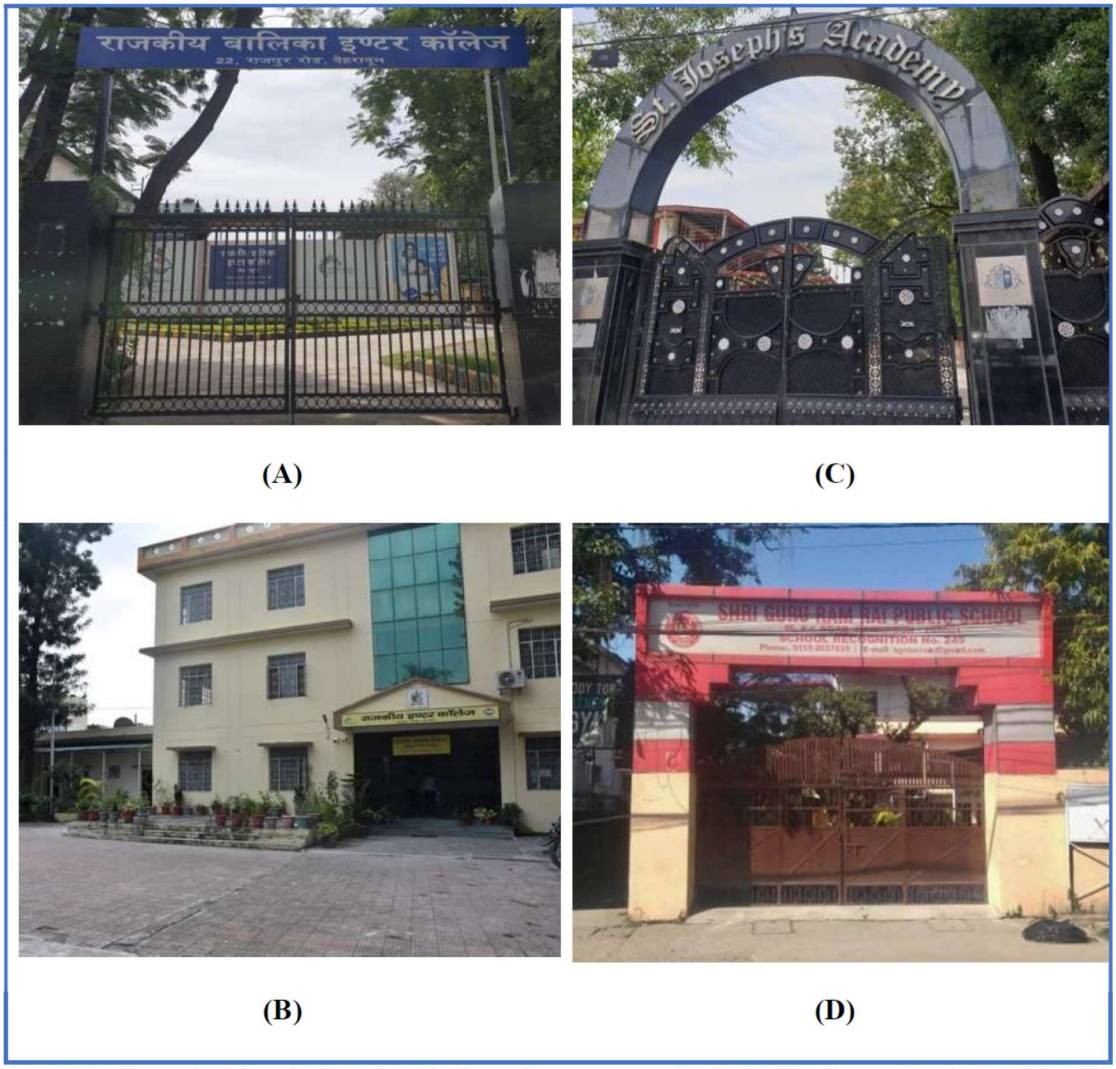
3.3.2 Data Collection Procedure

The primary method of sample collection was a survey through the questionnaire. A provisional questionnaire was prepared, and feedback was taken from a few parents. The final questionnaire having 33 questions, was designed based on feedback. It took 8-10 minutes to complete the final questionnaire during the trial. The questionnaire was made in English and Hindi, the local language and the medium of instruction in public schools. Further, an online link was generated through "Google Forms." The questionnaire was distributed in both hard copy and as an online link to students in school gatherings in the presence of Principals and Teachers to facilitate parents to choose the mode based on their competence (Photograph 3.4). All forms were codified and linked with students to ensure tracking of the questionnaire. The presence of Principals and Teachers resulted in a high number of returns of forms.

3.3.3 In-depth Interview and Focus Group Discussion

Since the decision of travel mode choices for school trips is a complex process, to decipher the survey questionnaire results, in-depth interviews and focus group discussions (FGD) of parents of different students (other than those involved in the survey questionnaire) of the same school were considered. The in-depth interview was taken through 10 open-ended

questions corroborating the survey questions through the online form and hard copies distributed to students. Written consent was taken from all participating parents. After 33 interviews, the responses were repetitive; thus, only 33 were considered (Table 3.2). Two FGDs were organised, one for public and private schools each (Figure 3.4).



(A) GGIC, Rajpur Road, and (B) GIC Kurbuda, and two private schools (C) SJA, Rajpur Road, (D) SGRR, EC Road.

Photograph 3.3. *Data collection points in two public and two private schools*

Four parents per school were randomly selected, making eight participants per FGD (Table 3.2). Public school FGD was organised in GGIC on May 6, 2023, and private school FGD was held in SJA on May 9, 2023 (Photograph 3.5). An innovative approach was adopted to conduct FGD based on partial steps of the Action Planning exercise, including problem analysis, force field analysis, option development and analysis, and prioritisation of options to mitigate the problem. The duration of each FGD was 90 min. Before FGD, the context was explained to all parents, and consent was obtained orally. I moderated the FGD, and two teachers from each school assisted me in taking notes and observing non-verbal

communication. Three parents from public schools were assisted by their children in writing as they were unable to write. Refreshments were provided in both FGDs. Since I served as District Magistrate of Dehradun, the top official post in the districts, I introduced myself as a student of IHS at the beginning of FGD, as it might have impacted the discussion. Nevertheless, after completing FGD, I fully introduced myself to avoid ethical issues.

(A) GIC, (B) GGIC, and private schools (C) SJA to the students in the presence of Principals.

Photograph 3.4. *Questionnaire distribution in data collection points in three schools*

Photograph 3.5 *FGD of respondents of (A) Public Schools, (B) Private Schools*

3.4 Data Analysis

3.4.1 Quantitative Data Analysis

The primary data analysis was done through quantitative methods using survey data in SPSS software version 26. In order to assess the level of NMT, it was essential to examine all modal choices taken for travel to school. Along with the current composition of travel choices, desired preference was also assessed to evaluate the NMT preferences of other modal users. Since all questions in the survey were made compulsory, missing data on any question was ruled out. However, in questions 2 and 4, respondents were asked to prioritise the mode of travel to school and the problem faced during travel. Only some respondents ranked all options as others never travelled by all modes provided in the questionnaire, thus resulting in missing data for any specific option. For analysis purposes, the score was calculated separately for all options provided in the questionnaire, followed by calculating scores of walking and cycling separately and a collective score of non-motorised (addition of score of walking and cycling for each respondent). The downloaded data was cleaned using a random data check method; if data was not coded, it was converted to code, especially in the question with an open option," any other, please specify." The data in the Excel file was imported to SPSS. The first row of the Excel file was considered variable names. The type of variables, the label of variables, values of variables, missing and measure, etc., have been defined as per the options of each question for further analysis. Different hypotheses were formulated to check the factors explaining level of NMT as per actual use and desired preference (See Annexure 5). The correlation and linear regression coefficients through the ordinary least square (OLS) methods were calculated to establish a relationship between the variables. Multiple linear regression test was performed after checking multicollinearity and omitted variable biases.

3.4.2 Qualitative Data Analysis

To triangulate the data, output of the interview was analysed using Atlas-Ti version 22 software. A total of 42 codes were applied. Similar codes were grouped, and network analysis was done to find the relationship and pattern among the codes through cross-tabulation and co-occurrence tools. The outcome of this analysis and FGD were used to triangulate the primary data.

3.5 Reliability and Validity

Reliability and validity of data are the most critical aspects of social science research. Reliability is related to the consistency of measurements, while validity deals with the accuracy

of measurements. Clear conceptualisation, selection of variables, their measurement, and unit based on an exhaustive literature review added to the reliability of the study. Multiple indicators of all three factors further eliminated the chance of biases. The data collection instruments, questionnaire, and interview guides were tested before execution to ensure relevance in the local context. These instruments were made available in English and Hindi as well as the offline and online modes to include all possible respondents and eliminate the chances of the specific sample population. The sample size, both in the quantitative survey and the qualitative interview, was more than the threshold level, increasing the data's external validity. The survey findings were triangulated using the responses of in-depth interviews, FGD, and secondary data from the Departments of School Education, Transport, and Police to ensure internal validity.

3.6 Scope and Limitations

Since this study is focused on school trips in Dehradun, the barriers to NMT identified may not apply to the general use of NMT other than school trips. Many respondents, especially from public schools, were having lesser education level; this might have interfered with their responses in the survey. Other common limitations of the study were (1) the observations were based on a cross-sectional study focused on one city and one type of commuters, (2) the findings can only apply to cities similar to Dehradun, (3) the variables selected in the study were based on literature review, but was likely that other relevant variables are left out from the study, for example, metal health of parents while deciding the mode of travel, presence of green vegetation and canopy, etc. Another significant limitation was my official post, because of which many people know that I work in the government. I overcame this by requesting the principals of schools not to disclose their identity while distributing the survey questionnaire, both online and offline, to students.

4. Results, Analysis and Discussion

The results presented were based on descriptive and inferential statistical analysis. The descriptive analysis was categorised in sample characteristics, travel mode choices and factors explained actual level of NMT and desired preference. The factors were further categorised in built-environment, socioeconomic and psychological indicators. The inferential analysis was based on ANOVA, correlation and multiple linear regression between factors and level of NMT as per actual use and desired preference. The data collection points were strategically selected, as a choice of public or private schools directly reflects parents' education, household income, and status in society. Further, the gender of the child is a critical factor in selecting a school and travel mode in the Indian scenario due to more traffic and personal safety concerns of parents of female students. Due to this consideration, the relationship between the level of NMT and built environment and psychological factors are explained based on gender, and socioeconomic factors are analysed based on school status due to Indian context.

4.1 Descriptive Analysis

4.1.1 Sample Characteristics

The respondents in the present study were either of the parents of students belonged to classes 6^{th} to 12^{th} as for these students, parents decide mode for school travel in India. Of 400 survey forms sent to the parents of two public and two private schools (data collection points), 390 forms (97.5%) were returned online and offline. The offline forms were collected through the school. Only 30% of forms were received through online mode. Respondents from public schools filled out the forms offline, which suggests a difference in education level and technology awareness among the parents of both public and private schools. All forms collected offline were entered in "Google Forms" to get the complete data. Parents of female students responded more (205 or 52.6%) in comparison to parents of male students (185 or 47.4%) (Figure 4.1). The job profile of respondents was also analysed to access income source, which is related to affordability of private schools. There was a difference in the job profile of respondents from both public and private schools (Figure 4.2). Among the public school, the maximum number of respondents (67%) were self-employed or doing business. As per interpersonal communication with the students, it was found that most of the respondents are daily wagers, followed by private service (32%), and only two respondents were in government jobs. In contrast to this, the maximum number of respondents from private schools were doing private service (48.5%), followed by business or self-employment (30.6%) and government jobs (20.9%). Thus, the respondents of both public and private schools belonged to different socioeconomic background. Families having salaried income (government and private jobs)

prefer private school and self-employed low-income families are forced to go to public school in Indian context. The income level of family is discussed later in this chapter.

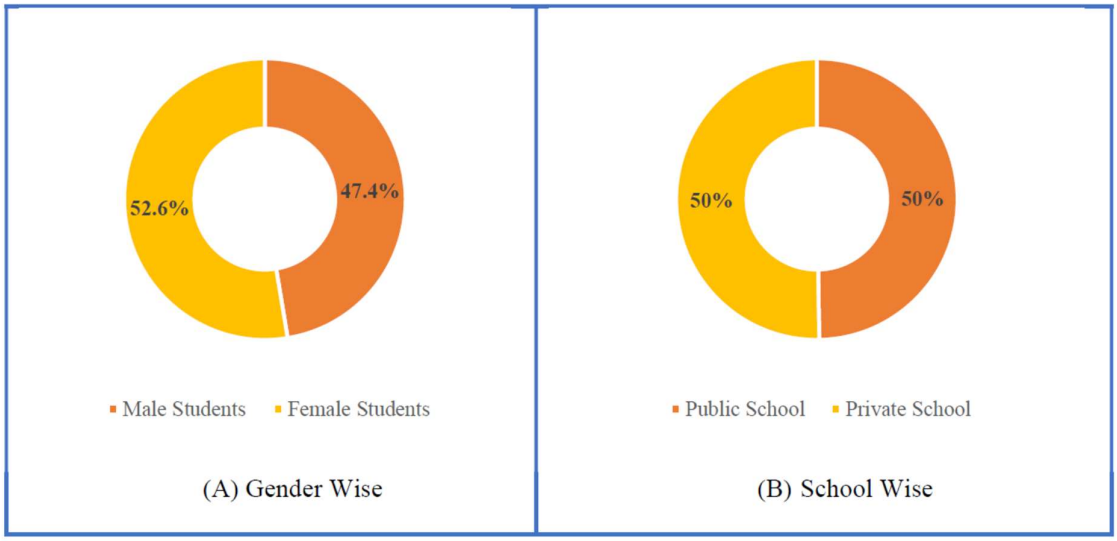


Figure 4.1. *Composition of the respondents who participated in the survey*

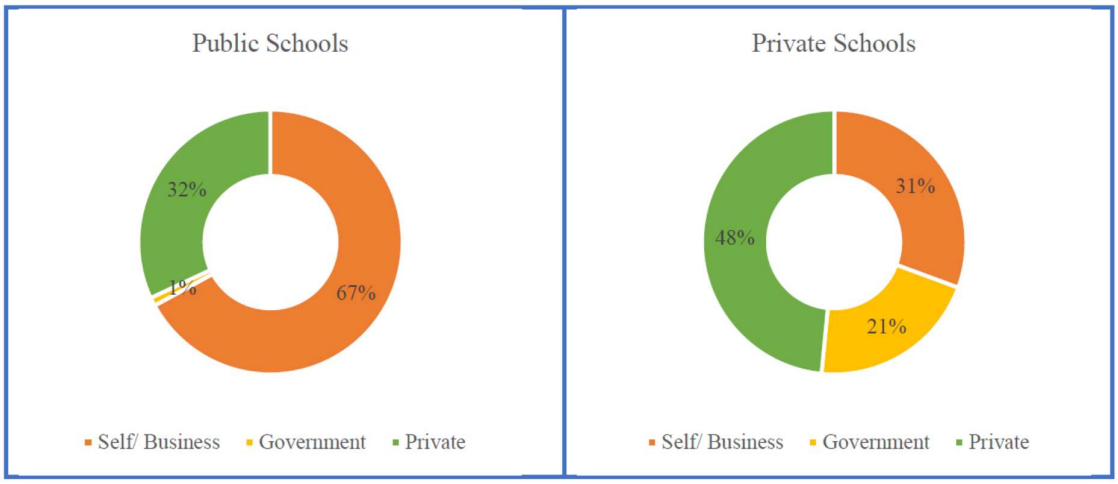
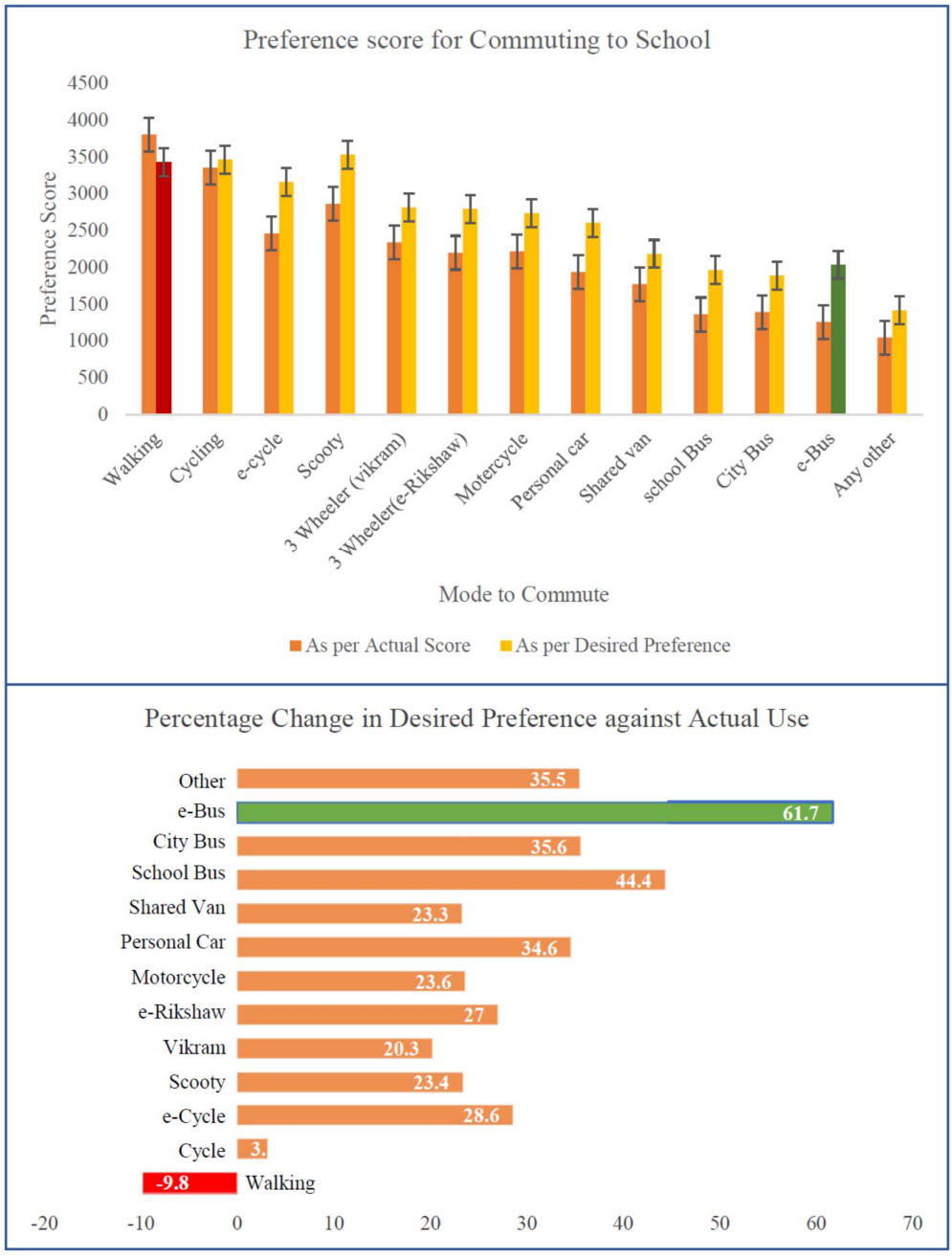


Figure 4.2. *Occupation of respondents of public and private schools*

4.1.2 Travel Mode Choices for School Trips and Preference for NMT

All possible present travel modes for commuting to schools by respondents' children were recorded. The modes included walking, cycling, e-rikshaw, scooty (non-geared bike), vikram (three-wheeler public transport), motorcycle (bike), personal car, shared van, school bus, city bus, e-bus, and other modes. For the present study, first two choices were considered as NMT. Based on frequency, the maximum number of respondents had given walking (44.7%) as their first actual choice, followed by scooty (11%) and cycling (9.4%). However, cycling (28.2%) recorded the highest preference among respondents as second choice. Respondents

were asked to assign similar rankings to these choices to record their desired preferences for respective travel modes. As per desired preferences for respective travel modes, maximum respondents were willing to walk as the first choice but much lower (18.7%) than actual use (44.7%). As per actual use, NMT choice scored 25.6% of the total trips; however, in comparison to 20.3% as desired preference.



Collective score ± SE of different travel modes adopted by students from home to school as per accrual use and their desired preferences (above) and percentage change in the preferences against actual uses (below). Green and red colours show maximum increase and decrease in preference respectively.

Figure 4.3. *Collective score of different trave modes as per actual use and desired preference*

All thirteen respondents' preferences about every travel mode were converted to a score to get a decisive conclusion. Walking and cycling remained the first two preferred among all travel modes both as per actual and desired preference. As per the score assigned to a different mode (Figure 4.3), the preference to walking marginally declined (-9.8%), but cycling recorded a marginal increase (3.2%) as a preference over present use. Interestingly, the e-bus, introduced in Dehradun as public transport on a pilot basis, recently recorded a 61.7% increase as a preferred mode of travel to school in the future than present use.

Since, school status and gender were hypothesised as critical factors in Indian scenario, scores of each travel mode were also analysed based on these factors. As per table 4.1, public school respondents used NMT as most preferred travel but their desire for using NMT found reduced and they liked to use e-bus. In contrast to this, maximum students of private schools travelled by scooty and preferred to use this in future also. Maximum percentage increase in preference over actual use was recorded for school bus in private school. Maximum number of male students walked to school at present though they preferred cycle. This resulted on decline in NMT use among male students as they preferred e-bus. Among the female, maximum students were found walking to school but they preferred scooty for travel to school (Table 4.2).

Table 4.1. *Actual use and reference for modes of travel as per school status*

Mode of Travel	Public School			Private School		
	Actual	Preference	% Change	Actual	Preference	% Change
Walking	2279	1909	-16.2	1521	1517	-0.3
Cycling	1876	1806	-3.7	1476	1653	12.0
e-cycle	1100	1622	47.5	1335	1535	15.0
Scooty	1076	1624	50.9	1784	1904	6.7
3 Wheeler (Vikram)	985	1399	42.0	1350	1411	4.5
3 Wheeler (e-Rikshaw)	758	1282	69.1	1438	1508	4.9
Motor Cycle	712	1210	69.9	1501	1525	1.6
Personal Car	590	1156	95.9	1342	1445	7.7
Shared Van	593	937	58.0	1176	1244	5.8
School Bus	584	919	57.4	773	1040	34.5
City Bus	628	1041	65.8	764	846	10.7
e-Bus	548	1150	109.9	709	883	24.5
Any Other	434	809	86.4	609	607	-0.3

Numbers shown are number of respondents. Shades of green and red showed highest number of respondents and maximum decline in percentage in descending order respectively.

Table 4.2. Actual use and preference for modes of travel as per gender

Mode of Travel	Male			Female		
	Actual	Preference	% Change	Actual	Preference	% Change
Walking	1904	1734	-8.9	1896	1692	-10.8
Cycling	1793	1762	-1.7	1559	1697	8.9
e-cycle	1048	1637	56.2	1407	1520	8.0
Scooty	1050	1628	55.0	1810	1900	5.0
3 Wheeler (Vikram)	772	1318	70.7	1563	1492	-4.5
3 Wheeler (e-Rikshaw)	821	1325	61.4	1375	1465	6.5
Motor Cycle	840	1339	59.4	1373	1396	1.7
Personal Car	654	1077	64.7	1278	1524	19.2
Shared Van	626	944	50.8	1143	1237	8.2
School Bus	467	824	76.4	890	1135	27.5
City Bus	435	856	96.8	957	1031	7.7
e-Bus	384	1043	171.6	873	990	13.4
Any Other	321	650	102.5	722	766	6.1

Numbers shown are number of respondents. Shades of green and red showed highest number of respondents and maximum decline in percentage in descending order respectively.

Respondents generally preferred electric vehicles like e-cycle in two-wheelers, e-rikshaw in three-wheelers, and e-bus in large vehicles. Thus, the respondents were not willing to continue (preference score) NMT and were inclined to use electric vehicles to commute to school. The factors responsible are explained first collectively and then separately for actual use and preference of NMT in school trips.

4.1.3 Factors Explaining the Level of NMT

The respondents were asked to priorities the critical factors affecting NMT identified through the literature review and rank most critical as 1 and least important as 18 as done for travel mode choices. Since all factors might not be considered critical by the respondents, they only ranked factors based on their observation and experience. As per actual use, 41.6% of respondents reported distance between home and school as the most critical factor affecting NMT as their top priority. The presence of footpaths and cycle tracks were second and third choices, with 21.8% and 12.3% respondents respectively as their first priority. However, as the second priority, the presence of major road crossings (21.3%) was the most critical factor, followed by the quality of footpaths (15.1%) and cycle tracks (11.3%). This data corroborates that Dehradun city has only 38% of roads with footpaths either on one side or on both (UKMRC, 2019). However, the footpath is not continuous and of bad quality (Photograph 4.1).

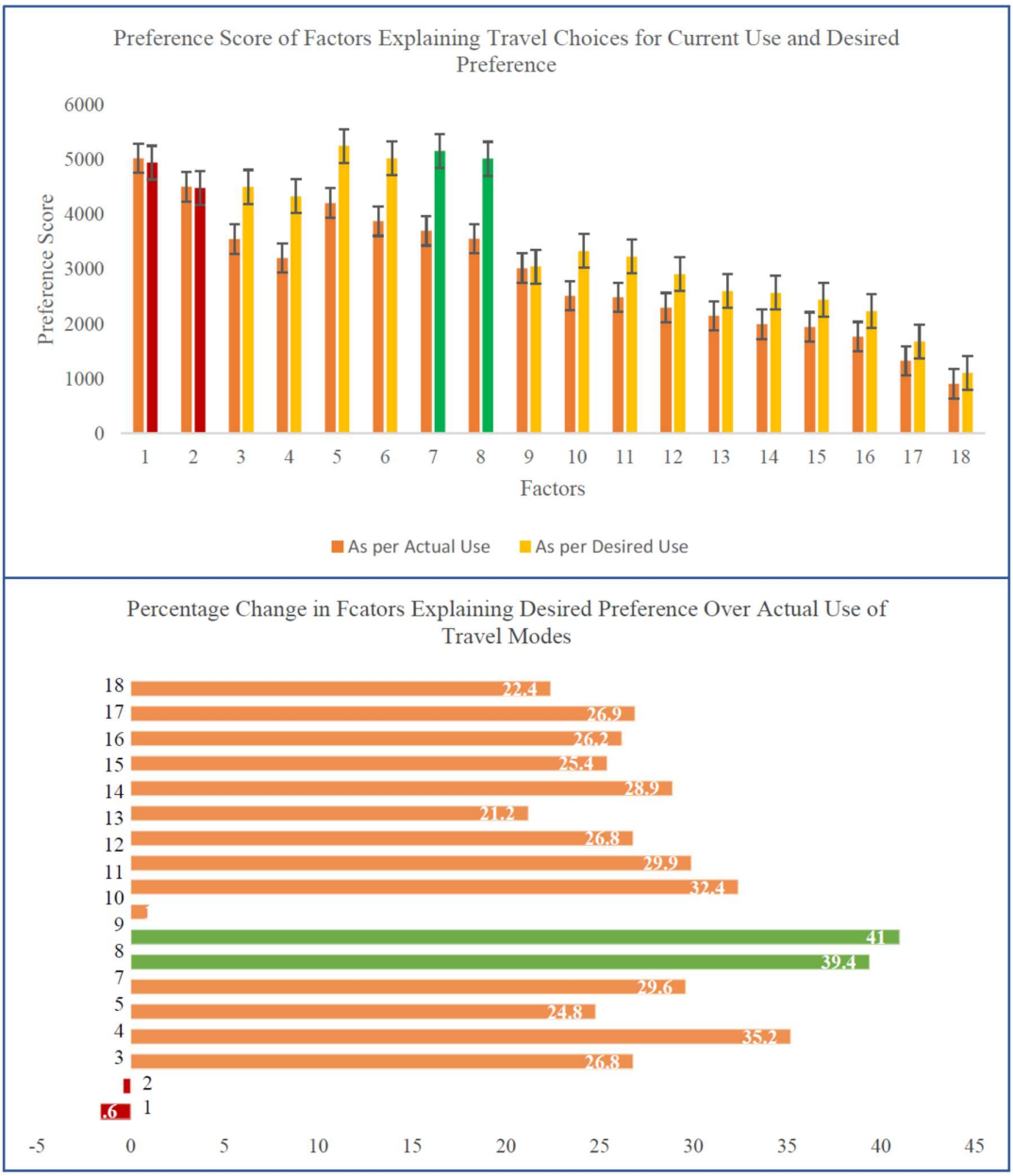
(A) Graded Footpath (B) Graded and Protected Footpath

(C) Discontinuous Footpath (D) Footpath encroached by vendors & vehicles

Photograph 4.1. *Different aspects of footpath availability in Dehradun City*

The psychological factors were given lesser preference over the built environment factors when all factors were clubbed together. The less priority may be due to the evident presence or absence of built environment factors than psychological factors, which are more perceived. Among the psychological factors, high traffic volume (fourth preference), crime on the street (fifth preference), and presence of stray animals (sixth preference) were prominently selected by the respondents.

The response of respondents changed when the same question was asked, considering the factors critical for their desired preference for NMT. However, distance was the most crucial factor to a lesser extent, as only 23.5% of respondents recognised it as the first priority. Interestingly quality of cycle tracks (20.6%) and the presence of footpaths (19.5%) become the second and third most essential factors for NMT as the first preference rather than the presence of cycle tracks. A similar pattern was observed in psychological factors for NMT desired preference, like actual use. Among the psychological issues important to continue NMT, road safety and traffic volumes were essential and appeared more prominently compared to actual use.



Factors explaining the level of NMT as per actual use and desired preference based on collective score ± SE of all 18 factors (above) and factor-wise percentage change in preference against actual use (below). Green and red colours show maximum increase and decrease in preference respectively. Factors considered are (1) Distance between home to school, (2) number of major crossings, (3) availability of alternate routes, (4) company during travel, (5) presence and (6) quality of footpath, (7) presence and (8) quality of cycle tracks, (9) road safety like accidents, (10) high traffic volume, (11) crime on street, (12) presence of stray animals, (13) weather conditions, (14) presence of CCTV, (15) functional traffic lights, (16) presence of traffic police, (17) NMT friendly school infrastructure, and (18) any other.

Figure 4.4. *Factors explaining the level of NMT as per actual use and desired preference based on collective score of all 18 factors*

Like travel mode choices, factors critical for the actual level of NMT and desired preference were assigned scores. According to scores, the presence of footpaths and cycle

tracks became the most essential factor rather than distance (Figure 4.4). Interestingly comparing the essential factors for actual use and desired preference, psychological factors become more prominent than built environment factors. Factors like company during travel (35.2%), high traffic volume (32.4%), and crime on the street (29.9%) recorded a maximum percentage increase just after presence (39.4%) and quality of cycle tracks (41.0%). Overall, after assigning scores respondents considered psychological factors important for level of NMT in comparison to rank based on number of respondents choosing a particular factor.

Since the present thesis is focused on factors explaining the level of NMT in school trips, the relationship between three independent variables, viz. built environment, socioeconomic and psychological factors with the level of NMT, are discussed separately.

4.1.3.1 Built Environment Factors and Level of NMT

As discussed above, distance from home to school has been recognised as the most critical barrier to NMT by the respondents for their actual use and desired preferences. As per the literature review, gender plays a significant role in deciding the level of NMT by parents; the effect of built environment factors on the level of NMT is explained gender-wise. 70.3% of male students, in comparison to 56.6% of female students, travelled up to 3 KM to reach school from home every day (Figure 4.5). The distance travelled by female students is distributed in all cohorts, but female students travelled more distance than male students as 20% of females compared to 9.7% of male students travelled more than 5 KM to reach school. Furthermore, the median distance travelled by female students (Median 2.5 ± SD 1.75 KM) was longer than male students (Median 1.5 ± SD 1.59 KM).

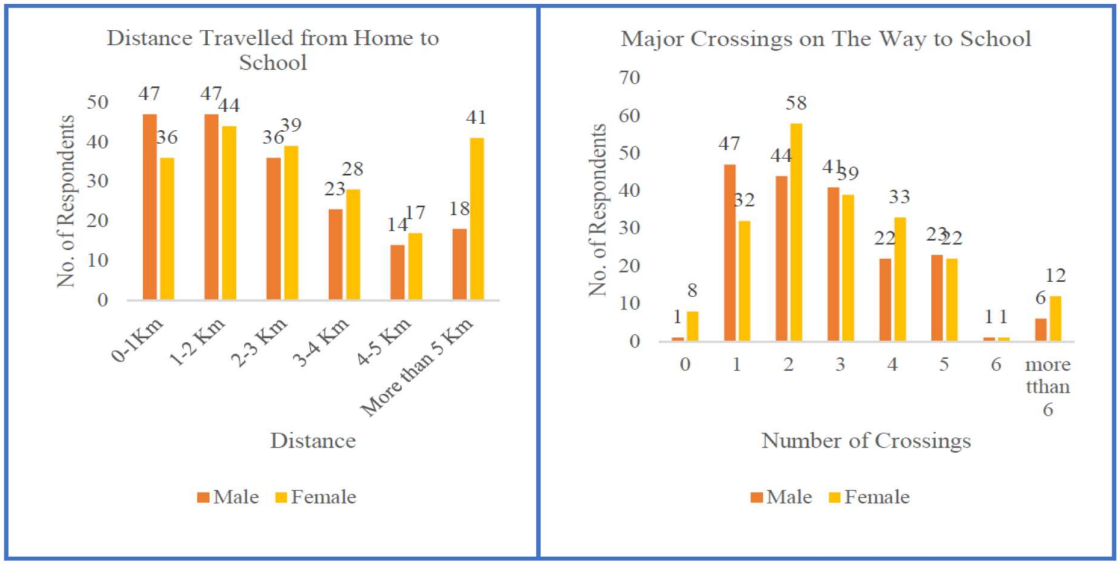


***Figure 4.5**. Gender wise distance travelled by children (left) and major crossing points from home to school (right)*

Maximum male students (25.4%) crossed one major crossing while travelling from home to school, while female students (28.3%) crossed two major crossings. Surprisingly, many students travel more than 5 KM on one side daily, but the number of students crossings over six major crossings per side was minimal. This contradiction might be due to less vigilance while using other modes than NMT. The data of the number of crossings on the way and distance travelled by the students from home to school corroborate each other.

To avoid the problem of major crossings, the respondents were asked about the availability of alternate routes. Collectively 41.6% of respondents reported the availability of alternate routes for their children's commute to school. Alternate route availability for female children was lower than for male children using NMT. Furthermore, if respondents reported the availability of an alternate route, the reason for not using an alternate route was asked. "Do not feel safe" was the highest reported reason (37%) for not taking an alternate route to avoid major crossings. However, the absence of footpaths (17.4%) and the presence of stray animals (16.7%) were reported next most significant reasons for avoiding alternate routes (Figure 4.6). This data corroborates with the findings of the interview and FGD, suggesting that built environmental risks were perceived as less dangerous than psychological risks. Thus, distance is a critical factor for the level of NMT, but the level can be explained with inferential statistics mentioned later in this section. Thus, distance between home and school was a critical factor, but female students travelled more distance than male students. Longer distance was corroborated by high number of major crossing and respondents preferred routes with major crossing as they did not feel safe in alternate routes to avoid crossings.

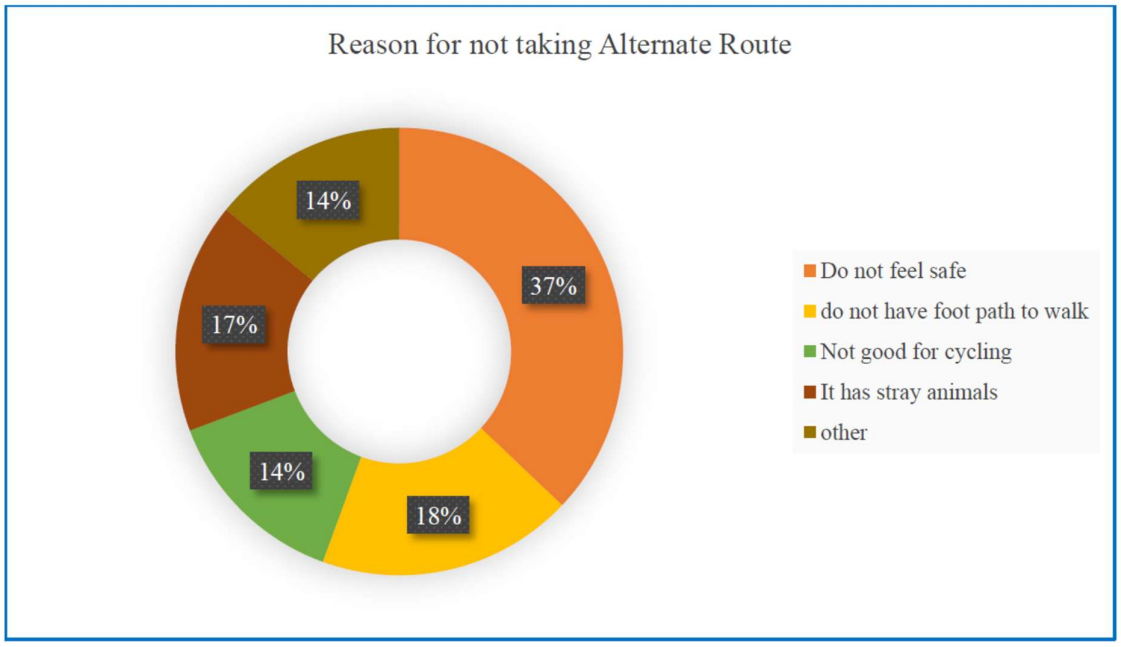


Figure 4.6. *Different reasons for not taking an alternate route to school for those who have the option*

4.1.3.2 Socioeconomic Factors and Choice of NMT

The level of NMT was found to be different in public and private schools (Figure 4.7), which is mentioned as school status in this study. Most of the socioeconomic parameters are analysed based on school status as it directly reflects the status of family based on income and education in the Indian society. Students of public schools used more NMT than private schools. Public school students contribute 76.7% of the total level of NMT; however, 23.3% was contributed by private school students. Among the students of public schools, 73.2% used NMT, and the rest came from other types of MT. In contrast, only 22.9% of private school students travelled by NMT in private schools. Thus, it was a primary mode of travel to school in public schools, making school status a critical factor in explaining the level of NMT in school trips.

Further, data on gender suggested that the travel mode choices of the respondents also factor in the gender of their children (Figure 4.7). Female students (42.2%) used less NMT than male students (57.8%) in total NMT-based trips. Approximately 38% of female students travel to school by NMT compared to 57.8% of male students. Less use of NMT by female students might be due to the long distance travelled by them to reach schools and the safety concerns of the parents due to local social phenomena.

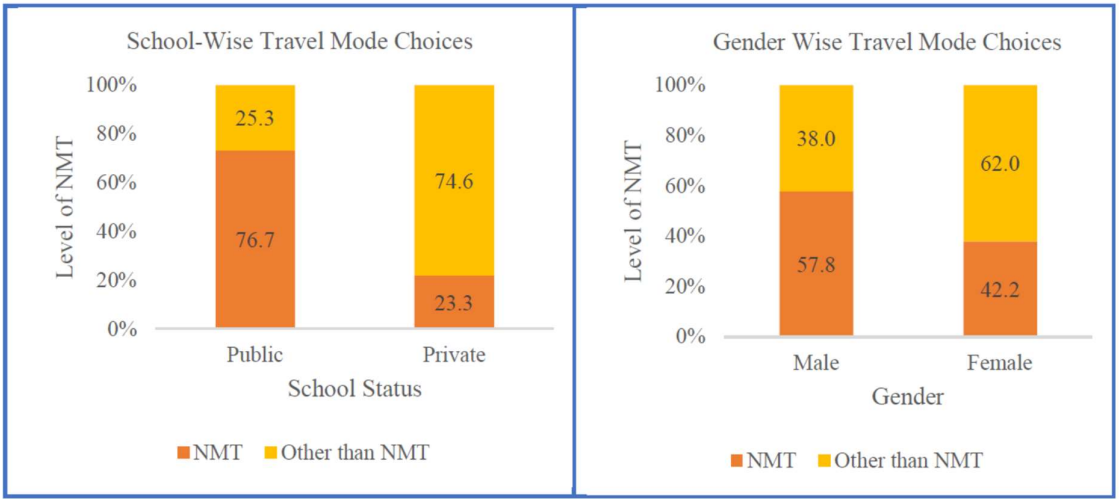


Figure 4.7. *School wise and gender wise trave made composition in Dehradun*

The company during travel to school was also reported as a significant decisive factor in promoting NMT in the literature review. Maximum students travelled alone (33.8%), followed by travelling with parents (26.9%), with friends (23.8%), and with siblings (15.9%). Interestingly, parents accompanied 31.2% of female students, but many male students commuted with friends (26.5%) (Figure 4.8) after travelling alone. This again suggested the safety concerns of parents about female students and their lesser travel by NMT than male students.

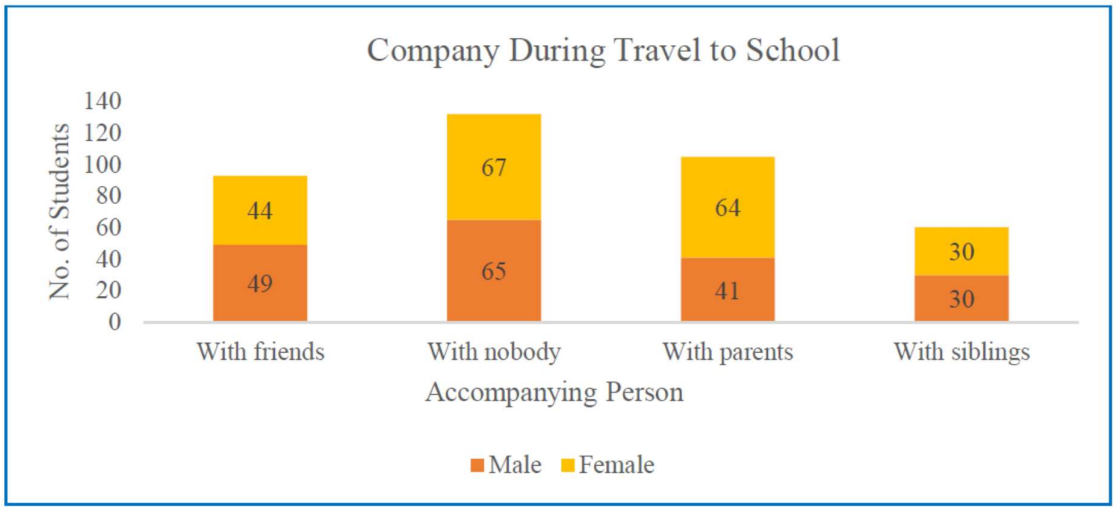


Figure 4.8. *Gender based company during travel from home to school*

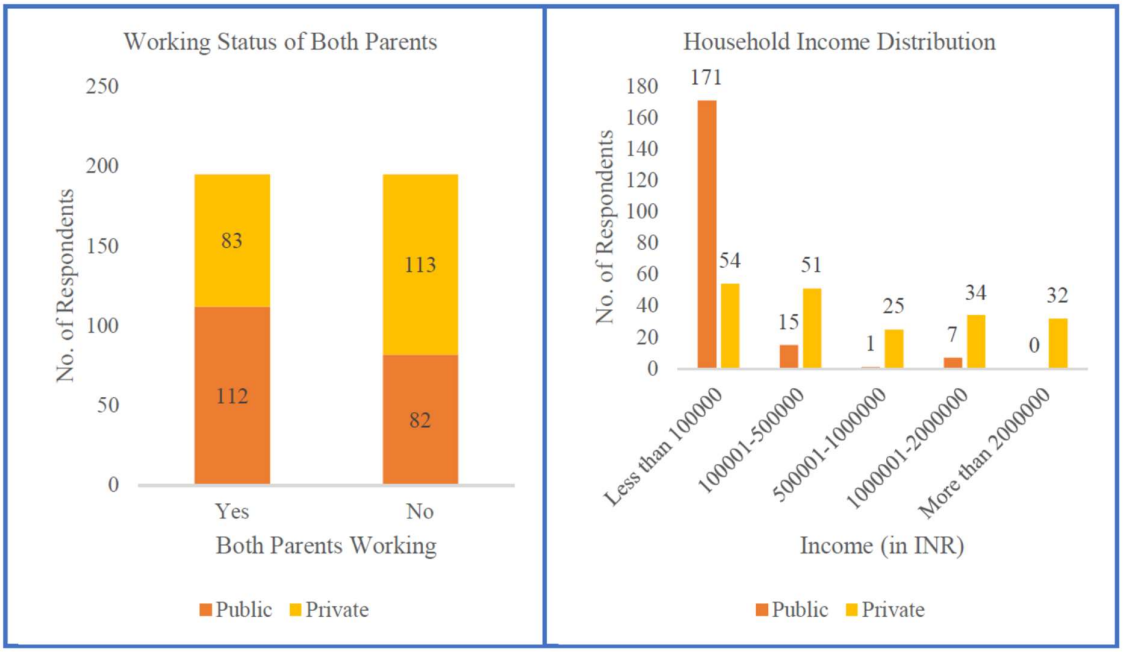


Figure 4.9. *School wise working status of parents (left) and household income (right)*

Household income is the most significant criterion for selecting a school in the Indian scenario. Low-income families sent their children to public schools due to free education. Both parents of students from public schools (57.7%) worked more than those from private schools (42.3%). However, the median income of respondents from public schools was less (INR 50,000) than those from private schools (INR 300,000), which might be because both parents are involved in low-income employment, contributing lesser household income despite both parents working. The household income of respondents sending their children to public schools

was below INR 100000 (88.1%) (Figure. 4.9). But the household income of respondents sending children to private schools was spread over all categories, with the maximum belonging to less than 100000 (27.6%) followed by INR 100001-500000 (26%). In addition to the travel mode used by both types of schools, it is suggested that respondents with less income used NMT more and went to public schools due to the unaffordability of other modes of transport and fees of private schools.

The education of parents, especially the mother, is one of the significant factors deciding the travel mode of their children recognised in the literature rereview. In the present study education level of both parents was asked (Figure 4.10). The education level of both parents was lower (less than high school) in respondents of public school, having lesser income and having high level of NMT for travel to school. In contrast, the education level of both parents was higher (maximum having either a bachelor or master's degree) in private school respondents having more income and using a lower level of NMT.

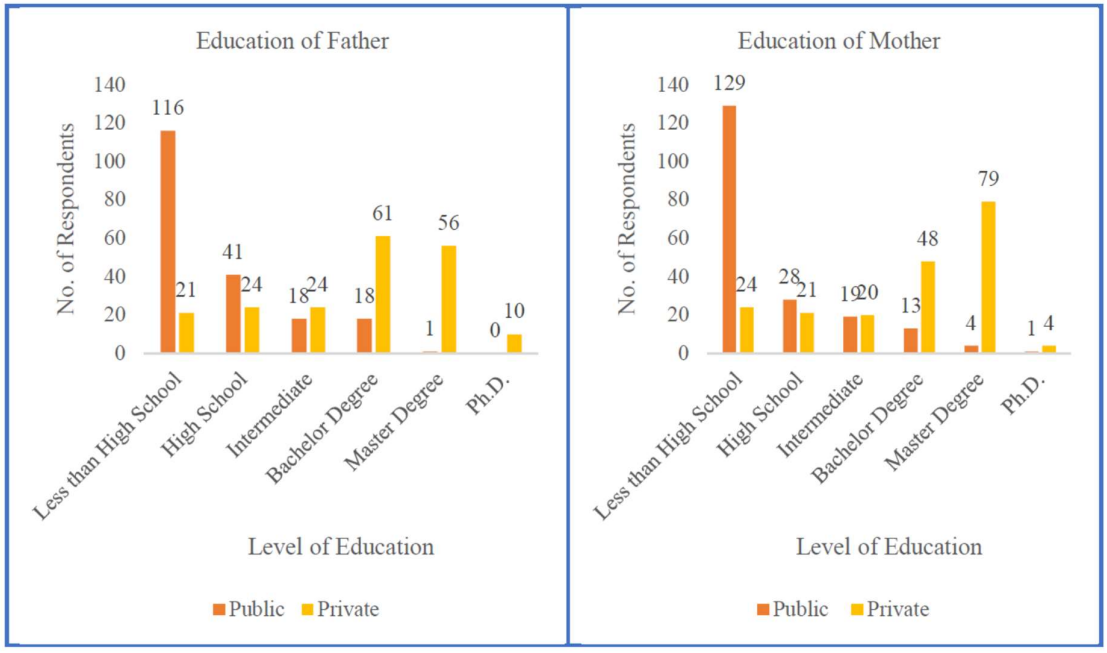


Figure 4.10. *Education level of the father (left) and mother of children as per their school status (right)*

84.9% of respondents had more than one child, out of which 62.2% were not studying in the same school, causing more travel by respondents to drop their children in different schools resulting in lower level of NMT. 65.9 % of respondents had any motorised vehicles like a car (27.2%), a scooty (23.9%), or a motorcycle (13.4%), and the rest had electric bikes; however, 60.3% of respondents from public schools had no vehicles (Figure 4.11). This again corroborated income levels and the unaffordability of having any vehicles; thus, their children were using NMT.

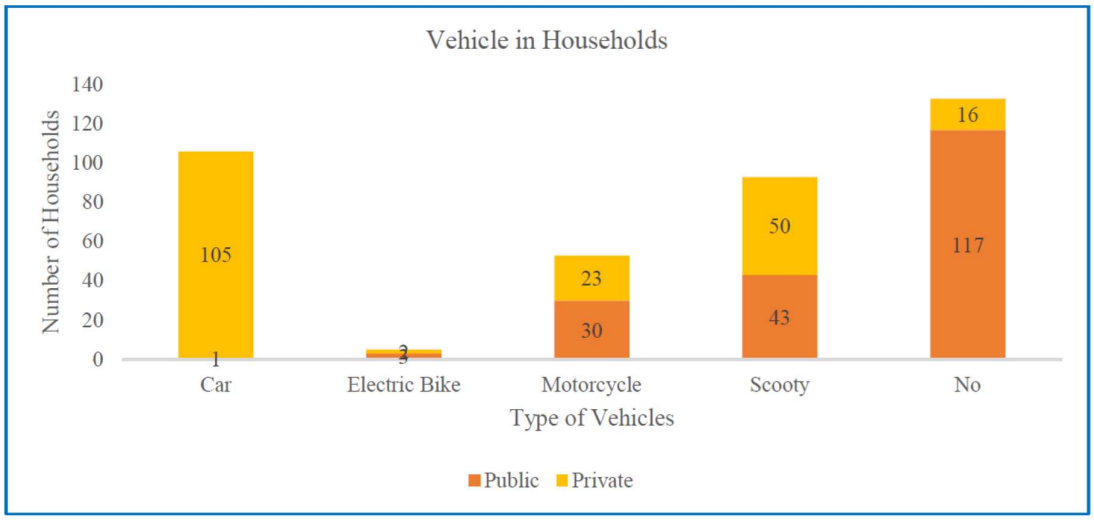


Figure 4.11. *School wise availability of vehicles in households*

4.1.3.3 Psychological Factors and Decision of NMT

Psychological factors were mainly related to the perception of transport modes and safety concerns. These factors are analysed based on gender of children as safety concerns of parents are different and crucial for female students in Indian culture. Respondents were asked to consult their children about their feelings from home to school (Table 4.3).

Table 4.3. *The emotional feeling of children when travelling from home to school*

S.No.	Emotional feeling	Gender of your child				Total	
		Male		Female			
		N	%	N	%	N	%
1	Exited	21	11.4	32	15.6	53	13.5
2	Curious	26	14.0	13	6.3	39	10.0
3	Relaxed	20	10.8	9	4.3	29	7.4
4	Happy	77	41.6	76	37.1	153	39.2
5	Tired	24	12.9	42	20.5	66	16.9
6	Bored	2	1.0	4	1.9	6	1.5
7	Worried	3	1.6	7	3.4	10	2.6
8	Rushed	12	6.5	22	10.7	34	8.7

Both types of students reported that they felt happy during the journey, followed by a maximum number of male students (14%) who felt curious, while female students felt tired (20.5%). Female students (15.6%) were more excited than male students (11.4%), who felt curious (14%) more than female students (6.3%). Female students had more negative emotions than male students, who had more positive emotions, thus female students were unwilling to use NMT.

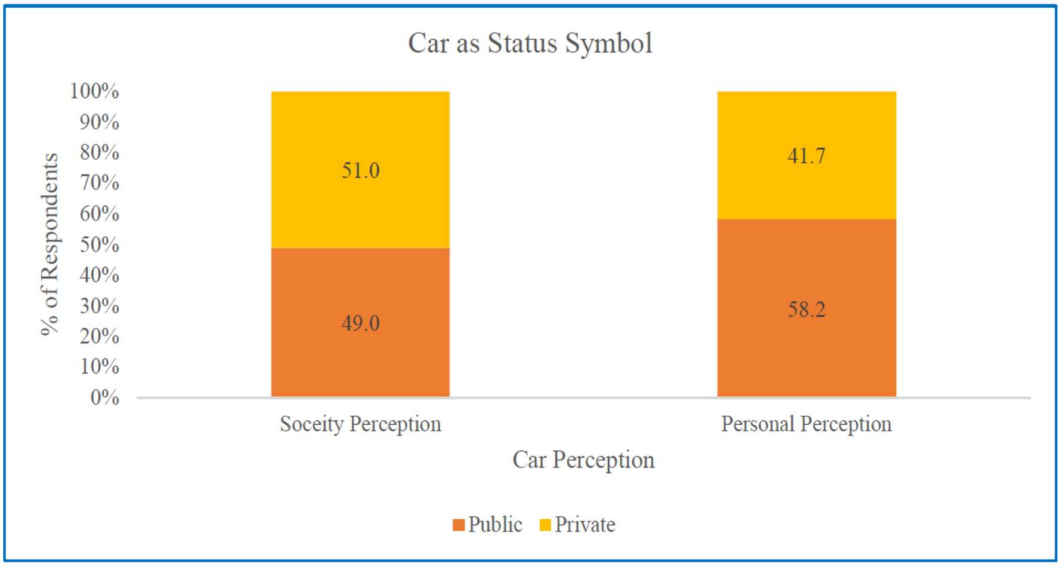


Figure 4.12. *Perception of society and individuals about the car as a status symbol*

Table 4.4. *Response of respondents on the NMT related statements*

S. No	Statement/Response	S. Disagreed	Disagreed	Neutral	Agreed	S. Agreed
1.	Use of technology has increased safety	13 (3.7)	30 (7.8)	25 (6.5)	254 (65.8)	64 (16.7)
2.	NMT is good for health	19 (4.9)	46 (11.9)	17 (4.4)	221 (57.1)	84 (21.7)
3.	NMT is good for environment	17 (4.4)	46 (11.9)	20 (5.2)	206 (53.1)	99 (25.5)
4.	NMT is solution for traffic congestion	14 (3.6)	54 (13.9)	55 (14.2)	207 (53.1)	56 (14.5)
5.	NMT can reduce road accidents	11 (2.8)	53 (13.7)	66 (17.0)	200 (51.4)	58 (14.9)
6.	NMT is time taking	16 (4.2)	114 (29.8)	73 (19.1)	157 (41.0)	22 (5.8)

Green shows the maximum frequency of responses, followed by light green in favour of NMT. Red shows the response against NMT. (Values in parenthesis are percentages).

Data suggests that opinions about car being status symbol in society in inconclusive. However, more respondents from public schools (58.2) either agreed or strongly agreed that

car is a status symbol for them compared to private schools (41.7%) (Figure 4.12). Driving a car was found a desire for respondents of public school, who cannot afford it and using NMT.

Benefits and limitation of NMT was asked to respondents. Since these questions were agreed upon by many respondents irrespective of the mode of travel, these factors are not determining factors for travel choice but largely agreed norms in the society (Table 4.4).

4.2 Inferential Statistics about NMT and Its Relation with Different Factors

4.2.1 Factors Associated with Actual Use of NMT

Analysis of Variance (ANOVA) was performed between different factors affecting travel choices and level of NMT collectively along with individual scores of walking and cycling separately by the respondents. The present level of NMT was found to be significantly related to built environment factors like distance between home and schools (p<0.01), number of major crossings (p<0.01), and quality of NMT-friendly infrastructure (p<0.05), socioeconomic factors such as gender of the child (p<0.01), school status (p<0.01), income of households (p<0.01), highest education of father and mother (p<0.01), availability of motorised vehicles (p<0.01), and psychological factors like car is a status symbol for society (p<0.01), NMT is good for health (p<0.05), and environment (p<0.05) but it is time taking (p<0.01). Interestingly, the present level of NMT was associated with the willingness to continue walking or cycling (p<0.01) and the emotional feeling of children during travel to school (p<0.10). The present level of NMT was negatively correlated with the distance between home and school (R= -0.41), number of major crossings (R= -0.38), gender of the child (R= -0.19), household income (r= -0.19), education of father (R= -0.45), and mother (R = -0.40) (Figure 4.13). Thus, increase in the distance between home and school and highly educated parents reduced the NMT choices of parents. Actual use of NMT was positively correlated with school status (R= 0.38), quality of NMT infrastructure (R= 0.15), car as a status symbol for respondents (R= 0.17), and willingness to continue NMT (R= 0.15). Surprisingly, the actual use of NMT is adversely linked with the perception of NMT being good for health and environment (R = -0.21 and -0.24 respectively) but not in relation with the time taken by NMT. Collectively factors mentioned above predict in 27.7% (adjusted R^2=0.277) change in the present level of NMT in multiple regression (p<0.01). However, maximum positive change was contributed by school status (β= 0.26) and adverse change by the distance between home and school (β=- 0.22), keeping other factors constant at a 1% significance level.

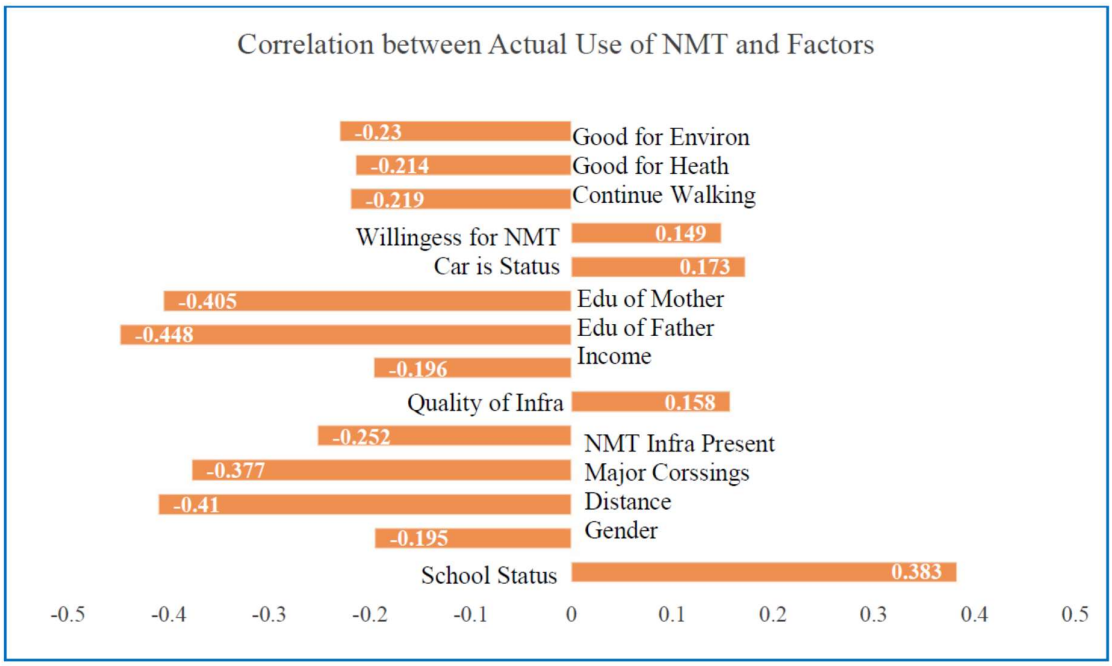


Figure 4.13. *Correlation analysis showing the relationship between the actual level of NMT and other factors at a 1% significance level*

4.2.2 Factors Associated with Desired Preference for NMT

Desired Preference for NMT by respondents was found to be significantly related to all the above factors mentioned for NMT actual uses except that the emotional feeling of children during travel to school is related to NMT at $p<0.05$. Similarly, children's desire to walk or cycle to school was also significantly related ($p<0.05$), indicating the actual users' desire to use NMT in the future. The desired preference for NMT was correlated with the same factors but to a lesser extent (less R value) than the present level of NMT (Figure 4.14). It is pertinent to mention that the respondents using NMT were willing to continue to use it but not because of attitudinal factors like NMT is good for health and environment (negative correlation) but because of inability to afford motorised vehicle (in this case low income). Collectively these factors explained a 16.4% change in NMT choice in the future by current NMT users. Unlike school status explaining 26.1% (β= 0.26) change in present NMT choice, it only contributed 10.8% (β= 0.108) in NMT as desired preference. However, distance remained the most prominent contributor as an increase in 1 KM distance will lower the NMT by 27.2% (β=-0.272), keeping other factors constant ($p<0.01$).

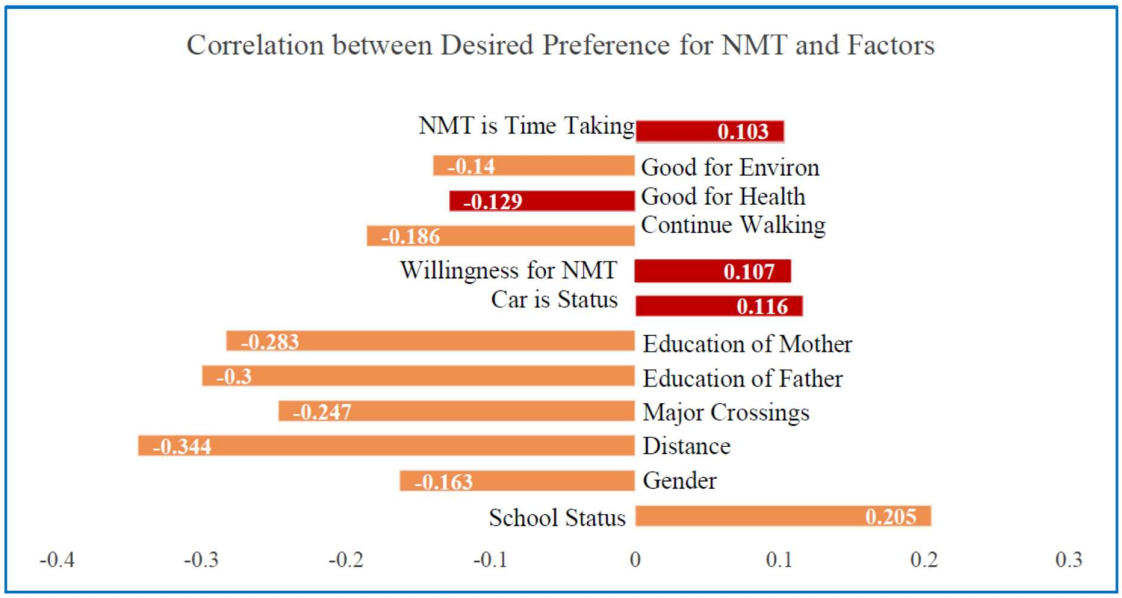


Figure 4.14. *Correlation analysis showing the relationship between the preference of NMT other factors at 1% and 5% significance levels*

4.2.3 Factors Associated with Walking

For a better understanding of desired NMT preference, factors explaining the level of walking and cycling were also analysed separately (Table 4.5). Walking by children of respondents at present was found to be negatively correlated with the distance between home and school (R= -0.36), number of major crossings (R= -0.28), household income (R= -0.24), and education of both parents. However, the education of the father (R= -0.45) was found to be more negatively correlated in comparison to the mother (R= -0.42). School status was positively correlated with walking for both actual use (R= 0.43) and willingness (R= 0.24); however, gender was only negatively related to the preference to walk (R= -0.13). Respondents sending their children on foot were unwilling to continue, and they did not believe that NMT is good for the environment and health but were forced to walk due to financial unaffordability. Collectively these factors contributed 34.1% (adjusted R^2=0.341) change in current choice of walking, but only 16.8% (adjusted R^2=0.168) in desire to walk by the same respondents providing other factors were constant (p<0.01).

4.2.4 Factors Associated with Cycling

Those who cycle to school were found to correlate with all factors similar to those walking, except the number of major crossings on the way. Those cycling at present were not inclined to walk in the future. Interestingly, the gender of children was found to be negatively correlated with the choice of the cycle at present (R= -0.32) and in the future (R= -0.20).

However, school status was positively correlated with a actual use of cycling (R= 0.23) and willingness to cycle (R= 0.12). The selected factors collectively contributed to 23.4% (adjusted R^2=0.234) changes in the actual use of cycling but only 9.9% (adjusted R^2=0.099) in desired preference of cycling. School status and income of household were found to be most enhancing, and gender of children was the most inhibiting factor for preference of cycling at p<0.01, not distance which was the most influential factor in preference of walking.

Table 4.5. Correlation between actual use and desired preference of walking and cycling

S.No.	Factors	Actual Walking	Preference for Walking	Actual Cycling	Preference for Cycling
1.	School Status	0.429***	0.243***	0.230***	0.117**
2.	Gender	NC	-0.134***	-0.317***	-0.204***
3.	Distance	-0.358***	-0.327***	-0.272***	-0.222***
4.	Major Crossings	-0.276***	-0.219***	-0.228***	NC
5.	Quality of Infrastructure	0.174***	NC	NC	NC
6.	Occupation of Parents	0.194***	0.117*	NC	NC
7.	Income of Household	-0.239***	NC	NC	NC
8.	Education of Father	-0.456***	-0.322***	-0.284***	-0.210***
9.	Education of Mother	-0.418***	-0.312***	-0.257***	-0.190***
10.	Car is Status Symbol for You	0.203***	NC	0.122**	0.117**
11.	Continue use of NMT	0.113**	0.142***	NC	NC
12.	Continue/ Wish to Walk	-0.231***	-0.176***	-0.150***	-0.143***
13.	NMT is Good for Health	-0.218***	-0.136***	NC	NC
14.	NMT is Environment Friendly	-0.247***	-0.145***	NC	NC
15.	NMT is Time Taking	0.107**	NC	NC	NC

*The green colour shows a positive correlation, and the red colour depicts a negative correlation. *** and ** shows significance at 1 and 5% level, respectively. NC depicts no correlation.*

In a nutshell, distance and major crossing between home and school, school status, gender of child, and education of both parents were the most influential factors for NMT choices as per regression analysis (Table 4.6, For detail, see annexure 5). Overall respondents were preferring to continue NMT, but they have preference for cycling in comparison to walking.

Table 4.6. *Key factors explaining the level of NMT as per actual use and desired preference based on regression analysis*

S. No.	Factors	Level of NMT					
		Actual Use			Desired Preference		
		β	R^2	Significance	β	R^2	Significance
1	Distance between Home and School	-0.410	0.168	.000***	-0.344	0.119	.000***
2	Number of major road crossings	-0.377	0.142	.000***	-0.247	0.061	.000***
3	School Status	0.383	0.147	.000***	0.205	0.042	.000***
4	Gender of Child	-0.195	0.038	.000***	-0.163	0.027	.001**
5	Education of Father	-0.448	0.201	.000***	-0.300	0.090	.000***
6	Education of Mother	-0.405	0.164	.000***	-0.283	0.080	.000***

**** and ** shows significance at 1 and 5% level, respectively.*

Table 4.7. *FGD of public and private schools showing restraining factors against NMT according to ranking during action planning analysis*

S.No.	Public Schools	Private Schools
1.	Traffic-related like heavy traffic, difficulty crossing the roads, and fear of getting hit by vehicles.	Traffic-Related like a violation of traffic rules rash driving, use of mobile during driving, jumping red lights, and encroachment of footpaths
2.	Presence of stray animals, especially dogs, on the way.	Infrastructure related such as lack of footpaths and cycle tracks, improper design of footpaths, unplanned digging of roads, improper road repair works, lack of coordination among departments
3.	Financial problems lead to the unaffordability of other means of transport, even ticket of public transport.	Psychological issues like cars as status symbols in society, preferences of parents, road safety
4.	Distance related like heavy bags, pain in legs, feeling tired	Lack of awareness about the benefit of NMT
5.	Difficulty in walking due to heavy rains	NMT is time taking

4.3 Triangulation by Interview and Focus Group Discussion

A total of 42 codes were applied in 33 interviews. “NMT is Good for health" was the maximum applied code, which occurred 40 times in all documents, followed by codes "Footpath availability" and "Insufficient infrastructure," which were used 27 and 25 times, respectively. A few codes were grouped, like "Income is a factor" and "Income is not a factor," to decide travel mode in one hierarchical group, "Income." Similarly, the level of NMT was

treated as being a "Status symbol" in society or a "Not status symbol" in one group, "Social Status." A maximum of 18 codes were applied in documents 4 and 7, followed by 16 codes in documents 5, 15, and 28. Separate FGDs of public and private schools were done (Table 4.7). Respondents of public schools categorised the top three factors affecting NMT as safety issues related to traffic, danger from stray animals, especially dogs, and weather (rain). However, respondents from private schools classified safety as related to traffic, the absence of NMT-specific infrastructure, and the perception of society about the car as a higher class. Thus, both FGDs found that socio-institutional transition is required to mitigate the concerns related to NMT preferences.

4.4 Willingness to Continue/ Switch to NMT by Other Users

In response to the question about the willingness of the respondents currently using other than NMT to switch to NMT, 73% of male students were willing to switch to NMT; however, only 63.7% of female students were either likely to change or agreed to change. Almost 43.5% and 46.5% of respondents reported that their children did not want to go to school on foot and by cycle, respectively (Table 4.8). However, 28.5% and 38.3% of children wished to go to school on foot and by cycle for all five days, respectively, and the rest wished to go between 1 to 4 days. Interestingly, female students were willing to walk more male students liked to cycle more than their respective counterparts; further, in response to the question about how many days respondents were likely to send their male children by NMT, 53.8%, and 26.6% were willing to cycle or walking for five days in a week respectively. However, only 24.4% and 30% of respondents agreed to send their female students by cycling or walking for five days a week, respectively. Thus, male students were more willing to switch to NMT or continue to use NMT than female students, which may be because emotional perception during travel from home to school was more positive in male students than female students.

Table 4.8. *Gender wise willingness to adopt/ continue walking and cycling*

S. No.	Days	Willingness to Walk			Willingness to Cycle		
		Male	Female	Total	Male	Female	Total
1	1 day	12 (6.6)	9 (4.4)	21 (5.4)	1 (0.5)	7 (3.4)	8 (2.0)
2	2 days	5 (2.7)	11 (5.4)	16 (4.1)	9 (4.1)	13 (6.3)	22 (5.7)
3	3 days	45 (24.6)	20 (9.9)	65 (16.8)	10 (5.5)	10 (4.9)	20 (5.1)
4	4 days	4 (2.2)	2 (0.9)	6 (1.6)	5 (2.7)	4 (1.9)	9 (2.3)
5	5 days	49 (26.8)	61 (30.0)	110 (28.5)	99 (54.1)	50 (24.4)	149 (38.3)
6	No	68 (37.2)	100 (49.3)	168 (43.5)	60 (32.8)	121 (59.0)	181 (46.5)

4.5 Comprehensive Discussion

Different barriers affecting choices towards NMT as per actual use were assessed and compared with those of desired preference for NMT. Results revealed that parents did not prefer NMT based on its benefit but out of financial compulsion. One possible reason for this is, current transport and infrastructure planning calibrated for motorised transport (Winters et al., 2010). A similar response was given by "respondent 10" as

"Today people must be comfortable to drive a car."

Respondents identified the distance between home and school as the most crucial barrier for NMT, followed by the number of major road crossings on the way. Similar findings were reported by Kelley and Fu (2014) in Ireland, Hatamzadeh et al. (2017) in Iran, Kingsly et al. (2020) in India, and Helbich et al. (2016) in The Netherlands. Those with a longer distance between home to school, but less income of the household, forced to walk or cycle, but higher household income with a lesser distance between home and school were using MT. Thus, distance between home and school was a significant factor for level of NMT, it does not play an influential role in deciding the mode of travel.

The level of NMT was also found to be inversely related to the highest education of parents, meaning, thereby, the income of households as reported by Bringolf-Isler et al. (2008). Respondents with a secure income source like government or private sector jobs preferred private schools, which are considered better than public schools (Meena et al., 2022). These respondents had a lesser preference for NMT for sending their children to private schools, as Timperio et al. (2006) observed. NMT was the primary travel mode in public schools, which primarily cater to lower-income students with less educated parents. It has been found that the income of household (Babey, Hastert, Huang, & Brown, 2009; Pabayo, Gauvin, & Barnett, 2011; Pont, Ziviani, Wadley, Bennett, & Abbott, 2009; Tudor-Locke et al., 2001) and education of parents (Chillón et al., 2009; Reimers et al., 2013; Shi, Lien, Kumar, & Holmboe-Ottesen, 2006) are critical determinants for the decision of travel choices. Interestingly both parents of students using NMT were working but having a collective income of less than INR 100000, suggesting that they were involved in daily wage work resulting in the unaffordability of motorised transport. This finding is in contrast to the reports of Aliyas et al. (2022) about the walking and working of both parents were inversely reported. However, the survey result was corroborated by an interview, where "respondent 7" replied as

"Income of the family is surely an important part, and we can see that people coming from low-income groups are forced to walk or cycle for their daily needs and chores."

Preference for MT was also found gender-specific (Guliani et al., 2015; Marten & Olds, 2004; McDonald, 2012). Many respondents with girl children have lower levels of NMT because of safety concerns, a cultural phenomenon in India (Meena et al., 2022). Since girl students travelled more distance than boys, it is evident that parents are more concerned about a safe environment in schools. Thus, the distance between home to school is a secondary consideration. Like in this study, Kingsly et al. (2020) also found that girls travel more distance

than boys in Chennai, India. The perceived reputation of the school is also responsible for longer trips to school through MT in India (Meena et al., 2022).

Another critical factor is company during the travel from home to school, on which the emotional perception of commuters depends (Ramanathan et al., 2014). Male students generally travelled with their friends, while female students were accompanied by their parents. This data corroborated with the data on parents' occupation and household income. This again explained the safety concerns of the parents of female students, which is specific to Indian culture. Emotional perception of students revealed that 70.2% of students had positive emotions like excited, curious, relaxed, and happy. In contrast, the rest had negative emotions such as tired, bored, worried, and rushed, which suggested that many students are satisfied with their current mode of travel. However, their parents wished to switch from NMT, especially those who were walking, to cycling or other MT because children especially females felt tired during walking, the second dominant feeling among NMT-using children. This finding contradicts the report of Aliyas et al. (2022), who suggested more positive emotions in children who walk in Iran.

Respondents identified the car as a status symbol for themselves in survey and for society in FGD, as identified by Tetali et al. (2016) in India, and one of three main identified barriers to NMT, which indicates that respondent's behaviour individually and, in the group, varies considerably regarding their preferences. “Respondent 4” replied in the interview as

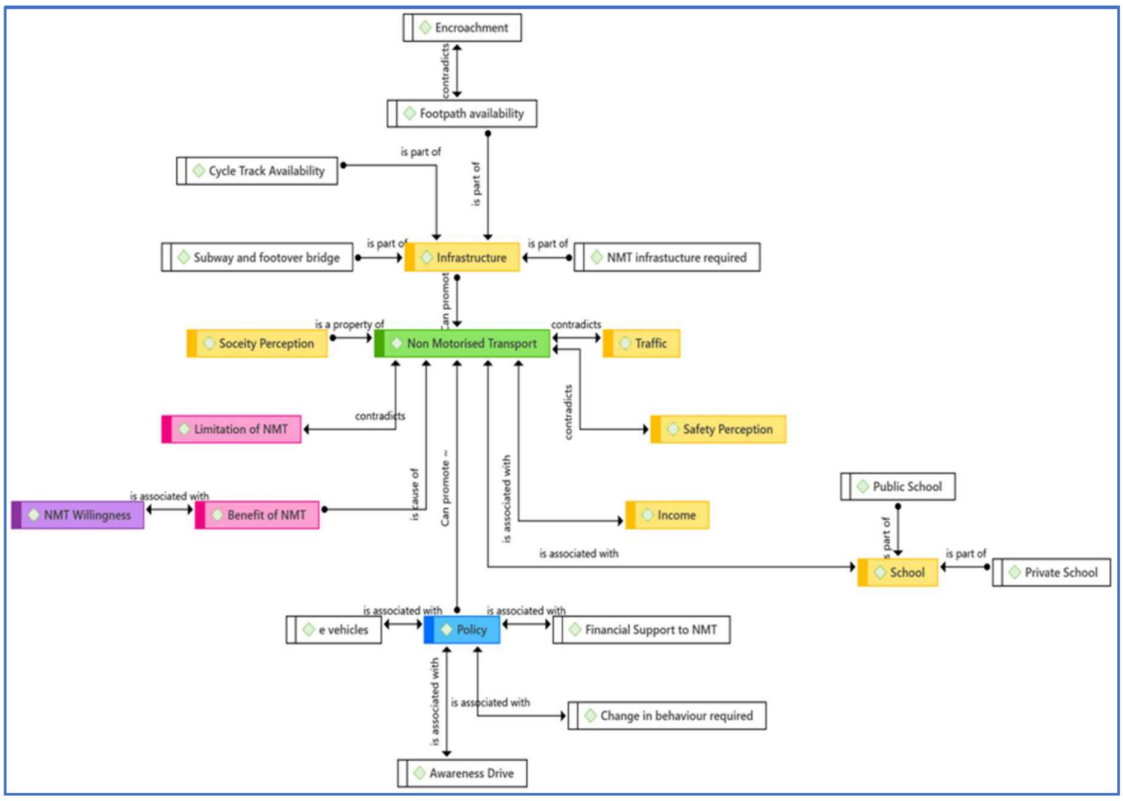
"cycling and walking should be as prominent as other vehicles as they are environment friendly and should be taken up by as many people as possible regardless of our social status. Non-motorized Transport contributes to the health of our society."

Most of the respondents either agreed or strongly agreed with the opinions like NMT is good for health and the environment, NMT is a good solution for the problem of traffic congestion in Dehradun, and it reduces the risk of road accidents and, thus, can mitigate the safety concerns. Similar findings were reported by Davison et al. (2008) about health and Dirks et al. (2016) about the environment. Contrary to this, respondents also believed that NMT is a time-taking travel mode. Similar observations were also received in the interview and FGD.

Safety concerns related to traffic and personal safety from crime and stray animals were identified as significant psychological barriers in NMT. This may be corroborated by data from transport and police departments of the Government of Uttarakhand (personal communication on June 3, 2023), as eight deaths and nine injured children were reported in Dehradun city in the last three years. Respondents with alternate routes to school reported that they do not use them because of safety concerns and the quality of footpaths and roads (Figure 3.3). This result is supported by the findings of Huertas-Delgado et al. (2017) in Spain, Race et al. (2017) in Canada, and Romero (2015) in Australia.

The respondents' safety-related concerns were further analysed in detail through interviews and FGD. Figure 4.15 shows the interrelationship between the codes assigned to the interviewees' responses. Traffic-related safety was mainly related to traffic speed, traffic volume, and frequent traffic rule violations like traffic light jumping, use of mobile while driving, rash driving, and underage driving due to inadequate enforcement by traffic police,

which are common concerns in Indian cities (Mohan, 2002). The interviewees also emphasised the encroachment of footpaths by street vendors resulting in pedestrians walking on the road, exposing them to road accidents.



The analysis was done using Atlas Ti 22. For details, please see Annexure 6.

Figure 4.15. *Relationship between codes applied to interviews depicting different enabling and restraining forces to NMT*

Children walking to school at present did not show their desired preference for walking to school. However, collective NMT users wanted to continue NMT, especially cycling. Female students preferred walking, and male students liked cycling in the present study. Respondents walking at present were unwilling to continue it in the future, indicating that they use it due to unaffordability to use other motorised transport, but they are willing to use a cycle. "Respondent 17" replied in the interview about expenses on public transport, which he cannot afford; thus, the child is walking to school.

"then ₹ 20 - 40 are spent daily and accordingly for month 600 to 1200 rupees are spent, that much income is not ours."

There is likely to be a drop in NMT users in Dehradun, as observed in different cities worldwide (Fusco et al., 2012; Kelly & Fu, 2014; Kim, Y. & Lee, 2020). The rising middle

class in India is causing more affordability of motorised transport leading to more comfort considering the distance, time, and schedule (Ikeda, Hinckson, Witten, & Smith, 2019).

Thus, the experience related to barriers of NMT and perceptible barriers of NMT is different in Dehradun. Based on the above discussion and responses to questions about the current and desired travel mode preferences, it is evident that people are forced to use NMT due to the unaffordability of MT. One interviewee responded with a conditional willingness to switch to NMT. Respondent 24 suggested during the interview as

"would love to do only if the current unregulated situation of the roads improve."

The interviewees also suggested the policy interventions discussed in the next chapter. The future choice of transport revealed that people are more oriented toward electric vehicles like e-bikes in two-wheelers, e-rikshaw in three-wheelers, and e-bus in four-wheelers. This may be due to their environmental concerns and many policies the Government of India pushed to use electric vehicles. However, it is imperative to promote NMT in school trips through multiple interventions to avoid extinction of experience among the children and to let them know about the surroundings and cultural heritage of the city in addition to their health and clean environment. An NMT-based child-friendly city is always in the making through societal transformation, technological innovations, and user feedback.

5. Conclusion and Policy Recommendations

School trip-related travel choices of parents depend on several determinants like built environment, socioeconomic and psychological factors. These factors collectively influence the choice and preference of parents NMT use. Among the built environment factors, distance from home to school, and number of major crossings were found negatively associated with actual use and preference for NMT, but quality of NMT friendly infrastructure (where present) was having positive impact. School status was found positively associated but education of both parents was negative related with actual use and preference for NMT in socioeconomic factors. Respondents revealed that safety concerns, especially from traffic and stray animals were primary psychological factors restraining the use of NMT. Respondents whose children were walking to school were unwilling to continue but desired to cycle. The respondents using other modes of transport were willing to switch to NMT in future. Due to the willingness to cycle, overall NMT use in future showed a positive trend. School status and the gender of the child were considered important factors in the Indian context, as previous is related to household income and for later female children generally have more safety concerns due to crime. Thus, due to less education and low income of respondents, they sent their children to public school through NMT and vice versa. Female children had less preference for NMT than male children and due to safety concerns, previous were travelling with parents.

Benefits such as NMT is good for health, and the environment, solutions for current traffic problems, and limitations like NMT is time taking were primarily agreed by the respondents irrespective of travel modes. However, NMT is good for health, and environment was found to be negatively correlated with the use of NMT. This suggests that children are currently using NMT, mainly walking, not because of the benefit of NMT but due to financial constraints to afford any other mode of travel. As per in-depth interview, the willingness to switch to NMT was conditional provided the government ensures the safety and infrastructure of NMT. Respondents felt that innovative interventions in the city, like intelligent traffic lights, CCTV cameras, and technology-based crime detection, have increased the sense of safety in the city.

In-depth interviews and FGD also corroborated the data obtained from the survey. Although respondents using NMT felt (generally public schools) that using the car is a status symbol for them, interviewees and participants of private school FGD reported that society considers using the car a status symbol. Traffic-related concerns were identified as an essential determinant by both FGD groups. Public schools FGD decided that the presence of stray animals and financial constraints are other important determinants. However, private school FGD found limited and low-quality NMT infrastructure and the positive attitude of society toward car use as the other two determinants of NMT.

Thus, the determinants of NMT by respondents using NMT (experience) were found to be different from those using other modes (perception). However, respondents recognised the benefits of NMT and were willing to switch to using the cycle rather than walking, but they preferred to use electric vehicles in the future for school travel. Thus, desired preference of NMT in overall travel composition will reduce from 25.6% to 20.3% based on score. People

are unlikely to continue walking and desire to use green energy-based public transport. The present study, therefore, answered the research question and sub-questions thoroughly.

5.1 Future Research Opportunities

This study is first-hand information on people's experience and perception of NMT in school trips in India in general and in Dehradun in particular. Although findings reported that people agreed with the benefits of NMT, but they thought it is time taking. Thus, studying the time taken by all modes of transport to school in the future is desirable. The perceived and actual time taken by different transport may reveal the comparative time taken to travel from home to school. In addition to this, the effect of NMT on students' physical and mental wellbeing also needs to be explored in the future. It is also required to explore the role of urban forms, especially master plans, green spaces, tree cover, density, etc., and the mitigating effect of intelligent interventions.

5.2 Policy Recommendations

The present study has provided insightful empirical data on travel choices for school trips in Dehradun. The methodology proposed in this study can be proved to be a paradigm shift in urban transport planning in tire II cities (like Dehradun) in India. The study revealed that sustainable travel choices must be the cornerstone of urban planning to increase the city's sustainability. Following policy recommendations for city, state and national governments can be proposed based on the finding of the present study.

1. Instead of continuing the isolated land use plans, mixed land use shall be promoted to reduce the trips related to school and work, constituting almost two third of total trips in Indian cities to promote NMT.
2. Urban transport policy must be planned around sustainable travel choices like walking and cycling. The master plan and transport policy shall complement each other to make a one km city, which means all daily needs can be fulfilled within a km walking distance.
3. Government should consider implementing neighbourhood school policy to reduce the longer trips based on school perception.
4. As suggested in interview and FGD, Government shall provide incentives for NMT like subsidies on buying cycles, universal NMT infrastructure on roads, public places, and in schools, and disincentivising the motorised transport through taxation and awareness campaigns. The Netherlands can be the best model to study for this.
5. The safety concerns of female children's parents must be addressed to improve gender neutrality for NMT through technological interventions in road safety.

6. Coordination among the departments shall be promoted to increase trust-building between the government and citizens.
7. The city belongs to the citizens. Therefore, community participation must be encouraged in urban planning in India. Most plans must be made through a bottom-up approach.
8. It is very important to start work in a child-friendly city as our future lies in the hand of children. Thus, their physical and mental wellbeing is of utmost priority. Improved walking and cycling experience can achieve this as most children in the present study felt happy during school trips.
9. As per the observation of FGD, strict compliance with the traffic rule is required than making the traffic rules strict. They also suggested the formulation of a pedestrian priority-based policy.

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Annexure 1. Questionnaire in English

Institute of Housing and Urban Development Studies (IHS)

Erasmus University, Rotterdam, The Netherlands

Please submit before – 02/05/2023 at 5.00 PM

Form Code ……

This questionnaire is a part of my master thesis, which is an essentiality to fulfil the requirement of Master of Urban Development and Management from Institute of Housing and Urban Development Studies of Erasmus University, Rotterdam, The Netherlands

The questionnaire will take 8 - 10 mins to complete. Your personal information and answers are purely for the research purpose and will not be disclosed to anyone in any circumstances.

With your answers you will not only support this research work but also help to provide recommendations to the policy makers for better Dehradun.

Please read questions carefully as few questions are specific for students and few for parents.

Thanks in advance for your valuable support to this research work.

Name of School……

Name of Respondent…….

Name of student……

Name of Father…….

Name of Mother……

Class…….

Date of response……..

1. Gender of your child
    a. Male
    b. Female
    c. Other

2. Frequency of modes used for travel to School by the child in a month (number of times used/month) and your preferences (Rank them from 1 for highest use to 13 for lowest)

S. No.	**Mode of travel**	**Your Current Use**	**Your Preferences**
1	Walking		
2	Cycling		
3	e-Cycle		
4	Scooty		
5	Three Wheeler (Vikram)		
6	Three Wheeler (e-Rikshaw)		
7	Motor Cycle		
8	Personal Car		
9	Shared Van		
10	School Bus		
11	City Bus		
12	e-Bus		
13	Any Other		

3. Based on above response in which broad category do you classify the travel of child to school
    a. Non-motorised (walking and cycling)
    b. Motorised (Rest modes)

4. Which of the following factors do you think is most important (in order of priority) to facilitate walking and cycling in the city (Rank them from 1 for highest use to 18 for lowest)

S. No.	Factors	In Present Scenario	Criticality in Future
Built Environment Factors			
1	Distance between home and school		
2	Major Road Crossings		
3	Availability of Alternate Route		
4	Company During Travel		
5	Presence of Footpath		
6	Quality of Footpath		

7	Presence of Cycle Tracks		
8	Quality of Cycle Tracks		
Psychological Factors			
9	Road Safety Issues like Accidents		
10	High Traffic Volume		
11	Crime on Street		
12	Presence of Stray Animals		
13	Weather Condition		
14	Presence of CCTV		
15	Functional Traffic Lights		
16	Presence of Traffic Police		
17	NMT Friendly School Infrastructure		
18	Any Other		

5. Do you think, it is convenient to walk or cycle in Dehradun
    a. Yes
    b. No

6. What is distance between your home and school
    a. 0 - 1 KM
    b. 1 – 2 KM
    c. 2 – 3 KM
    d. 3 – 4 KM
    e. 4 – 5 KM
    f. More than 5 KM

7. How many major road crossings come during the trip from your home to school
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5
    f. If more than 6, please write number ----------

8. Is there any alternate route available from your home to school to avoid major crossings
    a. Yes
    b. No

9. If your answer is Yes, why do your child not take that route
    a. Do not feel safe
    b. Do not have footpath to walk
    c. Not good for cycling
    d. It has stray animals
    e. Other, please specify……
    ……

10. With whom do your child walk or cycle
    a. With siblings
    b. With parents

c. With friends
d. With nobody

11. Does the route your child take has infrastructure for NMT like footpath, cycle track or space for cycling and pedestrian friendly crossing
    a. Yes
    b. No

12. If your answer is yes, what is the quality of such infrastructure

1 Very poor	2 Poor	3 Satisfactory	4 Good	5 Very good
○	○	○	○	○

13. What is the occupation of parents
    a. Government Service
    b. Private Service
    c. Business/ Self Employed

14. Whether both parents are working
    a. Yes
    b. No

15. What is the income of household in Indian Rupees (in case of both parents working, please answer joint income)
    a. Less than 100000
    b. 100001 – 500000
    c. 500001 – 1000000
    d. 1000001 – 2000000
    e. More than 2000000

16. What is the highest education of father
    a. Less than High School
    b. High School
    c. Intermediate
    d. Bachelor Degree
    e. Master Degree
    f. Ph.D.

17. What is the highest education of mother
    a. Less than High School
    b. High School
    c. Intermediate
    d. Bachelor Degree
    e. Master Degree
    f. Ph.D.

18. Whether household is having motorised vehicle
    a. Car
    b. Motorcycle
    c. Electric Bike
    d. Scooty
    e. No

19. Does your child has any sibling (Brother/ sister)
    a. Yes
    b. No

20. If your answer is yes, whether the sibling study in same school
    a. Yes
    b. No

21. How do you feel during your travel from home to school (Please consult your child/children)
    a. Excited
    b. Curious
    c. Relaxed
    d. Happy
    e. Tired
    f. Bored
    g. Worried
    h. Rushed

22. Do you feel that driving a car is a societal perception of being higher class

1 definitely not	2 probably not	3 neutral	4 probably yes	5 definitely yes

23. Do you feel use of car is a status symbol (to be filled by parents)

1 definitely not	2 probably not	3 neutral	4 probably yes	5 definitely yes

24. Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection?

1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree

25. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future

1 Not willing to change	2 May not be	3 Neutral	4 May be	5 Agreed to change

26. You/ your child wish to cycle to school for
    a. 1 day
    b. 2 days
    c. 3 days
    d. 4 days
    e. 5 days
    f. No

27. You/ your child wish to walk to school for
    a. 1 day
    b. 2 days
    c. 3 days

d. 4 days
e. 5 days
f. No

Please agree or disagree with following statements

28. Non-motorised transport is good for health

1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree

29. Non-motorised transport is environment friendly

1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree

30. Non-motorised transport is a good solution to traffic problem in Dehradun

1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree

31. Non-motorised transport will reduce the risk of road accidents

1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree

32. Non-motorised transport is a wastage of time as it requires more time to commute

1 strongly disagree	2 disagree	3 neutral	4 agree	5 strongly agree

33. If you have any specific comments, please mention here

This study also requires in-depth interview of some respondents. If you are willing to support this research through in-depth interview and focus group discussion, which may run for 30 min, please provide your email id or mobile number.
Yes …… Mobile number/ email id ……
No……...

Annexure 2. Questionnaire in Hindi

Institute of Housing and Urban Development Studies (IHS)

Erasmus University, Rotterdam, The Netherlands

जमा करने की अंतिम तिथि - 02/05/2023 शाम 5.00 बजे

- यह प्रश्नावली मेरे मास्टर थीसिस का एक हिस्सा है, जो **Institute of Housing and Urban Development Studies (HIS) Erasmus University, Rotterdam, The Netherlands** के मास्टर डिग्री की आवश्यकता को पूरा करने के लिए एक अनिवार्यता है।
- प्रश्नावली को पूरा करने में 8 से 10 मिनट का समय लगेगा। आपकी व्यक्तिगत जानकारी और उत्तर विशुद्ध रूप से शोध के उद्देश्य से हैं और किसी भी परिस्थिति में किसी के सामने प्रकट नहीं किए जाएंगे।
- **अपने उत्तरों से आप न केवल इस शोध कार्य में सहयोग देंगे बल्कि देहरादून को बेहतर बनाने के लिए नीति निर्माताओं को सुझाव देने में भी मदद करेंगे ।**
- कृपया प्रश्नों को ध्यान से पढ़ें क्योंकि कुछ प्रश्न छात्रों के लिए और कुछ माता-पिता के लिए हैं।
- इस शोध कार्य के लिए आपके बहुमूल्य योगदान के लिए अग्रिम धन्यवाद।
- Online link. https://docs.google.com/forms/d/e/1FAIpQLScla2BmyTzlI0rnYcco-F-JdsxCYIpPM7Ouk2DSSQWWcCfUcw/viewform

- स्कूल का नाम……
- उत्तरदाता का नाम ……
- छात्र / छात्रा का नाम……
- पिता का नाम ……
- माता का नाम …….
- कक्षा……
- उत्तर देने की तिथि ……

1. आपके बच्चे का लिंग
    a. पुरुष
    b. महिला
    c. अन्य

2. एक महीने में बच्चे द्वारा स्कूल जाने के लिए उपयोग किए जाने वाले तरीकों की आवृत्ति (उपयोग की गई संख्या/महीने) और आपकी प्राथमिकताएं (उच्चतम उपयोग के लिए उन्हें 1 से न्यूनतम के लिए 13 तक रैंक करें)

क्र.सं.	**यात्रा का तरीका**	**आपका वर्तमान उपयोग**	**आपकी प्राथमिकताएं**
1	पैदल चलना		
2	साइकिल चलाना		
3	ई साइकिल		
4	स्कूटी		
5	तिपहिया (विक्रम)		
6	तिपहिया (ई-रिक्शा)		
7	मोटर साइकिल		
8	व्यक्तिगत कार		
9	साझा वैन		
10	स्कूल बस		
11	सिटि बस		
12	ई-बस		
13	अन्य साधन		

3. उपरोक्त प्रतिक्रिया के आधार पर आप बच्चे की स्कूल तक की यात्रा को किस व्यापक श्रेणी में वर्गीकृत करते हैं?
    a. गैर-मोटर चालित (चलना और साइकिल चलाना)
    b. मोटर चालित (अन्य प्रकार)

4. शहर में चलने और साइकिल चलाने की सुविधा के लिए निम्नलिखित में से कौन सा कारक सबसे महत्वपूर्ण (प्राथमिकता के क्रम में) लगता है (उन्हें उच्चतम उपयोग के लिए 1 से निम्नतम के लिए 18 तक रैंक करें)

क्र.सं.	कारक	वर्तमान परिदृश्य में	भविष्य हेतु प्राथमिकता
निर्मित पर्यावरण कारक			
1	घर और स्कूल के बीच की दूरी		
2	प्रमुख रोड क्रॉसिंग की संख्या		
3	वैकल्पिक मार्ग की उपलब्धता		
4	सहपाठियों के साथ यात्रा		
5	फुटपाथ की उपस्थिति		
6	फुटपाथ की गुणवत्ता		
7	साइकिल ट्रैक की उपस्थिति		
8	साइकिल ट्रैक की गुणवता		
मनोवैज्ञानिक कारक			
9	सड़क सुरक्षा मुद्दे जैसे दुर्घटनाएं		
10	उच्च यातायात		
11	सड़क पर अपराध		
12	आवारा पशुओं की उपस्थिति		
13	मौसम		
14	सीसीटीवी की उपस्थिति		
15	ट्रैफिक लाइट		
16	यातायात पुलिस की उपस्थिति		

17	पैदल चलने / साइकल हेतु स्कूल इंफ्रास्ट्रक्चर		
18	कोई और		

5. क्या आपको लगता है, देहरादून में पैदल या साइकिल चलाना सुविधाजनक है
    a. हाँ
    b. नहीं

6. आपके घर और स्कूल के बीच कितनी दूरी है
    a. 0 - 1 कि.मी
    b. 1 - 2 कि.मी
    c. 2 - 3 कि.मी
    d. 3 - 4 कि.मी
    e. 4 - 5 कि.मी
    f. 5 किमी से अधिक

7. आपके घर से स्कूल तक की यात्रा के दौरान कितने प्रमुख रोड क्रॉसिंग आते हैं
    a. 1
    b. 2
    c. 3
    d. 4
    e. 5
    f. यदि 6 से अधिक है तो संख्या लिखें ---------

8. क्या प्रमुख क्रॉसिंग से बचने के लिए आपके घर से स्कूल तक कोई वैकल्पिक मार्ग उपलब्ध है
    a. हाँ
    b. नहीं

9. अगर आपका जवाब हां है, तो आपका बच्चा वह रास्ता क्यों नहीं अपनाता
    a. सुरक्षित महसूस नहीं करता
    b. चलने के लिए फुटपाथ नहीं है
    c. साइकिल चलाना हेतु उपयुक्त नहीं है
    d. रास्ते में आवारा पशु हैं
    e. अन्य (कृपया निर्दिष्ट करें.....

10. आपका बच्चा किसके साथ पैदल चलकर स्कूल आता है या साइकिल चला कर स्कूल आता है
    a. भाई बहनों के साथ
    b. माता - पिता के साथ
    c. दोस्तों के साथ
    d. किसी के साथ नहीं

11. क्या आपके बच्चे के रास्ते में NMT के लिए फुटपाथ, साइकिल ट्रैक या साइकिल चलाने के लिए जगह और पैदल यात्री अनुकूल क्रॉसिंग जैसी बुनियादी सुविधाएं हैं
    a. हाँ
    b. नहीं

12. अगर आपका जवाब हां है तो ऐसे इंफ्रास्ट्रक्चर की गुणवता क्या है

1 बहुत खराब	2 खराब	3 संतोषजनक	4 अच्छा	5 बहुत अच्छा
○	○	○	○	○

13. माता-पिता का व्यवसाय क्या है
    a. सरकारी सेवा
    b. निजी सेवा
    c. व्यवसाय / स्वरोजगार

14. माता-पिता दोनों कामकाजी हैं या नहीं
    a. हाँ
    b. नहीं

15. भारतीय रुपये में परिवार की आय क्या है (माता-पिता दोनों के कामकाजी होने की स्थिति में, कृपया संयुक्त आय का उत्तर दें)
    a. 100000 से कम
    b. 100001 - 500000
    c. 500001 - 1000000
    d. 1000001 - 2000000
    e. 2000000 से अधिक

16. पिता की उच्चतम शिक्षा क्या है
    a. हाई स्कूल से कम
    b. 10वीं
    c. 12वीं
    d. स्नातक की डिग्री
    e. मास्टर डिग्री
    f. पीएच.डी.

17. माँ की उच्चतम शिक्षा क्या है
    a. हाई स्कूल से कम
    b. 10वीं
    c. 12वीं
    d. स्नातक की डिग्री
    e. मास्टर डिग्री
    f. पीएच.डी.

18. क्या घर में मोटर चालित वाहन है
    a. कार
    b. मोटरसाइकिल
    c. इलेक्ट्रिक बाइक
    d. स्कूटी
    e. नहीं

19. क्या आपके बच्चे का कोई सहोदर (भाई/बहन) है

a. हाँ
b. नहीं

20. यदि आपका उत्तर हाँ है, तो क्या भाई-बहन एक ही स्कूल में पढ़ते हैं
    a. हाँ
    b. नहीं

21. घर से स्कूल की यात्रा के दौरान आप कैसा महसूस करते हैं (कृपया अपने बच्चे/बच्चों से सलाह लें)
    a. ऊर्जावान
    b. जिज्ञासु
    c. आरामदायक
    d. खुश
    e. थका हुआ
    f. ऊबा हुआ
    g. चिंतित
    h. भागमभाग

22. क्या आपको लगता है कि कार चलाना उच्च वर्गीय होने की सामाजिक धारणा है

1 निश्चित रूप से नहीं	2 शायद नहीं	3 तटस्थ	4 शायद हाँ	5 निश्चित रूप से हाँ
○	○	○	○	○

23. क्या आपको लगता है कि कार का उपयोग एक स्टेटस सिंबल है

1 निश्चित रूप से नहीं	2 शायद नहीं	3 तटस्थ	4 शायद हाँ	5 निश्चित रूप से हाँ
○	○	○	○	○

24. क्या आपको लगता है कि ट्रैफिक लाइट लगाने, सीसीटीवी कैमरा लगाने, ऑनलाइन ट्रैफिक उल्लंघन की निगरानी और अपराध का पता लगाने में तकनीकी के उपयोग के कारण सुरक्षा में वृद्धि हुई है?

1 दृढ़ता से असहमत	2 असहमत	3 तटस्थ	4 सहमत	5 दृढ़ता से सहमत हैं
○	○	○	○	○

25. यदि आप वर्तमान में मोटर चालित परिवहन से यात्रा करते हैं, तो विकल्प देने पर क्या आप भविष्य में गैर-मोटर चालित परिवहन से चलना पसंद करगे

1 बदलने को तैयार नहीं	2 नहीं हो सकता	3 तटस्थ	4 हो सकता है	5 बदलने पर सहमत हुए
○	○	○	○	○

26. आप/आपका बच्चा साइकिल से कितने दिन स्कूल जाना चाहता है
    a. एक दिन
    b. दो दिन
    c. तीन दिन
    d. चार दिन
    e. पांच दिन
    f. नहीं

27. आप/आपका बच्चा कितने दिन स्कूल पैदल जाना चाहता है

a. एक दिन
b. दो दिन
c. तीन दिन
d. चार दिन
e. पांच दिन
f. नहीं

<u>कृपया निम्नलिखित कथनों से सहमत या असहमत हों</u>

28. गैर-मोटर चालित परिवहन स्वास्थ्य के लिए अच्छा है

1 दृढ़ता से असहमत	2 असहमत	3 तटस्थ	4 सहमत	5 दृढ़ता से सहमत हैं
○	○	○	○	○

29. गैर-मोटर चालित परिवहन पर्यावरण के अनुकूल है

1 दृढ़ता से असहमत	2 असहमत	3 तटस्थ	4 सहमत	5 दृढ़ता से सहमत हैं
○	○	○	○	○

30. गैर-मोटर चालित परिवहन देहरादून में यातायात समस्या का एक अच्छा समाधान है

1 दृढ़ता से असहमत	2 असहमत	3 तटस्थ	4 सहमत	5 दृढ़ता से सहमत हैं
○	○	○	○	○

31. गैर-मोटर चालित परिवहन सड़क दुर्घटनाओं के जोखिम को कम करेगा

1 दृढ़ता से असहमत	2 असहमत	3 तटस्थ	4 सहमत	5 दृढ़ता से सहमत हैं
○	○	○	○	○

32. गैर-मोटर चालित परिवहन समय की बर्बादी है क्योंकि इससे आने-जाने के लिए अधिक समय की आवश्यकता होती है

1 दृढ़ता से असहमत	2 असहमत	3 तटस्थ	4 सहमत	5 दृढ़ता से सहमत हैं
○	○	○	○	○

33. यदि आपकी कोई विशिष्ट टिप्पणी है, तो कृपया यहाँ उल्लेख करें

_____
_____
_____
_____
_____
_____

इस अध्ययन में कुछ उत्तरदाताओं के गहन साक्षात्कार की भी आवश्यकता है। यदि आप गहन साक्षात्कार और फोकस समूह चर्चा के माध्यम से इस शोध का समर्थन करने के इच्छुक हैं, जो 30 मिनट तक चल सकता है, तो कृपया अपना ईमेल आईडी या मोबाइल नंबर प्रदान करें।

हां / नहीं ..... मोबाइल नंबर---------- / ईमेल आईडी .....

Annexure 3. Interview Guide in English

Institute of Housing and Urban Development Studies (IHS)

Erasmus University, Rotterdam, The Netherlands

Interview Guide

General Information

Name of Interviewer – Ashish Kumar Srivastava

Purpose of Interview – Thesis work for Masters in Urban Development and Management from Institute of Housing and Urban Development Studies of Erasmus University, Rotterdam, The Netherlands

Topic of Research: Factors explaining sustainable travel choices in school trips – A case study of Dehradun, India

Structure of Interview – Semi structured with open ended questions

Explanation about confidentiality: The data will solely be used for research purpose. The identity will not be disclosed to anyone at any time.

Permission to do interview – Yes/ No

Date of Interview

Online Link.
https://docs.google.com/forms/d/1aymXS1UC14xKfz_9hZQFkWCn0Ni2s2cnc3TfinBwrpo/edit?ts=644b73dd

Interview

A. Information about interviewee (in case of parents, information also about the student)

1. Name……
2. Name of Child…….
3. Class and School…….
4. Primary Mode of travel to school……
5. Duration of stay in Dehradun……..

B. Built environment factors

1. What is your opinion about current Non-Motorised Transport (NMT means walking/ cycling) specific infrastructure in the city?

2. Which infrastructure do you think is most important to promote NMT?

3. Do you think school of your child has sufficient facilities to promote NMT?

C. Socio-economic factors

1. Do you think walking and cycling is considered as a reflection on status in society?

2. Do you observe any pattern in level of NMT and income of the family?

D. Psychological factors

1. What is your biggest concern related to NMT in Dehradun?

2. Do you observe any pattern in students who use NMT to come to school and health?

3. What do you think about switching to NMT for school trips?

E. Others

1. Do you wish to recommend any policy change to promote NMT?

2. What is the major bottleneck to make Dehradun a walking and cycling city?

Concluding remarks

If you wish to know the findings of the research…….

Thanks for your cooperation.

Annexure 4. Interview Guide in Hindi

Institute of Housing and Urban Development Studies (IHS)
Erasmus University, Rotterdam, The Netherlands

साक्षात्कार गाइड

सामान्य जानकारी

- साक्षात्कारकर्ता का नाम - आशीष कुमार श्रीवास्तव
- साक्षात्कार का उद्देश्य - Erasmus University, Rotterdam, The Netherlands में परास्नातक थीसिस हेतु
- शोध का विषय: - **Factors explaining sustainable travel choices in school trips – A case study of Dehradun, India**
- साक्षात्कार की संरचना - ओपन एंडेड प्रश्नों के साथ अर्द्ध संरचित
- गोपनीयता के बारे में स्पष्टीकरण - डेटा का उपयोग केवल अनुसंधान उद्देश्य के लिए किया जाएगा। किसी भी समय पहचान किसी के सामने प्रकट नहीं की जाएगी।
- साक्षात्कार करने की अनुमति – हाँ/नहीं
- साक्षात्कार की तिथि - / 05 / 2023
- Online link.
  https://docs.google.com/forms/d/1aymXS1UC14xKfz_9hZQFkWCn0Ni2s2cnc3TfinBwrpo/edit?ts=644b73dd

साक्षात्कार

साक्षात्कार देने वाले के बारे में जानकारी

1. नाम……
2. बच्चे के नाम……
3. कक्षा और स्कूल ……
4. स्कूल जाने के लिए प्राथमिक साधन ……
5. देहरादून में रहने की अवधि……

A. निर्मित पर्यावरण कारक-

1. शहर में वर्तमान गैर-मोटर चालित परिवहन (एनएमटी अर्थात पैदल / साइकिल) विशिष्ट बुनियादी ढांचे के बारे में आपकी क्या राय है?
2. एनएमटी को बढ़ावा देने के लिए आपको कौन सा बुनियादी ढांचा सबसे महत्वपूर्ण लगता है?
3. क्या आपको लगता है कि एनएमटी को बढ़ावा देने के लिए आपके बच्चे के स्कूल में पर्याप्त सुविधाएं हैं?

B. सामाजिक-आर्थिक कारक-

3. क्या आपको लगता है कि पैदल चलना और साइकिल चलाना समाज में उच्च स्थिति का प्रतिबिंब माना जाता है?
4. क्या आप बच्चों के पैदल या साइकिल से स्कूल आने और उनके परिवार की आय में कोई सम्बंध देखते हैं ?

C. मनोवैज्ञानिक कारक

1. देहरादून में NMT से जुड़ी आपकी सबसे बड़ी चिंता क्या है?
2. क्या आप छात्रों के पैदल या साइकिल से स्कूल आने और उनके स्वस्थ में कोई सम्बंध देखते हैं?
3. स्कूल यात्राओं के लिए NMT पर स्विच करने के बारे में आप क्या सोचते हैं?

D. अन्य

3. क्या आप एनएमटी को बढ़ावा देने के लिए किसी नीतिगत बदलाव की सिफारिश करना चाहते हैं?

4. देहरादून को पैदल और साइकिल चलाने वाला शहर बनाने में सबसे बड़ी बाधा क्या है?

समापन टिप्पणी

यदि आप शोध के निष्कर्ष जानना चाहते हैं ----------

सहयोग हेतु आपका धन्यवाद

Annexure 5. Hypotheses Testing

Table. A1. Hypotheses related to relationship between different factors and level of NMT as per actual use-based preference tested in the study.

Factors	Indicators	Hypothesis	β Value	R^2 Value	Significance	Outcome
Built Environment	a. Distance travelled to reach school	Increase in distance from home to school will decrease the level of NMT.	-0.410	0.168	.000***	Accepted
	b. Major traffic crossing in the route	Increase number of major crossings will decrease level of NMT.	-0.377	0.142	.000***	Accepted
	c. Alternate route to the school is available	Increase in number of alternative routes will increase the preference for NMT.	-0.109	0.012	.032**	Not Accepted
	d. NMT-friendly infrastructure is available	Increase in number of NMT friendly components in infrastructure will increase the use of NMT.	-0.252	0.061	.000***	Not Accepted
Socio-Economic	a. Gender of child	Gender has an effect of level of preference for NMT	-0.195	0.038	.000***	Accepted
	b. School Status	Level of preference for NMT will be higher in case of students of public schools in comparison to private schools.	0.383	0.147	.000***	Accepted
	c. Occupation of parents	Salaried parents will have less preference for NMT in comparison to self-employed parents.	0.158	0.025	.002**	Accepted
	d. Both parents are working	NMT will be less preferred mode, if both parents are working.	-0.020	0.000	.690	Not Accepted
	e. The income of household	NMT will have less preference in the households having higher income.	-0.196	0.038	.000***	Accepted

	f. Education level of the father	Level of preference for NMT will be lesser for students whose parents are highly educated parents.	-0.448	0.201	.000***	Accepted
	g. Education level of mother		-0.405	0.164	.000***	Accepted
	h. Household structure	Not possible to make hypothesis.	NA	NA	NA	NA
	i. The sibling study in same school	Sibling studying in same school will increase the level of NMT.	-0.003	0.000	.949	Not Accepted
Psychological	a. Emotional perception of students for NMT	Positive emotions of students during travel from home to school will increase the level of NMT.	0.000	0.000	.993	Not Accepted
	b. Perception in society	Social norms favouring car will decrease the level of NMT.	0.134	0.018	.008**	Accepted
	c. Personal attitude of the parent	Personal attitude favouring car will decrease the level of NMT.	0.173	0.030	.001**	Accepted
	d. Perceived safety in the city to attitudinal change for NMT	Increased perceived safety due to different technological interventions will increase level of NMT.	-0.027	0.001	.595	Not Accepted
	e. Personal benefit of NMT	Attitude that NMT is good for health will increase the preference for NMT.	-0.214	0.046	.000***	Not Accepted
	f. Environmental Benefit of NMT	Attitude that NMT is good for environment will increase the preference for NMT.	-0.230	0.053	.000***	Not Accepted
	g. NMT is solution for problem of traffic congestion	Attitude that NMT is solution for problem of traffic congestion will increase the preference for NMT.	-.051	0.003	.320	Not Accepted

	h. NMT is solution for problem of road accidents	Attitude that NMT is solution for problem of traffic congestion will increase the preference for NMT.	-0.020	0.000	.698	Not Accepted
	i. NMT is a time taking travel mode	Attitude that NMT is time taking will decrease the preference for NMT.	0.063	0.004	.215	Not Accepted

The hypotheses mentioned here are alternate hypothesis which is opposite to null hypothesis. ***, ** and * denote significant at 1%, 5% and 10% confidence level respectively. Green and red colours denote accepted and rejected hypotheses respectively and shades represent the significance levels.

Table. A2. Hypotheses related to relationship between different factors and level of NMT as per desired preference tested in the study.

Factors	Indicators	Hypothesis	β Value	R^2 Value	Significance	Outcome
Built Environment	a. Distance travelled to reach school	Increase in distance from home to school will decrease the level of NMT.	-0.344	0.119	.000***	Accepted
	b. Major traffic crossing in the route	Increase number of major crossings will decrease level of NMT.	-0.247	0.061	.000***	Accepted
	c. Alternate route to the school is available	Increase in number of alternative routes will increase the preference for NMT.	-0.164	0.027	.001**	Not Accepted
	d. NMT-friendly infrastructure is available	Increase in number of NMT friendly components in infrastructure will increase the use of NMT.	-0.117	0.014	.022**	Not Accepted
Socio-Economic	a. Gender of child	Gender has an effect of level of preference for NMT	-0.163	0.027	.001**	Accepted
	b. School Status	Level of preference for NMT will be higher in case of students of public schools in comparison to private schools.	0.205	0.042	.000***	Accepted
	c. Occupation of parents	Salaried parents will have less preference for NMT in comparison to self-employed parents.	0.083	0.007	.104	Not Accepted
	d. Both parents are working	NMT will be less preferred mode, if both parents are working.	0.069	0.005	.178	Not Accepted
	e. The income of household	NMT will have less preference in the households having higher income.	-0.073	0.005	.155	Not Accepted

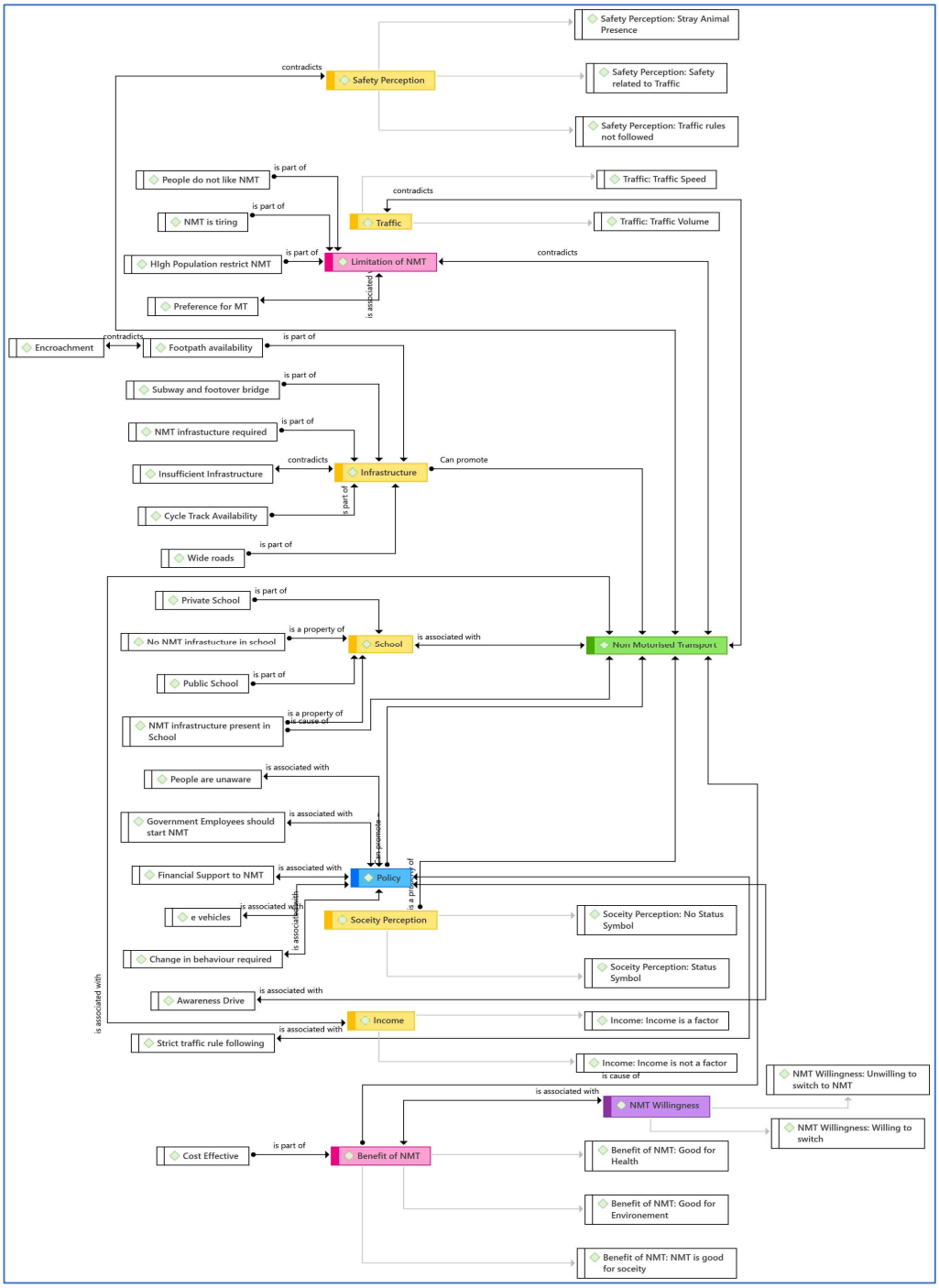
	f. Education level of the father	Level of preference for NMT will be lesser for students whose parents are highly educated parents.	-0.300	0.090	.000***	Accepted
	g. Education level of mother		-0.283	0.080	.000***	Accepted
	h. Household structure	Not possible to make hypothesis.	NA	NA	NA	NA
	i. The sibling study in same school	Sibling studying in same school will increase the level of NMT.	-0.020	0.000	.703	Not Accepted
Psychological	a. Emotional perception of students for NMT	Positive emotions of students during travel from home to school will increase the level of NMT.	0.009	0.000	.858	Not Accepted
	b. Perception in society	Social norms favouring car will decrease the level of NMT.	0.090	0.008	.077*	Accepted
	c. Personal attitude of the parent	Personal attitude favouring car will decrease the level of NMT.	0.116	0.013	.023**	Accepted
	d. Perceived safety in the city to attitudinal change for NMT	Increased perceived safety due to different technological interventions will increase level of NMT.	-0.071	0.005	.159	Not Accepted
	e. Personal benefit of NMT	Attitude that NMT is good for health will increase the preference for NMT.	-0.129	0.017	.011**	Not Accepted
	f. Environmental Benefit of NMT	Attitude that NMT is good for environment will increase the preference for NMT.	-0.140	0.020	.006**	Not Accepted
	g. NMT is solution for problem of traffic congestion	Attitude that NMT is solution for problem of traffic congestion will increase the preference for NMT.	-.100	0.010	.050**	Not Accepted

	h. NMT is solution for problem of road accidents	Attitude that NMT is solution for problem of traffic congestion will increase the preference for NMT.	-0.012	0.000	.819	Not Accepted
	i. NMT is a time taking travel mode	Attitude that NMT is time taking will decrease the preference for NMT.	0.103	0.011	.044**	Accepted

The hypotheses mentioned here are alternate hypothesis which is opposite to null hypothesis. ***, ** and * denote significant at 1%, 5% and 10% confidence level respectively. Green and red colours denote accepted and rejected hypotheses respectively and shades represent the significance levels.

Annexure 6. Network Diagram

Detailed network diagram of different factors explaining level of NMT as per current use and desired preference.



Annexure 7. Descriptive Statistics

As obtained using SPSS Software Version 26

A. ANOVA between different independent variables and present level of NMT

		Sum of Squares	df	Mean Square	F	Sig.
School Status	Between Groups	31.544	23	1.371	7.611	.000
	Within Groups	65.954	366	.180		
	Total	97.497	389			
Gender of your child	Between Groups	27.837	23	1.210	6.382	.000
	Within Groups	69.407	366	.190		
	Total	97.244	389			
What is distance between your home and school	Between Groups	254.687	22	11.577	4.886	.000
	Within Groups	867.164	366	2.369		
	Total	1121.851	388			
How many major road crossings come during the trip from your home to school	Between Groups	179.708	23	7.813	3.982	.000
	Within Groups	716.215	365	1.962		
	Total	895.923	388			
With whom do your child walk or cycle	Between Groups	30.663	23	1.333	1.408	.102
	Within Groups	340.962	360	.947		
	Total	371.625	383			
If your answer is yes, what is the quality of such infrastructure/	Between Groups	39.498	23	1.717	1.694	.026
	Within Groups	323.359	319	1.014		
	Total	362.857	342			
What is the occupation of parents	Between Groups	13.308	23	.579	1.286	.172
	Within Groups	161.919	360	.450		
	Total	175.227	383			
What is the income of household in Indian Rupees	Between Groups	85.425	23	3.714	2.274	.001
	Within Groups	586.376	359	1.633		
	Total	671.802	382			
What is the highest education of father	Between Groups	272.099	23	11.830	6.150	.000
	Within Groups	698.309	363	1.924		
	Total	970.408	386			
What is the highest education of mother	Between Groups	275.305	23	11.970	5.516	.000
	Within Groups	779.097	359	2.170		
	Total	1054.402	382			
How do you feel during your travel from home to school	Between Groups	120.773	23	5.251	1.520	.060
	Within Groups	1263.986	366	3.454		
	Total	1384.759	389			
Do you feel that driving a car is a societal perception of being higher class	Between Groups	46.492	23	2.021	1.089	.355
	Within Groups	668.497	360	1.857		

	Total	714.990	383			
Do you feel use of car is a status symbol (to be filled by parents)	Between Groups	93.656	23	4.072	2.267	.001
	Within Groups	648.302	361	1.796		
	Total	741.958	384			
Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection	Between Groups	18.470	23	.803	.923	.568
	Within Groups	317.643	365	.870		
	Total	336.113	388			
If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	Between Groups	61.656	23	2.681	2.264	.001
	Within Groups	428.678	362	1.184		
	Total	490.334	385			
You/ your child wish to cycle to school for	Between Groups	73.958	23	3.216	2.261	.001
	Within Groups	519.070	365	1.422		
	Total	593.028	388			
You/ your child wish to walk to school for	Between Groups	102.080	23	4.438	2.044	.003
	Within Groups	786.014	362	2.171		
	Total	888.093	385			
Non-motorised transport is good for health	Between Groups	44.181	23	1.921	1.758	.018
	Within Groups	397.633	364	1.092		
	Total	441.814	387			
Non-motorised transport is environment friendly	Between Groups	42.844	23	1.863	1.686	.026
	Within Groups	403.295	365	1.105		
	Total	446.139	388			
Non-motorised transport is a good solution to traffic problem in Dehradun	Between Groups	14.034	23	.610	.577	.943
	Within Groups	384.049	363	1.058		
	Total	398.083	386			
Non-motorised transport will reduce the risk of road accidents	Between Groups	18.819	23	.818	.824	.701
	Within Groups	362.384	365	.993		
	Total	381.203	388			
Non-motorised transport is a wastage of time as it requires more time to commute	Between Groups	65.932	23	2.867	2.919	.000
	Within Groups	352.585	359	.982		
	Total	418.517	382			

B. ANOVA between different independent variables and present level of walking

		Sum of Squares	df	Mean Square	F	Sig.
School Status	Between Groups	25.755	12	2.146	11.626	.000
	Within Groups	64.245	348	.185		
	Total	90.000	360			
Gender of your child	Between Groups	5.537	12	.461	1.897	.034
	Within Groups	84.629	348	.243		
	Total	90.166	360			
What is distance between your home and school	Between Groups	171.505	12	14.292	5.937	.000
	Within Groups	835.270	347	2.407		
	Total	1006.775	359			
How many major road crossings come during the trip from your home to school	Between Groups	96.194	12	8.016	4.075	.000
	Within Groups	682.581	347	1.967		
	Total	778.775	359			
With whom do your child walk or cycle	Between Groups	14.128	12	1.177	1.199	.282
	Within Groups	338.803	345	.982		
	Total	352.930	357			
If your answer is yes, what is the quality of such infrastructure/	Between Groups	32.528	12	2.711	2.679	.002
	Within Groups	324.840	321	1.012		
	Total	357.368	333			
What is the occupation of parents	Between Groups	13.678	12	1.140	2.811	.001
	Within Groups	138.677	342	.405		
	Total	152.355	354			
What is the income of household in Indian Rupees	Between Groups	58.823	12	4.902	3.025	.000
	Within Groups	554.135	342	1.620		
	Total	612.958	354			
What is the highest education of father	Between Groups	220.458	12	18.372	9.919	.000
	Within Groups	639.006	345	1.852		
	Total	859.464	357			
What is the highest education of mother	Between Groups	203.450	12	16.954	7.868	.000
	Within Groups	734.836	341	2.155		
	Total	938.285	353			
How do you feel during your travel from home to school	Between Groups	103.863	12	8.655	2.543	.003
	Within Groups	1184.513	348	3.404		
	Total	1288.377	360			
Do you feel that driving a car is a societal perception of being higher class	Between Groups	33.126	12	2.760	1.514	.117
	Within Groups	623.392	342	1.823		

	Total	656.518	354			
Do you feel use of car is a status symbol (to be filled by parents)	Between Groups	83.468	12	6.956	3.958	.000
	Within Groups	602.734	343	1.757		
	Total	686.202	355			
Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection	Between Groups	4.336	12	.361	.401	.963
	Within Groups	312.986	347	.902		
	Total	317.322	359			
If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	Between Groups	71.555	12	5.963	5.570	.000
	Within Groups	368.277	344	1.071		
	Total	439.832	356			
You/ your child wish to cycle to school for	Between Groups	41.460	12	3.455	2.473	.004
	Within Groups	484.871	347	1.397		
	Total	526.331	359			
You/ your child wish to walk to school for	Between Groups	54.329	12	4.527	2.035	.021
	Within Groups	765.268	344	2.225		
	Total	819.597	356			
Non-motorised transport is good for health	Between Groups	30.691	12	2.558	2.248	.010
	Within Groups	393.732	346	1.138		
	Total	424.423	358			
Non-motorised transport is environment friendly	Between Groups	41.636	12	3.470	3.216	.000
	Within Groups	374.319	347	1.079		
	Total	415.956	359			
Non-motorised transport is a good solution to traffic problem in Dehradun	Between Groups	17.905	12	1.492	1.456	.139
	Within Groups	353.562	345	1.025		
	Total	371.466	357			
Non-motorised transport will reduce the risk of road accidents	Between Groups	22.463	12	1.872	1.960	.027
	Within Groups	331.401	347	.955		
	Total	353.864	359			
Non-motorised transport is a wastage of time as it requires more time to commute	Between Groups	41.902	12	3.492	3.470	.000
	Within Groups	343.163	341	1.006		
	Total	385.065	353			

C. ANOVA between different independent variables and present level of cycling

		Sum of Squares	df	Mean Square	F	Sig.
School Status	Between Groups	14.094	12	1.175	5.398	.000
	Within Groups	73.766	339	.218		
	Total	87.861	351			
Gender of your child	Between Groups	22.012	12	1.834	9.444	.000
	Within Groups	65.849	339	.194		
	Total	87.861	351			
What is distance between your home and school	Between Groups	130.344	12	10.862	4.407	.000
	Within Groups	833.097	338	2.465		
	Total	963.442	350			
How many major road crossings come during the trip from your home to school	Between Groups	65.742	12	5.479	2.706	.002
	Within Groups	686.255	339	2.024		
	Total	751.997	351			
With whom do your child walk or cycle	Between Groups	2.627	12	.219	.218	.998
	Within Groups	337.327	336	1.004		
	Total	339.954	348			
If your answer is yes, what is the quality of such infrastructure/	Between Groups	21.501	12	1.792	1.718	.062
	Within Groups	328.496	315	1.043		
	Total	349.997	327			
What is the occupation of parents	Between Groups	5.272	12	.439	1.013	.436
	Within Groups	144.370	333	.434		
	Total	149.642	345			
What is the income of household in Indian Rupees	Between Groups	43.250	12	3.604	2.161	.013
	Within Groups	555.365	333	1.668		
	Total	598.616	345			
What is the highest education of father	Between Groups	104.280	12	8.690	3.934	.000
	Within Groups	742.127	336	2.209		
	Total	846.407	348			
What is the highest education of mother	Between Groups	94.734	12	7.894	3.162	.000
	Within Groups	828.820	332	2.496		
	Total	923.554	344			
How do you feel during your travel from home to school	Between Groups	48.824	12	4.069	1.165	.307
	Within Groups	1183.536	339	3.491		
	Total	1232.361	351			
	Between Groups	45.251	12	3.771	2.101	.017

Do you feel that driving a car is a societal perception of being higher class	Within Groups	597.711	333	1.795		
	Total	642.962	345			
Do you feel use of car is a status symbol (to be filled by parents)	Between Groups	48.453	12	4.038	2.175	.013
	Within Groups	620.094	334	1.857		
	Total	668.548	346			
Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection	Between Groups	9.000	12	.750	.832	.617
	Within Groups	304.743	338	.902		
	Total	313.744	350			
If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	Between Groups	23.761	12	1.980	1.650	.077
	Within Groups	401.971	335	1.200		
	Total	425.733	347			
You/ your child wish to cycle to school for	Between Groups	25.616	12	2.135	1.456	.139
	Within Groups	495.604	338	1.466		
	Total	521.219	350			
You/ your child wish to walk to school for	Between Groups	59.603	12	4.967	2.338	.007
	Within Groups	711.661	335	2.124		
	Total	771.264	347			
Non-motorised transport is good for health	Between Groups	17.101	12	1.425	1.209	.275
	Within Groups	397.267	337	1.179		
	Total	414.369	349			
Non-motorised transport is environment friendly	Between Groups	16.012	12	1.334	1.144	.324
	Within Groups	394.386	338	1.167		
	Total	410.399	350			
Non-motorised transport is a good solution to traffic problem in Dehradun	Between Groups	7.975	12	.665	.635	.812
	Within Groups	351.865	336	1.047		
	Total	359.840	348			
Non-motorised transport will reduce the risk of road accidents	Between Groups	17.231	12	1.436	1.465	.136
	Within Groups	331.373	338	.980		
	Total	348.604	350			
Non-motorised transport is a wastage of time as it requires more time to commute	Between Groups	43.759	12	3.647	3.614	.000
	Within Groups	334.995	332	1.009		
	Total	378.754	344			

D. ANOVA between different independent variables and preference to NMT

		Sum of Squares	df	Mean Square	F	Sig.
School Status	Between Groups	24.461	24	1.019	5.093	.000
	Within Groups	73.036	365	.200		
	Total	97.497	389			
8. Gender of your child	Between Groups	13.775	24	.574	2.510	.000
	Within Groups	83.469	365	.229		
	Total	97.244	389			
13. What is distance between your home and school	Between Groups	190.130	24	7.922	3.095	.000
	Within Groups	931.721	364	2.560		
	Total	1121.851	388			
14. How many major road crossings come during the trip from your home to school	Between Groups	106.251	24	4.427	2.041	.003
	Within Groups	789.672	364	2.169		
	Total	895.923	388			
17. With whom do your child walk or cycle	Between Groups	23.089	24	.962	.991	.477
	Within Groups	348.536	359	.971		
	Total	371.625	383			
19. If your answer is yes, what is the quality of such infrastructure/	Between Groups	41.191	24	1.716	1.697	.023
	Within Groups	321.667	318	1.012		
	Total	362.857	342			
20.What is the occupation of parents	Between Groups	12.498	24	.521	1.149	.288
	Within Groups	162.728	359	.453		
	Total	175.227	383			
22.What is the income of household in Indian Rupees	Between Groups	64.631	24	2.693	1.588	.041
	Within Groups	607.170	358	1.696		
	Total	671.802	382			
23.What is the highest education of father	Between Groups	235.094	24	9.796	4.822	.000
	Within Groups	735.314	362	2.031		
	Total	970.408	386			
24.What is the highest education of mother	Between Groups	215.182	24	8.966	3.825	.000
	Within Groups	839.220	358	2.344		
	Total	1054.402	382			
28. How do you feel during your travel from home to school	Between Groups	136.120	24	5.672	1.658	.028
	Within Groups	1248.639	365	3.421		
	Total	1384.759	389			
29. Do you feel that driving a car is a societal perception of being higher class	Between Groups	46.578	24	1.941	1.042	.410
	Within Groups	668.411	359	1.862		
	Total	714.990	383			
30. Do you feel use of car is a status symbol (to be filled by parents)	Between Groups	90.148	24	3.756	2.075	.002
	Within Groups	651.811	360	1.811		
	Total	741.958	384			
31. Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection	Between Groups	26.593	24	1.108	1.303	.157
	Within Groups	309.520	364	.850		
	Total	336.113	388			

32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	Between Groups	69.052	24	2.877	2.465	.000
	Within Groups	421.282	361	1.167		
	Total	490.334	385			
33. You/ your child wish to cycle to school for	Between Groups	57.723	24	2.405	1.635	.032
	Within Groups	535.306	364	1.471		
	Total	593.028	388			
34. You/ your child wish to walk to school for	Between Groups	84.610	24	3.525	1.584	.042
	Within Groups	803.483	361	2.226		
	Total	888.093	385			
35. Non-motorised transport is good for health	Between Groups	50.397	24	2.100	1.947	.005
	Within Groups	391.418	363	1.078		
	Total	441.814	387			
36. Non-motorised transport is environment friendly	Between Groups	60.628	24	2.526	2.385	.000
	Within Groups	385.511	364	1.059		
	Total	446.139	388			
37. Non-motorised transport is a good solution to traffic problem in Dehradun	Between Groups	28.127	24	1.172	1.147	.290
	Within Groups	369.956	362	1.022		
	Total	398.083	386			
38. Non-motorised transport will reduce the risk of road accidents	Between Groups	24.738	24	1.031	1.053	.397
	Within Groups	356.465	364	.979		
	Total	381.203	388			
39. Non-motorised transport is a wastage of time as it requires more time to commute	Between Groups	60.585	24	2.524	2.525	.000
	Within Groups	357.932	358	1.000		
	Total	418.517	382			

E. ANOVA between different independent variables and preference to Walking

		Sum of Squares	df	Mean Square	F	Sig.
School Status	Between Groups	25.785	12	2.149	11.435	.000
	Within Groups	68.213	363	.188		
	Total	93.997	375			
8. Gender of your child	Between Groups	13.148	12	1.096	4.932	.000
	Within Groups	80.636	363	.222		
	Total	93.785	375			
13. What is distance between your home and school	Between Groups	130.461	12	10.872	4.148	.000
	Within Groups	948.856	362	2.621		
	Total	1079.317	374			
14. How many major road crossings come during the trip from your home to school	Between Groups	63.898	12	5.325	2.470	.004
	Within Groups	780.502	362	2.156		
	Total	844.400	374			
17. With whom do your child walk or cycle	Between Groups	12.443	12	1.037	1.088	.369
	Within Groups	342.102	359	.953		
	Total	354.546	371			
19. If your answer is yes, what is the quality of such infrastructure/	Between Groups	33.240	12	2.770	2.785	.001
	Within Groups	323.260	325	.995		
	Total	356.500	337			
20.What is the occupation of parents	Between Groups	12.084	12	1.007	2.340	.007
	Within Groups	153.659	357	.430		
	Total	165.743	369			
22.What is the income of household in Indian Rupees	Between Groups	41.775	12	3.481	2.111	.016
	Within Groups	586.979	356	1.649		
	Total	628.753	368			
23.What is the highest education of father	Between Groups	179.316	12	14.943	7.216	.000
	Within Groups	745.462	360	2.071		
	Total	924.777	372			
24.What is the highest education of mother	Between Groups	180.810	12	15.068	6.466	.000
	Within Groups	831.960	357	2.330		
	Total	1012.770	369			
28. How do you feel during your travel from home to school	Between Groups	51.790	12	4.316	1.209	.275
	Within Groups	1295.803	363	3.570		
	Total	1347.593	375			
29. Do you feel that driving a car is a societal perception of being higher class	Between Groups	32.062	12	2.672	1.468	.134
	Within Groups	649.949	357	1.821		
	Total	682.011	369			
30. Do you feel use of car is a status symbol (to be filled by parents)	Between Groups	91.984	12	7.665	4.418	.000
	Within Groups	622.884	359	1.735		
	Total	714.868	371			
31. Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection	Between Groups	12.180	12	1.015	1.175	.299
	Within Groups	313.597	363	.864		
	Total	325.777	375			

32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	Between Groups	52.926	12	4.410	3.794	.000
	Within Groups	417.386	359	1.163		
	Total	470.312	371			
33. You/ your child wish to cycle to school for	Between Groups	27.057	12	2.255	1.467	.134
	Within Groups	556.532	362	1.537		
	Total	583.589	374			
34. You/ your child wish to walk to school for	Between Groups	55.915	12	4.660	2.101	.016
	Within Groups	796.117	359	2.218		
	Total	852.032	371			
35. Non-motorised transport is good for health	Between Groups	41.377	12	3.448	3.213	.000
	Within Groups	387.385	361	1.073		
	Total	428.762	373			
36. Non-motorised transport is environment friendly	Between Groups	32.761	12	2.730	2.486	.004
	Within Groups	397.623	362	1.098		
	Total	430.384	374			
37. Non-motorised transport is a good solution to traffic problem in Dehradun	Between Groups	29.388	12	2.449	2.534	.003
	Within Groups	347.888	360	.966		
	Total	377.276	372			
38. Non-motorised transport will reduce the risk of road accidents	Between Groups	15.055	12	1.255	1.323	.203
	Within Groups	343.345	362	.948		
	Total	358.400	374			
39. Non-motorised transport is a wastage of time as it requires more time to commute	Between Groups	47.089	12	3.924	3.869	.000
	Within Groups	361.106	356	1.014		
	Total	408.195	368			

F. ANOVA between different independent variables and preference to Cycling

		Sum of Squares	df	Mean Square	F	Sig.
School Status	Between Groups	13.794	12	1.150	5.199	.000
	Within Groups	80.706	365	.221		
	Total	94.500	377			
8. Gender of your child	Between Groups	11.850	12	.988	4.378	.000
	Within Groups	82.329	365	.226		
	Total	94.180	377			
13. What is distance between your home and school	Between Groups	132.813	12	11.068	4.213	.000
	Within Groups	956.327	364	2.627		
	Total	1089.141	376			
14. How many major road crossings come during the trip from your home to school	Between Groups	36.030	12	3.002	1.332	.198
	Within Groups	820.352	364	2.254		
	Total	856.382	376			
17. With whom do your child walk or cycle	Between Groups	16.288	12	1.357	1.423	.153
	Within Groups	344.261	361	.954		
	Total	360.548	373			
19. If your answer is yes, what is the quality of such infrastructure/	Between Groups	25.466	12	2.122	2.052	.020
	Within Groups	337.106	326	1.034		
	Total	362.572	338			
20.What is the occupation of parents	Between Groups	8.537	12	.711	1.604	.088
	Within Groups	159.195	359	.443		
	Total	167.731	371			
22.What is the income of household in Indian Rupees	Between Groups	8.278	12	.690	.394	.965
	Within Groups	626.191	358	1.749		
	Total	634.469	370			
23.What is the highest education of father	Between Groups	88.154	12	7.346	3.152	.000
	Within Groups	843.803	362	2.331		
	Total	931.957	374			
24.What is the highest education of mother	Between Groups	81.975	12	6.831	2.625	.002
	Within Groups	931.561	358	2.602		
	Total	1013.536	370			
28. How do you feel during your travel from home to school	Between Groups	47.476	12	3.956	1.096	.362
	Within Groups	1317.466	365	3.609		
	Total	1364.942	377			
29. Do you feel that driving a car is a societal perception of being higher class	Between Groups	37.362	12	3.114	1.724	.060
	Within Groups	648.345	359	1.806		
	Total	685.707	371			
30. Do you feel use of car is a status symbol (to be filled by parents)	Between Groups	88.961	12	7.413	4.254	.000
	Within Groups	627.425	360	1.743		
	Total	716.386	372			
31. Do you think safety has increased due to installation of traffic lights, CCTV camera, online traffic violation monitoring and use of technology in crime detection	Between Groups	7.428	12	.619	.708	.744
	Within Groups	318.376	364	.875		
	Total	325.804	376			
32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	Between Groups	63.136	12	5.261	4.543	.000
	Within Groups	418.097	361	1.158		
	Total	481.233	373			
33. You/ your child wish to cycle to school for	Between Groups	46.316	12	3.860	2.606	.002
	Within Groups	539.026	364	1.481		
	Total	585.342	376			
34. You/ your child wish to walk to school for	Between Groups	54.138	12	4.511	2.029	.021
	Within Groups	802.496	361	2.223		

	Total	856.634	373			
35. Non-motorised transport is good for health	Between Groups	18.665	12	1.555	1.367	.180
	Within Groups	413.120	363	1.138		
	Total	431.785	375			
36. Non-motorised transport is environment friendly	Between Groups	17.977	12	1.498	1.303	.214
	Within Groups	418.469	364	1.150		
	Total	436.446	376			
37. Non-motorised transport is a good solution to traffic problem in Dehradun	Between Groups	12.347	12	1.029	1.010	.439
	Within Groups	368.811	362	1.019		
	Total	381.157	374			
38. Non-motorised transport will reduce the risk of road accidents	Between Groups	9.781	12	.815	.835	.614
	Within Groups	355.158	364	.976		
	Total	364.939	376			
39. Non-motorised transport is a wastage of time as it requires more time to commute	Between Groups	53.048	12	4.421	4.442	.000
	Within Groups	357.275	359	.995		
	Total	410.323	371			

G. Multiple Linear Regression between present use of NMT and different independent variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.558[a]	.312	.277	6.059

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 24.What is the highest education of mother, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 8. Gender of your child , 34. You/ your child wish to walk to school for, 14. How many major road crossings come during the trip from your home to school, 19. If your answer is yes, what is the quality of such infrastructure/, 30. Do you feel use of car is a status symbol (to be filled by parents), 33. You/ your child wish to cycle to school for, 35. Non-motorised transport is good for health, 22.What is the income of household in Indian Rupees, 36. Non-motorised transport is environment friendly, 13. What is distance between your home and school, School Status, 23.What is the highest education of father

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4951.467	15	330.098	8.991	.000[a]
	Residual	10940.651	298	36.714		
	Total	15892.118	313			

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 24.What is the highest education of mother, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 8. Gender of your child , 34. You/ your child wish to walk to school for, 14. How many major road crossings come during the trip from your home to school, 19. If your answer is yes, what is the quality of such infrastructure/, 30. Do you feel use of car is a status symbol (to be filled by parents), 33. You/ your child wish to cycle to school for, 35. Non-motorised transport is good for health, 22.What is the income of household in Indian Rupees, 36. Non-motorised transport is environment friendly, 13. What is distance between your home and school, School Status, 23.What is the highest education of father

b. Dependent Variable: C_Non Moterised

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.816	3.876		4.854	.000
	School Status	3.720	1.125	.261	3.306	.001
	Gender of your child	-1.504	.716	-.106	-2.101	.036
	What is distance between your home and school	-.942	.268	-.229	-3.514	.001
	How many major road crossings come during the trip from your home to school	-.655	.280	-.142	-2.340	.020
	If your answer is yes, what is the quality of such infrastructure/	.379	.370	.054	1.025	.306
	What is the income of household in Indian Rupees	.660	.317	.127	2.078	.039
	What is the highest education of father	-.547	.403	-.120	-1.358	.176
	What is the highest education of mother	-.112	.378	-.026	-.296	.768
	Do you feel use of car is a status symbol (to be filled by parents)	.760	.260	.150	2.926	.004
	If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	.441	.325	.070	1.357	.176
	You/ your child wish to cycle to school for	-.205	.295	-.036	-.697	.487
	You/ your child wish to walk to school for	.079	.248	.017	.320	.749

Non-motorised transport is good for health	-.600	.418	-.087	-1.435	.152
Non-motorised transport is environment friendly	.189	.421	.028	.448	.654
Non-motorised transport is a wastage of time as it requires more time to commute	-.012	.346	-.002	-.034	.973

a. Dependent Variable: C_Non Moterised

H. Multiple Linear Regression between present use of walking and different independent variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.617[a]	.380	.341	3.012

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 33. You/ your child wish to cycle to school for, 35. Non-motorised transport is good for health, 8. Gender of your child , 14. How many major road crossings come during the trip from your home to school, 28. How do you feel during your travel from home to school , 22.What is the income of household in Indian Rupees, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 34. You/ your child wish to walk to school for, 20.What is the occupation of parents, 19. If your answer is yes, what is the quality of such infrastructure/, 30. Do you feel use of car is a status symbol (to be filled by parents), 24.What is the highest education of mother, 38. Non-motorised transport will reduce the risk of road accidents, 36. Non-motorised transport is environment friendly, 13. What is distance between your home and school, School Status, 23.What is the highest education of father

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1569.483	18	87.193	9.609	.000[a]
	Residual	2558.783	282	9.074		
	Total	4128.266	300			

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 33. You/ your child wish to cycle to school for, 35. Non-motorised transport is good for health, 8. Gender of your child , 14. How many major road crossings come during the trip from your home to school, 28. How do you feel during your travel from home to school , 22.What is the income of household in Indian Rupees, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 34. You/ your child wish to walk to school for, 20.What is the occupation of parents, 19. If your answer is yes, what is the quality of such infrastructure/, 30. Do you feel use of car is a status symbol (to be filled by parents), 24.What is the highest education of mother, 38. Non-motorised transport will reduce the risk of road accidents, 36. Non-motorised transport is environment friendly, 13. What is distance between your home and school, School Status, 23.What is the highest education of father

b. Dependent Variable: C_Walking

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.443	2.066		4.571	.000
	School Status	2.202	.589	.296	3.738	.000
	Gender of your child	-.355	.364	-.048	-.975	.330
	What is distance between your home and school	-.602	.137	-.280	-4.385	.000
	How many major road crossings come during the trip from your home to school	-.151	.145	-.063	-1.043	.298
	If your answer is yes, what is the quality of such infrastructure/	.146	.188	.040	.775	.439
	What is the occupation of parents	.023	.293	.004	.079	.937
	What is the income of household in Indian Rupees	.201	.160	.075	1.257	.210
	What is the highest education of father	-.213	.202	-.089	-1.055	.292
	What is the highest education of mother	-.122	.188	-.054	-.649	.517
	How do you feel during your travel from home to school	-.073	.101	-.037	-.730	.466
	Do you feel use of car is a status symbol (to be filled by parents)	.545	.140	.206	3.897	.000
	If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	.293	.166	.089	1.764	.079

You/ your child wish to cycle to school for	-.093	.150	-.031	-.621	.535
You/ your child wish to walk to school for	-.123	.129	-.049	-.956	.340
Non-motorised transport is good for health	-.107	.231	-.030	-.463	.644
Non-motorised transport is environment friendly	-.163	.223	-.046	-.734	.463
Non-motorised transport will reduce the risk of road accidents	.089	.219	.023	.405	.686
Non-motorised transport is a wastage of time as it requires more time to commute	.011	.181	.003	.060	.952

a. Dependent Variable: C_Walking

I. Multiple Linear Regression between present use of cycling and different independent variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.510[a]	.260	.234	2.859

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 24.What is the highest education of mother, 8. Gender of your child , 29. Do you feel that driving a car is a societal perception of being higher class, 34. You/ your child wish to walk to school for, 14. How many major road crossings come during the trip from your home to school, 22.What is the income of household in Indian Rupees, 30. Do you feel use of car is a status symbol (to be filled by parents), 13. What is distance between your home and school, School Status, 23.What is the highest education of father

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	891.964	11	81.088	9.918	.000[a]
	Residual	2534.458	310	8.176		
	Total	3426.422	321			

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 24.What is the highest education of mother, 8. Gender of your child , 29. Do you feel that driving a car is a societal perception of being higher class, 34. You/ your child wish to walk to school for, 14. How many major road crossings come during the trip from your home to school, 22.What is the income of household in Indian Rupees, 30. Do you feel use of car is a status symbol (to be filled by parents), 13. What is distance between your home and school, School Status, 23.What is the highest education of father

b. Dependent Variable: C_Cycling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.765	1.393		7.009	.000
	School Status	1.869	.493	.286	3.795	.000
	Gender of your child	-1.770	.327	-.271	-5.406	.000
	What is distance between your home and school	-.264	.123	-.136	-2.140	.033
	How many major road crossings come during the trip from your home to school	-.233	.133	-.107	-1.755	.080
	What is the income of household in Indian Rupees	.530	.150	.219	3.533	.000
	What is the highest education of father	-.256	.177	-.123	-1.448	.149
	What is the highest education of mother	-.029	.169	-.014	-.169	.866
	Do you feel that driving a car is a societal perception of being higher class	.162	.138	.067	1.173	.242
	Do you feel use of car is a status symbol (to be filled by parents)	.217	.138	.093	1.578	.115
	You/ your child wish to walk to school for	-.020	.114	-.009	-.178	.859
	Non-motorised transport is a wastage of time as it requires more time to commute	-.041	.160	-.013	-.259	.796

a. Dependent Variable: C_Cycling

J. Multiple Linear Regression between preference for NMT and different independent variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.455[a]	.207	.164	6.096

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 24.What is the highest education of mother, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 28. How do you feel during your travel from home to school , 8. Gender of your child , 34. You/ your child wish to walk to school for, 14. How many major road crossings come during the trip from your home to school, 19. If your answer is yes, what is the quality of such infrastructure/, 33. You/ your child wish to cycle to school for, 35. Non-motorised transport is good for health, 30. Do you feel use of car is a status symbol (to be filled by parents), 22.What is the income of household in Indian Rupees, 36. Non-motorised transport is environment friendly, 13. What is distance between your home and school, School Status, 23.What is the highest education of father

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2877.972	16	179.873	4.841	.000[a]
	Residual	11036.372	297	37.160		
	Total	13914.344	313			

a. Predictors: (Constant), 39. Non-motorised transport is a wastage of time as it requires more time to commute, 24.What is the highest education of mother, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 28. How do you feel during your travel from home to school , 8. Gender of your child , 34. You/ your child wish to walk to school for, 14. How many major road crossings come during the trip from your home to school, 19. If your answer is yes, what is the quality of such infrastructure/, 33. You/ your child wish to cycle to school for, 35. Non-motorised transport is good for health, 30. Do you feel use of car is a status symbol (to be filled by parents), 22.What is the income of household in Indian Rupees, 36. Non-motorised transport is environment friendly, 13. What is distance between your home and school, School Status, 23.What is the highest education of father

b. Dependent Variable: F_Non Moterised

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	24.547	3.902		6.290	.000
	School Status	1.441	1.150	.108	1.254	.211
	Gender of your child	-1.304	.721	-.098	-1.810	.071
	What is distance between your home and school	-1.049	.270	-.272	-3.888	.000
	How many major road crossings come during the trip from your home to school	.105	.282	.024	.373	.710
	If your answer is yes, what is the quality of such infrastructure/	-.387	.373	-.059	-1.037	.301
	What is the income of household in Indian Rupees	.691	.321	.142	2.155	.032
	What is the highest education of father	-.219	.405	-.051	-.540	.589
	What is the highest education of mother	-.510	.380	-.126	-1.342	.181
	How do you feel during your travel from home to school	.210	.198	.059	1.061	.290
	Do you feel use of car is a status symbol (to be filled by parents)	.414	.267	.087	1.553	.121
	If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	.144	.327	.024	.440	.660
	You/ your child wish to cycle to school for	-.595	.297	-.111	-2.005	.046
	You/ your child wish to walk to school for	-.161	.250	-.037	-.643	.521

Non-motorised transport is good for health	-.269	.424	-.042	-.634	.527
Non-motorised transport is environment friendly	-.323	.424	-.051	-.761	.447
Non-motorised transport is a wastage of time as it requires more time to commute	.598	.352	.095	1.699	.090

a. Dependent Variable: F_Non Moterised

K. Multiple Linear Regression between preference for walking and different independent variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.460[a]	.212	.168	3.602

a. Predictors: (Constant), 37. Non-motorised transport is a good solution to traffic problem in Dehradun, 34. You/ your child wish to walk to school for, 39. Non-motorised transport is a wastage of time as it requires more time to commute, 20.What is the occupation of parents, 14. How many major road crossings come during the trip from your home to school, 8. Gender of your child , 19. If your answer is yes, what is the quality of such infrastructure/, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 22.What is the income of household in Indian Rupees, 30. Do you feel use of car is a status symbol (to be filled by parents), 35. Non-motorised transport is good for health, 24.What is the highest education of mother, 13. What is distance between your home and school, 36. Non-motorised transport is environment friendly, School Status, 23.What is the highest education of father

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1001.963	16	62.623	4.826	.000[a]
	Residual	3724.139	287	12.976		
	Total	4726.102	303			

a. Predictors: (Constant), 37. Non-motorised transport is a good solution to traffic problem in Dehradun, 34. You/ your child wish to walk to school for, 39. Non-motorised transport is a wastage of time as it requires more time to commute, 20.What is the occupation of parents, 14. How many major road crossings come during the trip from your home to school, 8. Gender of your child , 19. If your answer is yes, what is the quality of such infrastructure/, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 22.What is the income of household in Indian Rupees, 30. Do you feel use of car is a status symbol (to be filled by parents), 35. Non-motorised transport is good for health, 24.What is the highest education of mother, 13. What is distance between your home and school, 36. Non-motorised transport is environment friendly, School Status, 23.What is the highest education of father

b. Dependent Variable: F_Walking

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	10.955	2.330		4.702	.000
	School Status	1.590	.692	.201	2.296	.022
	Gender of your child	-.315	.436	-.040	-.723	.470
	What is distance between your home and school	-.559	.163	-.243	-3.420	.001
	How many major road crossings come during the trip from your home to school	.019	.171	.007	.109	.913
	If your answer is yes, what is the quality of such infrastructure/	-.429	.223	-.111	-1.922	.056
	What is the income of household in Indian Rupees	.444	.189	.155	2.342	.020
	What is the highest education of father	.069	.241	.028	.288	.774
	What is the highest education of mother	-.455	.226	-.191	-2.019	.044
	Do you feel use of car is a status symbol (to be filled by parents)	.293	.161	.104	1.822	.070
	If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	.361	.201	.103	1.796	.074
	You/ your child wish to walk to school for	-.135	.146	-.051	-.921	.358
	Non-motorised transport is good for health	-.118	.261	-.031	-.452	.652
	Non-motorised transport is environment friendly	-.179	.274	-.047	-.652	.515
	Non-motorised transport is a wastage of time as it requires more time to commute	.176	.212	.047	.829	.408
	What is the occupation of parents	-.148	.348	-.025	-.426	.670
	Non-motorised transport is a good solution to traffic problem in Dehradun	-.284	.250	-.071	-1.133	.258

a. Dependent Variable: F_Walking

L. Multiple Linear Regression between preference for cycling and different independent variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.361[a]	.131	.099	3.146

a. Predictors: (Constant), 33. You/ your child wish to cycle to school for, 8. Gender of your child , 39. Non-motorised transport is a wastage of time as it requires more time to commute, 23.What is the highest education of father, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 34. You/ your child wish to walk to school for, 19. If your answer is yes, what is the quality of such infrastructure/, 30. Do you feel use of car is a status symbol (to be filled by parents), 13. What is distance between your home and school, School Status, 24.What is the highest education of mother

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	454.598	11	41.327	4.175	.000[a]
	Residual	3028.827	306	9.898		
	Total	3483.425	317			

a. Predictors: (Constant), 33. You/ your child wish to cycle to school for, 8. Gender of your child , 39. Non-motorised transport is a wastage of time as it requires more time to commute, 23.What is the highest education of father, 32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future, 34. You/ your child wish to walk to school for, 19. If your answer is yes, what is the quality of such infrastructure/, 30. Do you feel use of car is a status symbol (to be filled by parents), 13. What is distance between your home and school, School Status, 24.What is the highest education of mother

b. Dependent Variable: F_Cycling

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	14.140	1.714		8.248	.000
	School Status	.042	.518	.006	.081	.935
	8. Gender of your child	-.912	.363	-.138	-2.508	.013
	13. What is distance between your home and school	-.308	.116	-.159	-2.657	.008
	19. If your answer is yes, what is the quality of such infrastructure/	-.068	.189	-.021	-.360	.719
	23.What is the highest education of father	-.192	.199	-.090	-.962	.337
	24.What is the highest education of mother	-.156	.193	-.077	-.807	.420
	30. Do you feel use of car is a status symbol (to be filled by parents)	.306	.134	.129	2.285	.023
	32. If you travel by motorised transport at present, given an option do you like to change to non-motorised transport in future	-.205	.163	-.070	-1.261	.208
	34. You/ your child wish to walk to school for	-.071	.127	-.033	-.559	.577
	39. Non-motorised transport is a wastage of time as it requires more time to commute	.174	.177	.055	.980	.328
	33. You/ your child wish to cycle to school for	-.342	.152	-.128	-2.247	.025

a. Dependent Variable: F_Cycling

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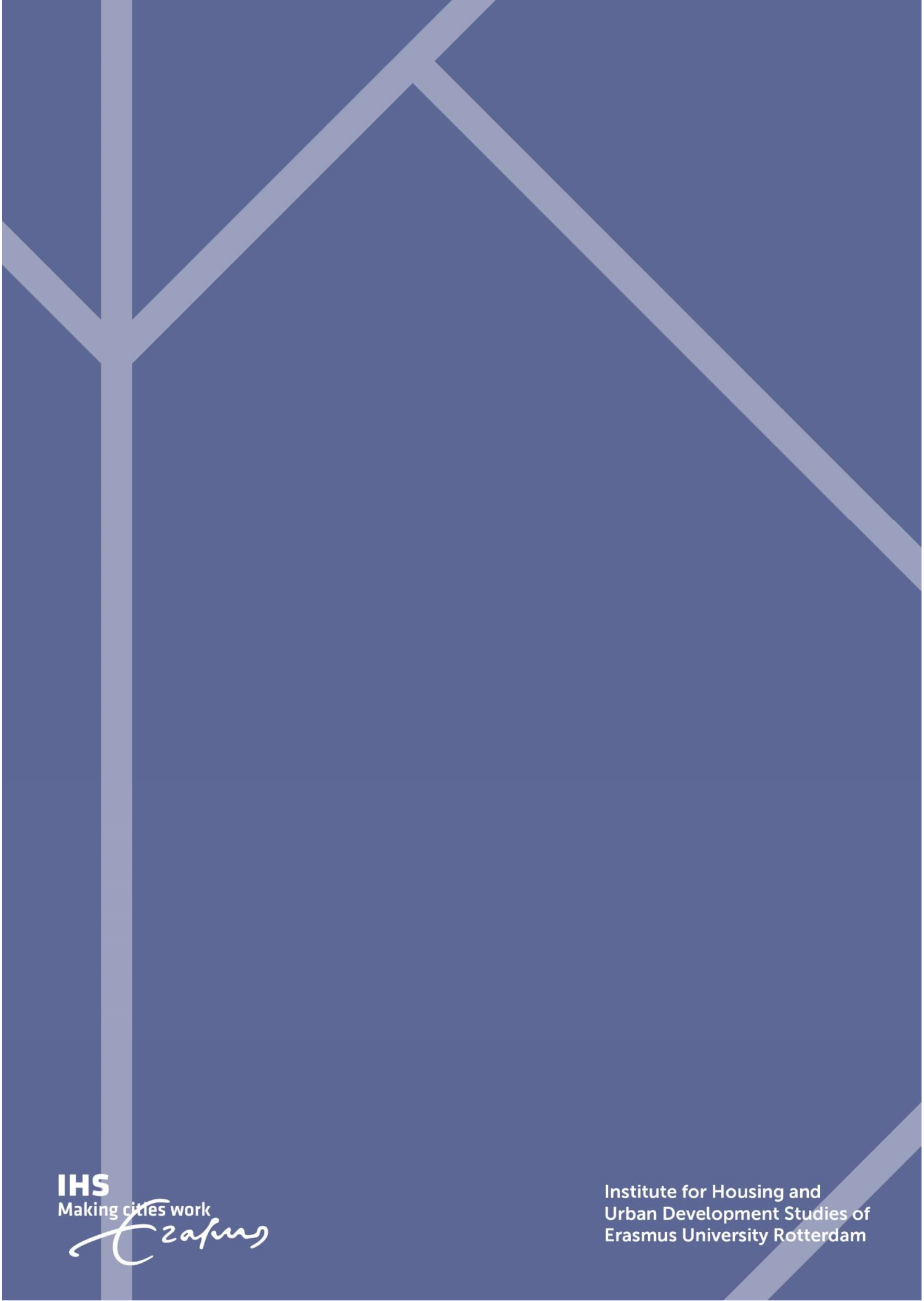

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