



## Identifying the attitude of users' preference towards sustainable transport modes



*Presenting by*

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## Introduction

- ✓ A sustainable transportation system is necessary for the world to prevent environmental loss and promote human well-being.
- ✓ **Urbanization** has significantly affected the prevalence of walking and bicycling globally. Additionally, the **increase in motorization** and **car-centric infrastructure** has led to a cultural shift and decrease in public transport usage, where **convenience** and **speed** have become more valued recently.
- ✓ Share of sustainable modes of transport (walking, bicycling, and public transit) remains quantitatively **outnumbered**.
- ✓ The preference for adopting sustainable transportation modes (STM) depends upon various factors at the individual level.



## Literature

- ✓ These factors encompass considerations of **accessibility, comfort, and convenience** (Altsybeeveva et al., 2023; Fishman et al., 2012) as well as concerns for **safety, security, and flexibility** (Fishman et al., 2012; Moreno et al., 2023; Pucher & Dijkstra, 2003; Simsekoglu & Nayum, 2019).
- ✓ Other influential factors comprise one's **past experiences** with public transit and bicycling, reliability issues (Amrapala & Choocharukul, 2019), **environmental concerns** (Hamidi & Zhao, 2020; Tao et al., 2019; Walton, 2021), **societal perspectives, and economic incentives** (Vredin Johansson et al., 2006).
- ✓ Many of the individuals use bicycles due to **economic concerns, perceived health benefits** (Bopp et al., 2012).
- ✓ Recent literature has revealed the significance of **attitude and behavior** in bicycling (Humphreys et al., 2013; Lizana et al., 2021; Martin et al., Xing et al., 2018).



## Literature

- ✓ Many studies have focused on the importance of **infrastructure facilities** like separate lanes (Dill & Carr, 1991; Fernández-Heredia et al., 2014; Lizana et al., 2021).
- ✓ Private vehicle users are more concerned about the **travel time, convenience, riding interest and societal perspective** (Handy et al., 2005; Schwanen & Mokhtarian, 2005).

The present study investigated the impact of attitudes toward owning private vehicles and attitudes toward public transport on users' preferences for sustainable transport modes, i.e., public transport, bicycles, and walking.



# Study area and data collection

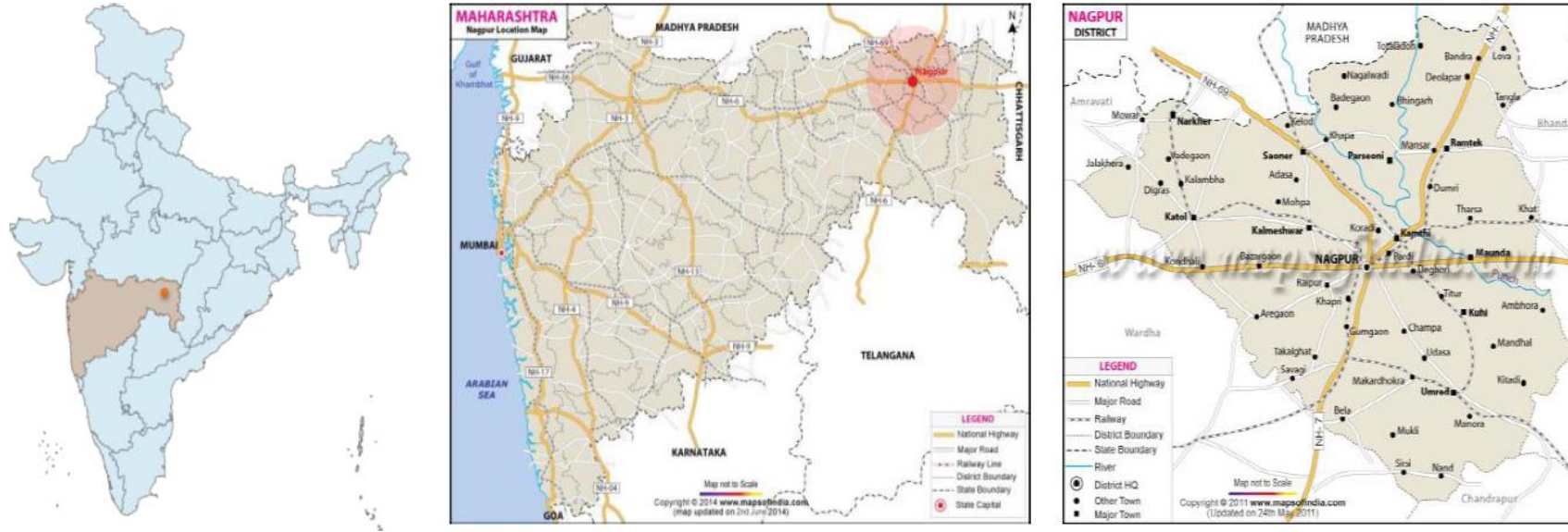


Figure 1. Geographical Location of Study Area

- ✓ The study was carried out in Nagpur, located in the central part of India, from November 2019 to February 2020.
- ✓ The data was collected through an intercept-based questionnaire survey, which includes 16 questions related to users' socio-demographic characteristics and 20 perception-based variables related to public transport, private transport, and preference for sustainable transport modes.
- ✓ A total of 850 responses were collected in the primary stage. Finally, a total of 620 responses were retained after removing outliers and biased responses.

## Methodology

- ✓ The study adopted a two-stage MIMIC (multiple cause multiple indicator) model that includes a measurement model and a MIMIC structural model.
- ✓ SEM allows one to check the complete and simultaneous relationship between one or more exogenous variables and one or more endogenous variables, which can be either continuous or discrete (Ullman, 2006).
- ✓ The number of latent constructs, relations between the latent constructs, and associations of variables with latent factors can be uncovered using measurement models.
- ✓ Further, confirmatory factor analysis (CFA) gives the idea of relationships between the factors and between the factors and measurement variables based on the hypothesized structure.
- ✓ The MIMIC SEM model can be used to test whether one or more measurement variables in the latent construct are reflective variables. It also detects the heterogeneity in the measurement model.

## Exploratory factor analysis

After descriptive analysis, exploratory factor analysis (EFA) was carried out on a total of 20 variables to identify underlying latent factors. The EFA results identified three latent variables under 12 variables: attitude towards public transport, preference for sustainable transport modes and attitude towards private transport.

Table 1. Rotation component matrix

Variables	Latent variable		
	Public transport	Preference for STM	Private transport
Public transport has limited flexibility	0.818		
Public transport has less frequency	0.887		
Public transport is not reliable	0.756		
Travelling by own vehicle is safer than travelling by public transport	0.638		
Public transport bus stations are not accessible to me	0.783		
I prefer walking to buy something at the closest store		0.732	
I prefer public transport service to commute rather than own vehicle		0.831	
I use bicycle for small work whenever it is possible		0.848	
Having own vehicle provides status and prestige for me			0.815
Privacy is an important factor for me for using own vehicle			0.824
Comfort is an important factor for me for using own vehicle			0.771

*Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization*





# MIMIC Model

✓The MIMIC model is an extended version of structural equation modelling that can test whether one or more covariates predict the variation in latent variables with multiple indicators.

Table 2. Fit indices of MIMIC model

Fit indices	Acceptable threshold value	Estimated model
$\chi^2/df$	<5.00	4.416
GFI	>0.90	0.933
SRMR	<0.08	0.064
PNFI	0.5-0.9	0.651
TLI	>0.90	0.927
NFI	>0.90	0.936
CFI	>0.90	0.949
RMSEA	<0.08	0.063

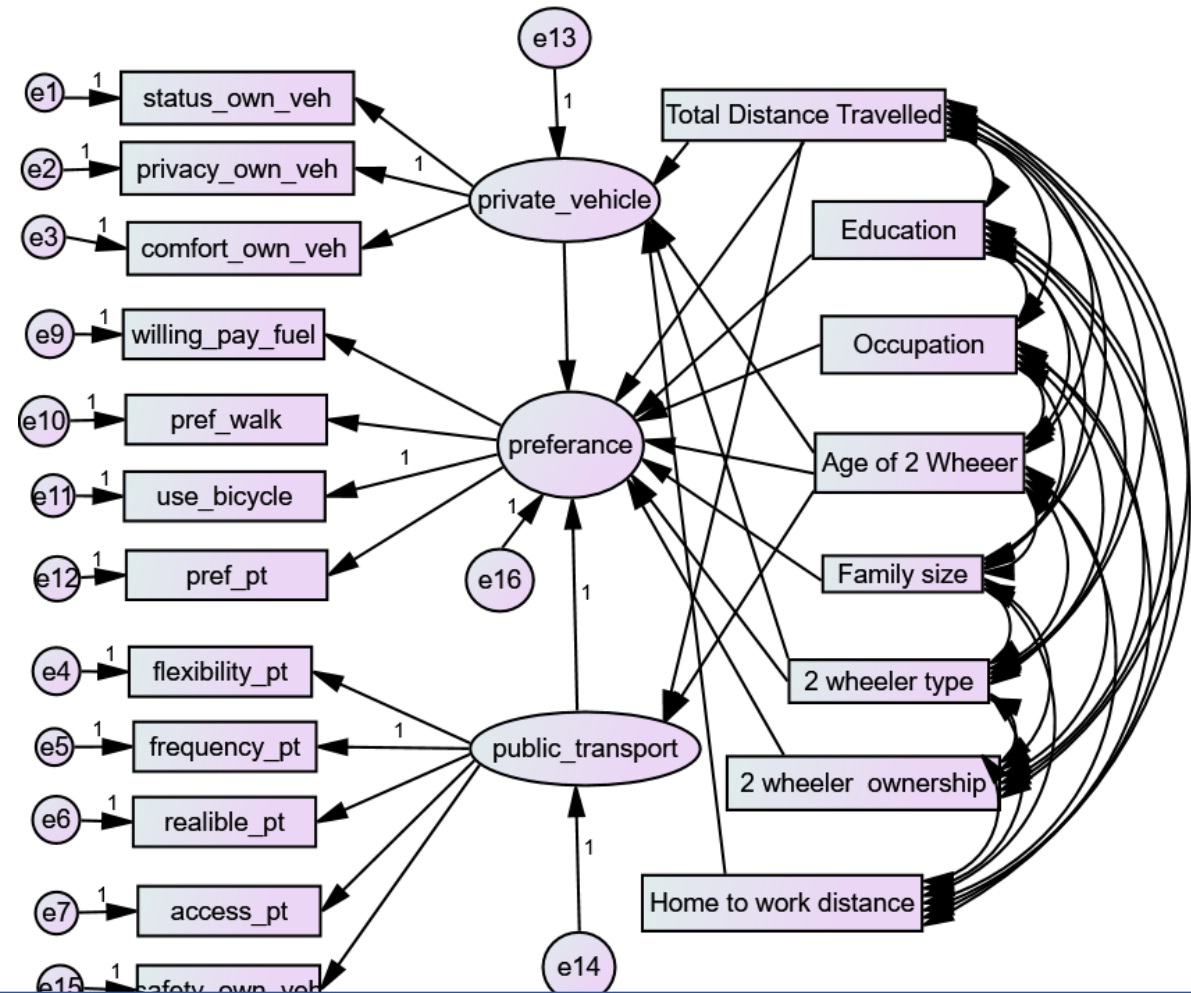


Table 3. Regression weight and path coefficient of SEM-MIMIC model

	Path		Path coefficient (b)	Estimate (d)	C.R.
Private_vehicle	<---	2w_type	0.103	0.13	1.962
Public_transport	<---	Age_2w	-0.057	-0.042	-1.53
Private_vehicle	<---	Age_2w	0.166	0.115	-2.995
Private_vehicle	<---	home_work_dist	-0.143	-0.155	-1.94
Private_vehicle	<---	Travel_dist	-0.174	-0.157	2.27
Public_transport	<---	Travel_dist	0.067	0.064	1.821
Preference	<---	Public_transport	-0.921	1	
Preference	<---	Private_vehicle	-0.278	-0.318	-5.556
Preference	<---	Education	0.085	0.116	2.321
Preference	<---	Occupation	-0.084	-0.09	-2.266
Preference	<---	Family_size	0.065	0.062	1.729
Preference	<---	2w_ownership	-0.212	-0.615	-1.947
Preference	<---	2w_type	0.191	0.276	2.116
Preference	<---	Age_2w	0.245	0.194	3.008
Preference	<---	Travel_distance	0.12	0.124	-2.584
Status_private_veh	<---	Private_vehicle	0.654	0.764	19.406
Privacy_private_veh	<---	Private_vehicle	0.866	1	
Comfort_private_veh	<---	Private_vehicle	0.827	0.879	24.077
Flexibility_pt	<---	Public_transport	0.847	0.898	31.895
Frequency_pt	<---	Public_transport	0.902	1	
Realible_pt	<---	Public_transport	0.721	0.768	24.801
Access_pt	<---	Public_transport	0.688	0.816	23.122
Safety_own_veh	<---	Public_transport	0.582	0.648	18.399
Pref_walk	<---	Preference	0.617	0.614	16.7
Use_bicycle	<---	Preference	0.817	1	
Pref_public_transport	<---	Preference	0.762	0.828	19.924



## Conclusion

- ✓ Individuals' attitudes towards public transport and private vehicles are crucial to their preferences for sustainable transport modes. The positive attitude towards owning private vehicles and the negative attitude towards public transport impact the preferences for sustainable transport modes, i.e., walking, bicycling, and public transport.
- ✓ the lack of frequency, reliability, accessibility, and safety in public transport demotivates the usage of public transport and, subsequently, walking and bicycling trips. Whereas the perceived comfort and privacy in private vehicles keep away individuals from prefer sustainable transport mode.



## Policy Implications

- ✓ First, to maintain or increase the share of sustainable transport modes, the government, planners, and policymakers should focus on the infrastructure required for sustainable transport modes.
- ✓ Second, a more concerted effort should be directed towards the low-income demographic, as they make transportation choices primarily based on economic considerations.
- ✓ Conversely, high-income groups can be attracted to the STM by enhancing the comfort level through improved seating structures in public transport and by ensuring the availability of restrooms at stations, catering to both pedestrians and bicyclists.

In conclusion, the focus on the target group and infrastructure improvement have the potential to increase the share of sustainable transport modes.



**THANK YOU**

