Baseline Data Collection for the Impact Analysis of MRT System in Dhaka

(ダッカMRTのインパクト評価研究ベースライン調査)

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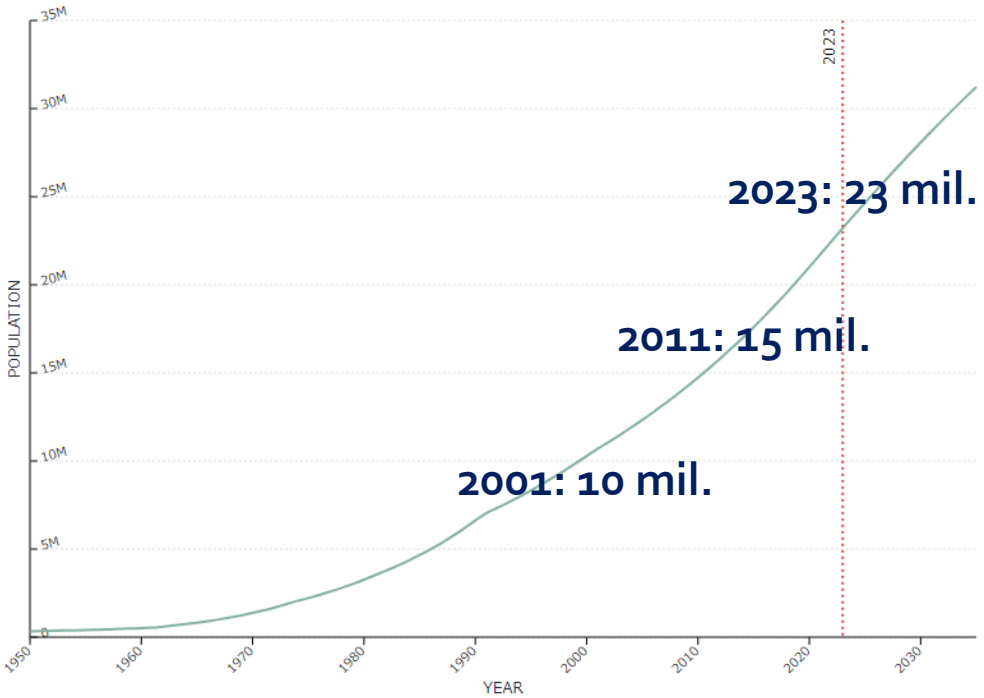
Where is Dhaka?

Ranking	City	Population	Growth
1	Tokyo	37,194,105	-0.21%
2	Delhi	32,941,309	2.73%
3	Shanghai	29,210,808	2.43%
4	Dhaka	23,209,616	3.25%

(World Population Review)



（急速な人口増加）

Diverse Livelihood in Dhaka
（人々の暮らしは多様）

Residence

Market Areas

Squatter housing

Low-income colonies

Business/Commercial District

（急速な人口増加）

（急速な人口増加）

Major Urban Problems in Dhaka

Traffic Congestion（交通渋滞）

Average travel speed of car: 4.5 km per hour in 2020
(21 km per hour in 2010/ 15km-20kmph in Tokyo Metropolis)
<Business Standard>

Air Pollution（大気汚染）

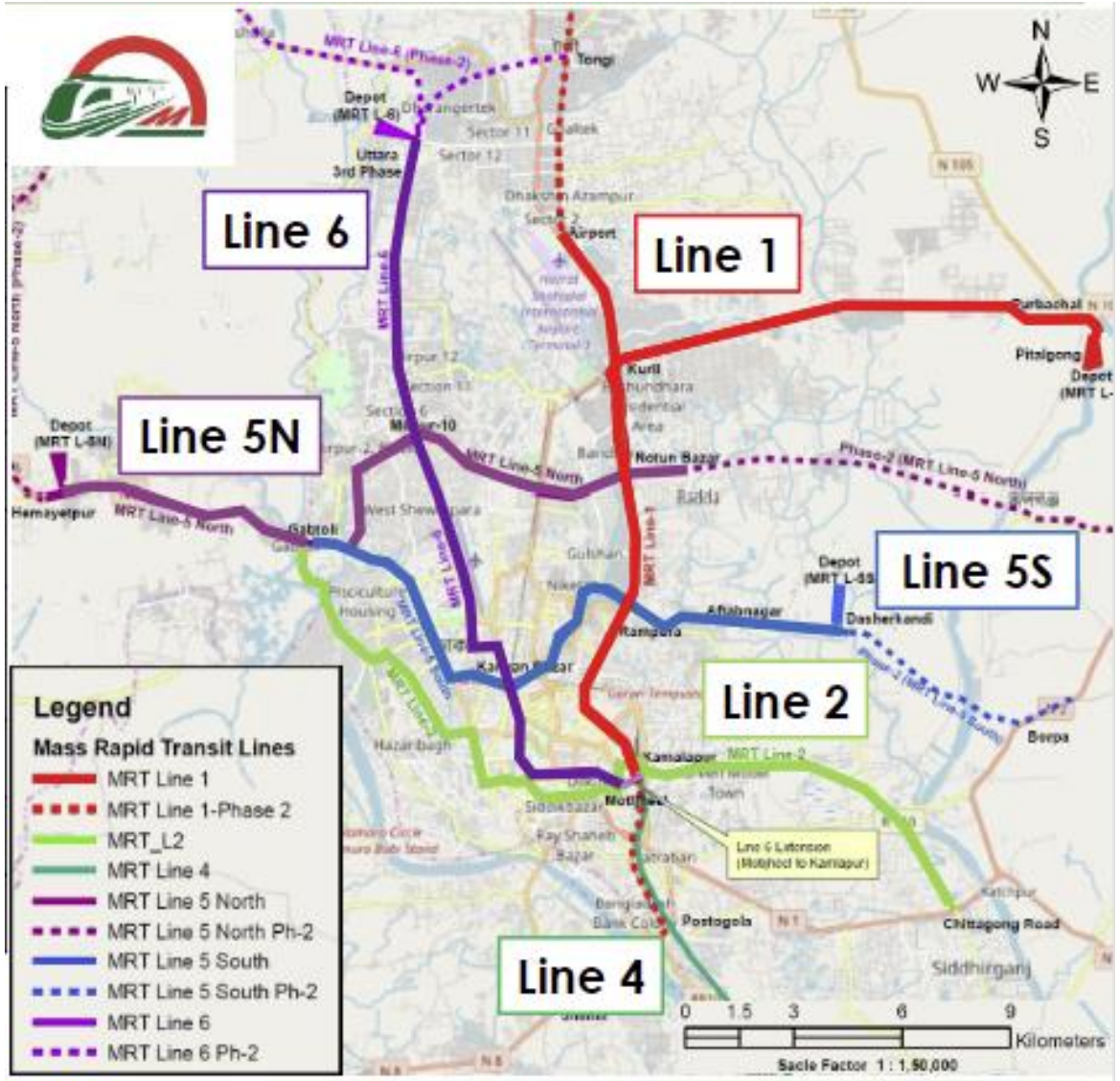
3rd most polluted cities in the world with annual average PM2.5 of 83.74 µg/m3
(11.7 µg/m3 for Tokyo Metropolis) <Smart Air>

Dhaka MRT

6 MRT Lines under Construction/Planning in Dhaka（6路線を計画・実施中）

Outline of 3 projects under construction/procurement

	Line 1	Line 5N	Line 6
Length	31km Viaduct (15 km) and underground (16 km)	20km Viaduct (6.5 km) and underground (13.5 km)	20km Viaduct
Station	19 (12UG+7EL)	14 (9UG+5EL)	17 (EL)
Project Period	2018-2028	2020-2029	2013-2025
Opening	2028	2029	Dec 2022 (limited hours) (UttaraN-Agargaon) Oct 2023 (limited hours): (Agargaon to Motijheel)



Why should we study the impact?

For Justification of the Current Investment

- Citizens are diverse and they are affected differently.
- Who gains what?

For the Improvement of Future Investment

- Design and alignment for the wider benefit
- Additional intervention other than urban transport to offset some negative impact to specific group of people

Do we know the benefit of Urban Transport?

Reduce Air Pollution?

In the short-run, expansion of Delhi Metro led to a 34 percent reduction in CO. NO2 also declines (*Goel & Gupta, 2015*) <デリーメトロ開業により、短期的に大気汚染が減少>

Job and Income Opportunity?

- Bogota's BRT system reduced income inequality (Tsivanidis, 2019)
- Subway in Mexico City reduced informality of employment by 7 percent (Zarate, 2022)
- More female's economic participation: Delhi Metro (Seki and Yamada, 2020) / Lima BRT & LRT (Martínez et al. 2018) <インフォーマル労働者・女性により良い就業機会を与える>

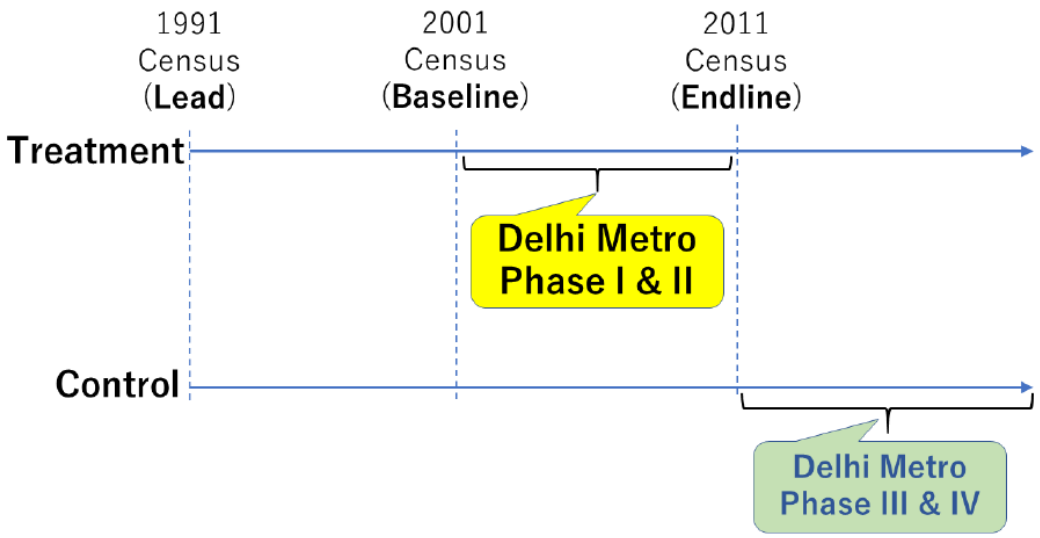
Improve Safety and Security?

- Introduction of Urban Transit (cable car system) reduced crime in Medellin, Columbia (Khanna et al, 2022)
- Safety matters for the school choice of girls (Borker, 2021) <都市交通により、治安・安全が改善>

Reduce Traffic Congestion?

- BRT in Jakarta neither reduced vehicle ownership nor travel times (*Gaduh, Gračner, and Rothenberg, 2022*)
- Subway has a slight effect to decentralize the cities, while it has no impact on urban population (*Gonzalez-Navarr & Turnerm, 2018*) <本当に渋滞緩和に役立っているかはまだ不明瞭>

Gendered Employment Effect of Delhi Metro

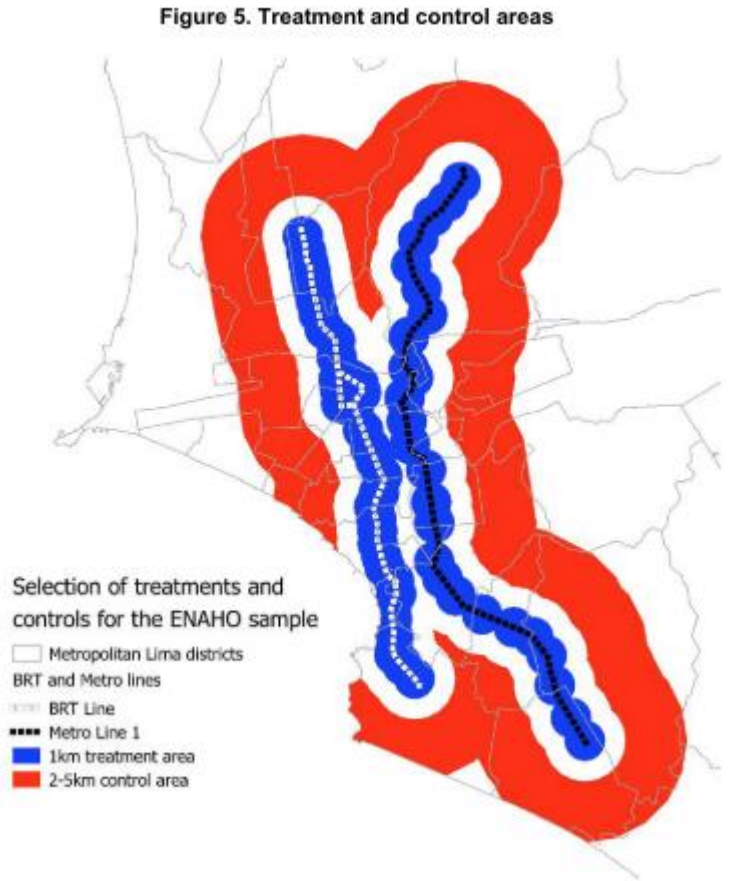


- Intervention: Metro Phase I & II (2002-11)
- Variation in the intervention: distance to the Metro station
- Data: India's population census abstract (1991, 2001, 2011)
- Outcome measure: work participation rate (female, male)
- Female: better access to Metro station ➔ **increase** work participation rate
- Male: better access to Metro station ➔ **decrease** work participation rate

＜デリーメトロの整備により女性の就労が増↑＞

Seki, Mai, and Eiji Yamada. 2020. "Heterogeneous Effects of Urban Public Transportation on Employment by Gender : Evidence from the Delhi Metro." No. 207. JICA-RI Working Paper. Tokyo.

Gendered Employment Effect of BRT and LRT in Lima



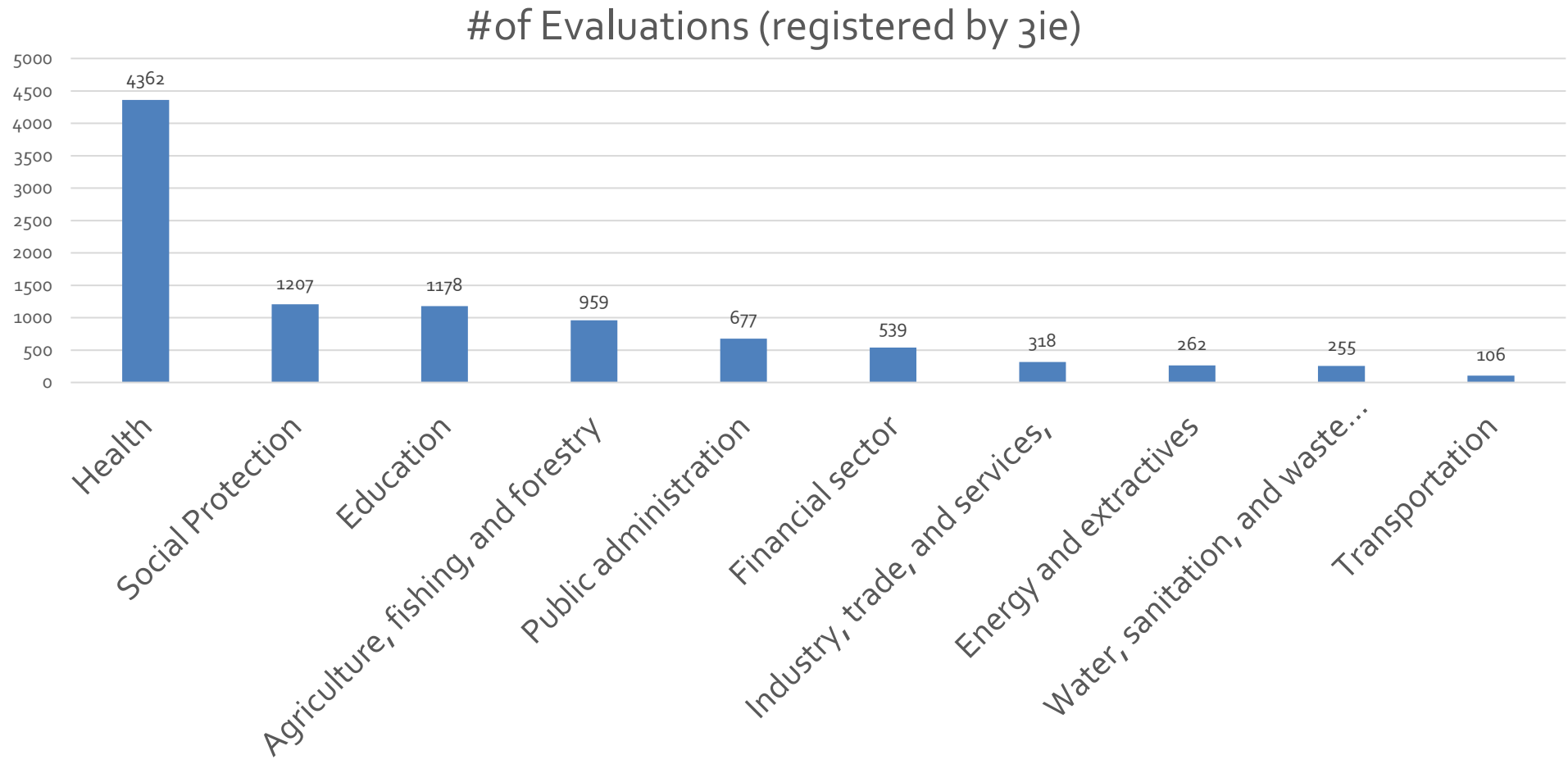
- Intervention: Lima BRT system (started operation 2010-14) & Metro Line 1 (opened 2012-14)
- Variation in the intervention: area within 1km from stations (treatment) v.s. area 2km -5km from stations (control)
- Data: Peruvian National Household Survey (2007, 2017)

	Female	Male
Probability to be employed	Increase	No change
Earnings	Increase	No change
Hours worked	Increase	No change
Job quality	No change	No change
Use of public transport	Increase	No change

＜BRT/Metroは女性の労働市場でのパフォーマンスを向上させる＞

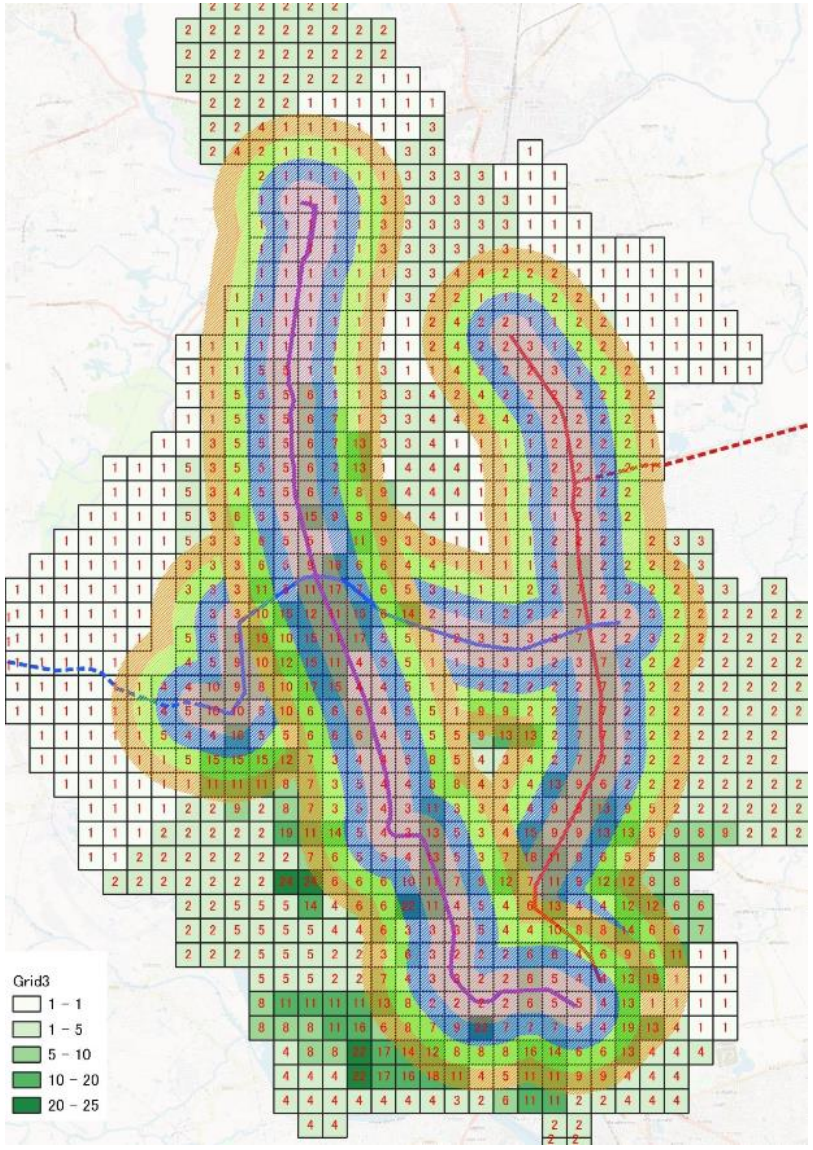
Martínez, Daniel, Oscar A. Mitnik, Edgar Salgado, Lynn Scholl, and Patricia Yáñez-Pagans. 2018. "Connecting to Economic Opportunity: The Role of Public Transport in Promoting Women's Employment in Lima." IZA Discussion Paper Series December (12020): 44. https://doi.org/10.18235/0001528.

Still Very Limited Evidence on Transportation Sector Projects

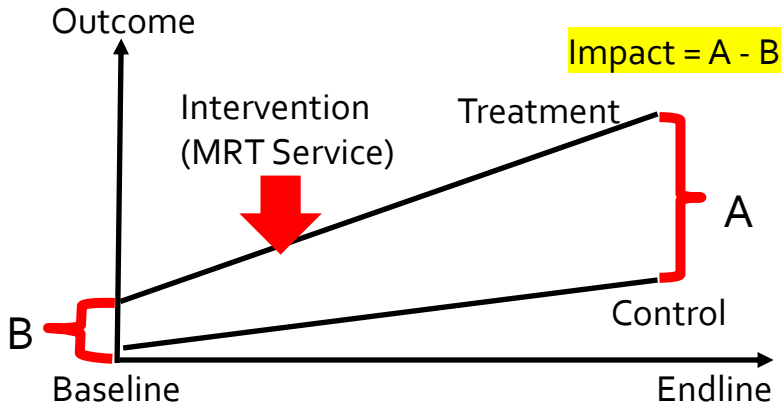


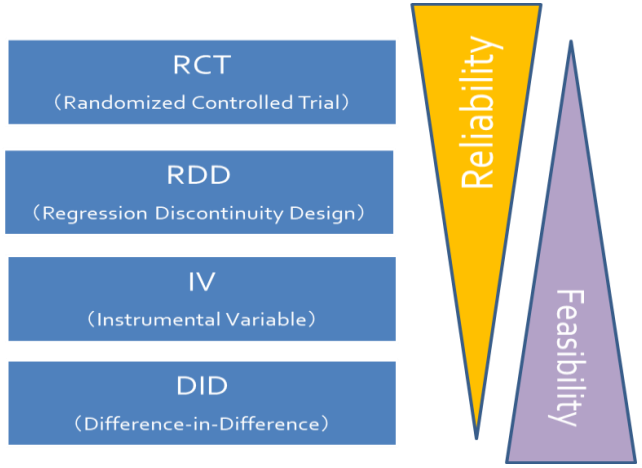
Why are the transport sector projects difficult to evaluate?

Study Design

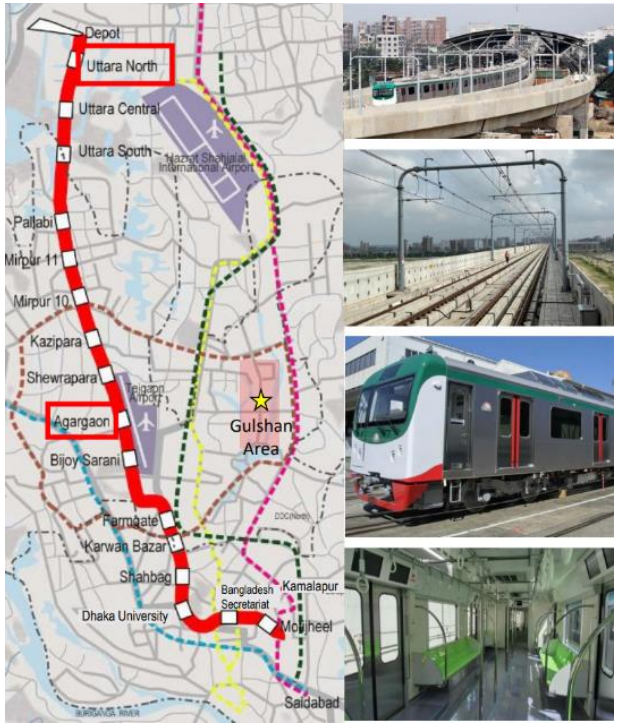


- **Analytical Method**:
  - Difference-in-Difference utilizing a household level panel data
    （「差の差」分析の手法を用いる想定）



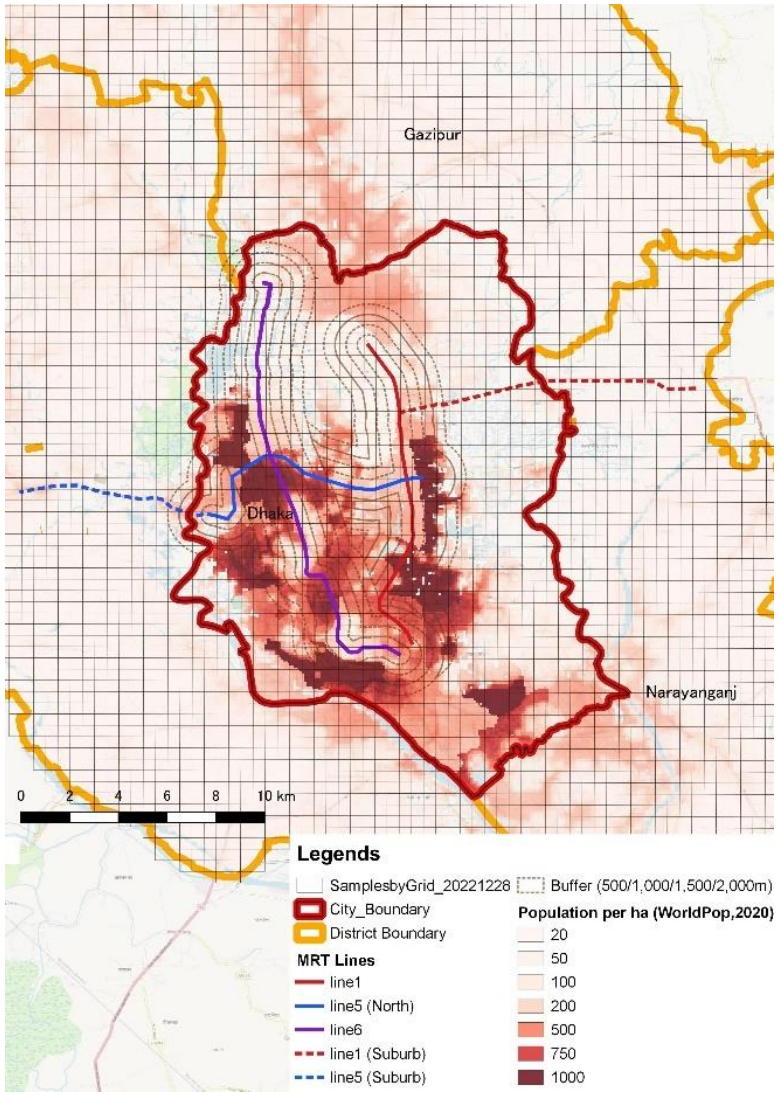


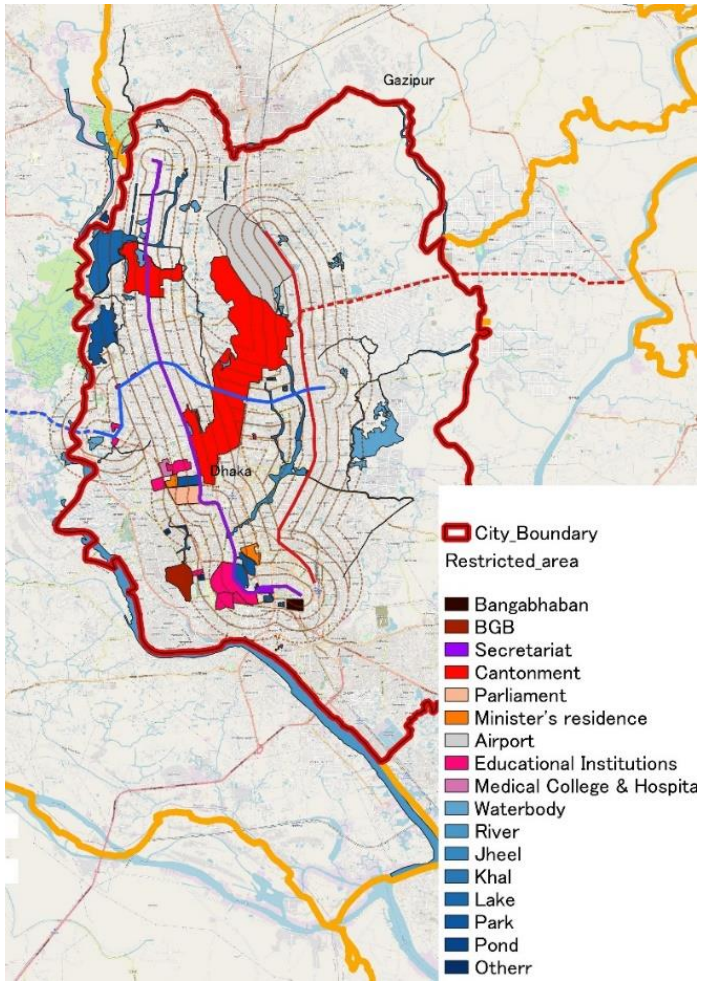
Timeline



		2022			2023																											2024									2025					
		12			1			2			3			4			5			6			≈	10			11			12			1		≈	12			1			2		
		B	M	E	B	M	E	B	M	E	B	M	E	B	M	E	B	M	E	B	M	E		B	M	E	B	M	E	B	M	E	B	M	E		B	M	E	B	M	E	B	M	E	B	M	E
Baseline	Preparation/Training																																												
	Field Survey																																												
	Data Cleaning/Reporting																																												
Endline	Field Survey																																												
MRT 6	Commissioning (Uttara-Agargaon)				8:30-12:30(x:Tue)									8:00-14:00(x:Tue)			8:00-20:00(x:Fri)															Full Operation(6:00-24:00?)												
	Commissioning (Agargaon-Motijheel)																									Only morning						Full Operation(6:00-24:00?)												

Sampling（ダッカ市域全体から4000家計をサンプルとしてデータ収集）

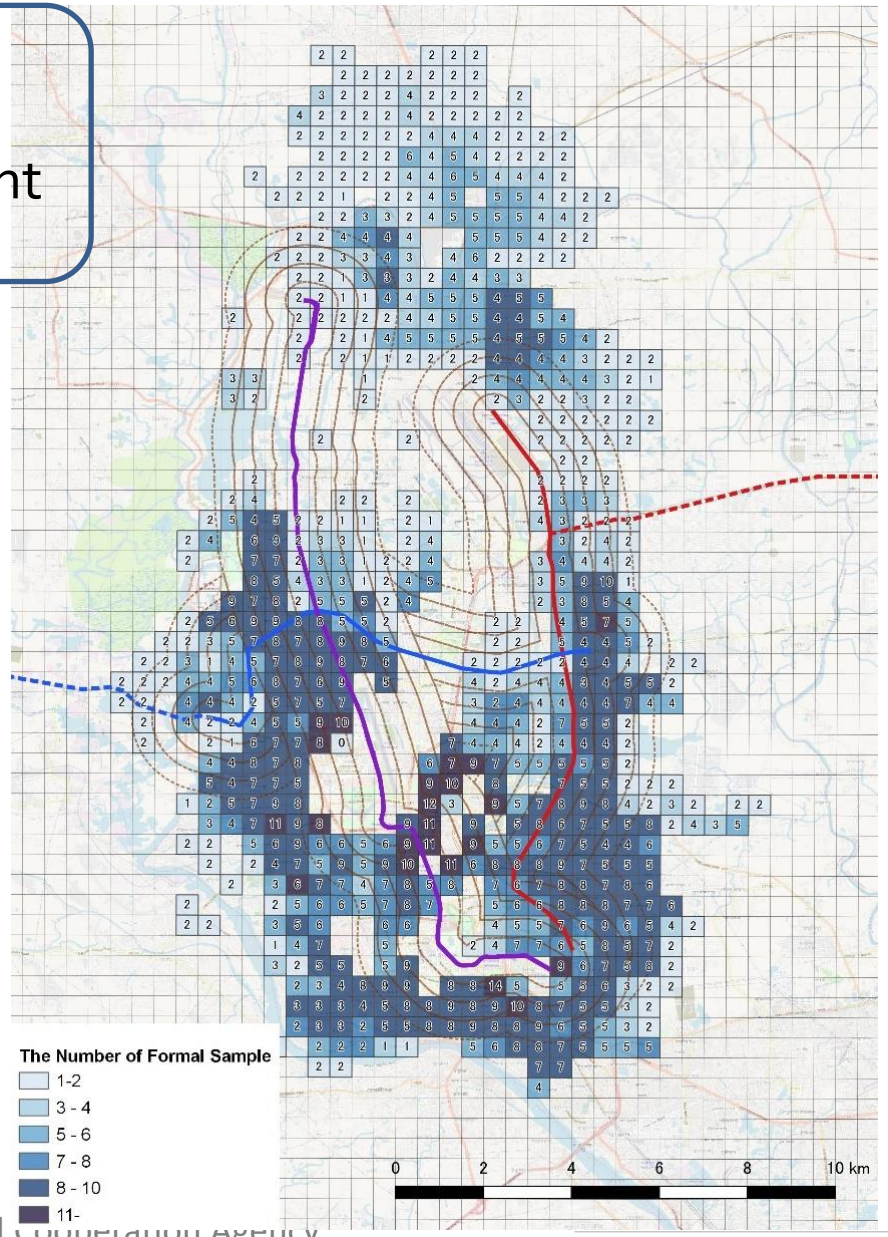




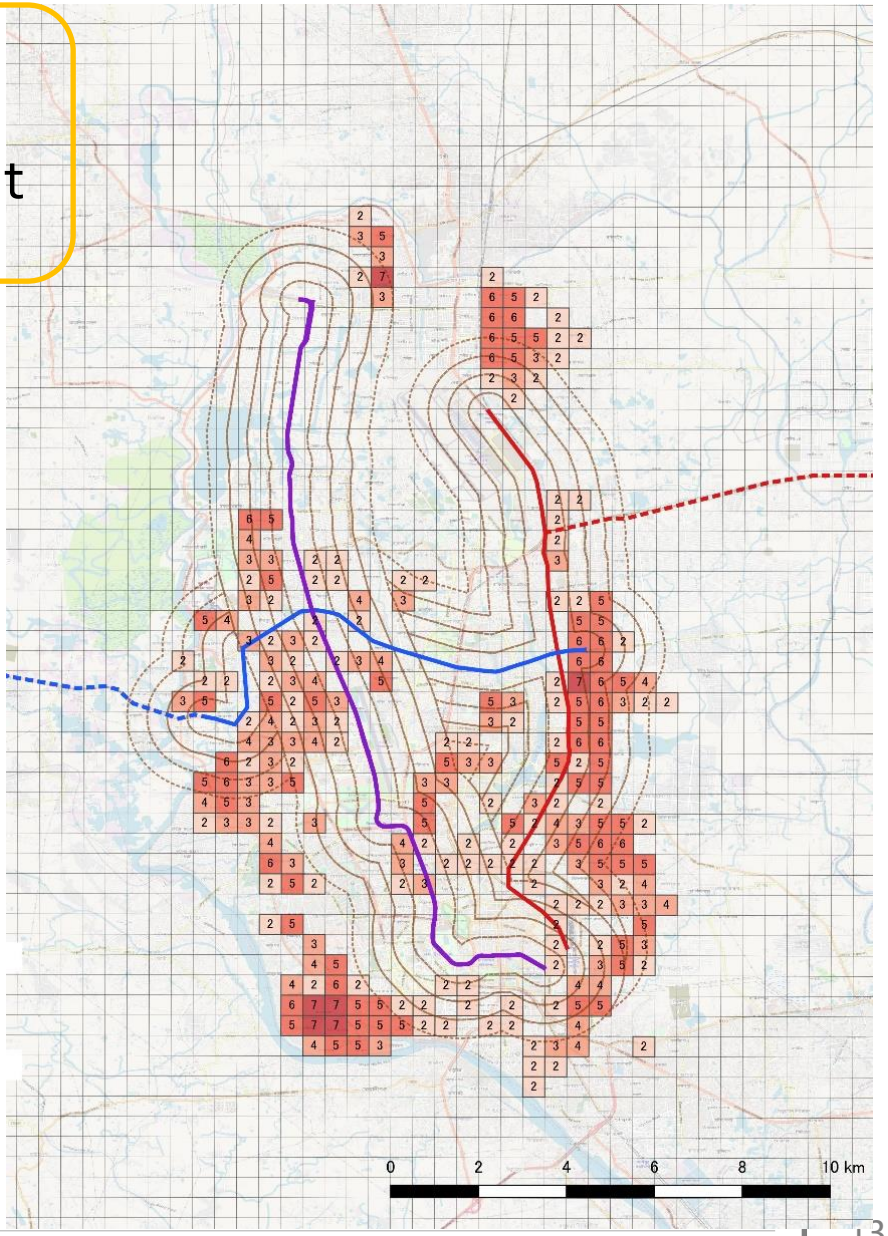
- **Number of sample**: 4,000 HH (incl. 1,000 HH from informal settlements)
- **Sampling Unit**: 500m X 500m grid
- **Excluded non-residential grids**: water bodies, public infrastructures (such as airports), government facilities, military facilities.
- **Sample distribution**: Population distribution according to the WorldPop
- **Share of informal HH in a grid**: according to the area of informal settlement based on World Bank's EO4SD Urban Development Project
- **Surveyor's visit**: nearby building (choice by surveyor) from predetermined random points

Sample Distribution

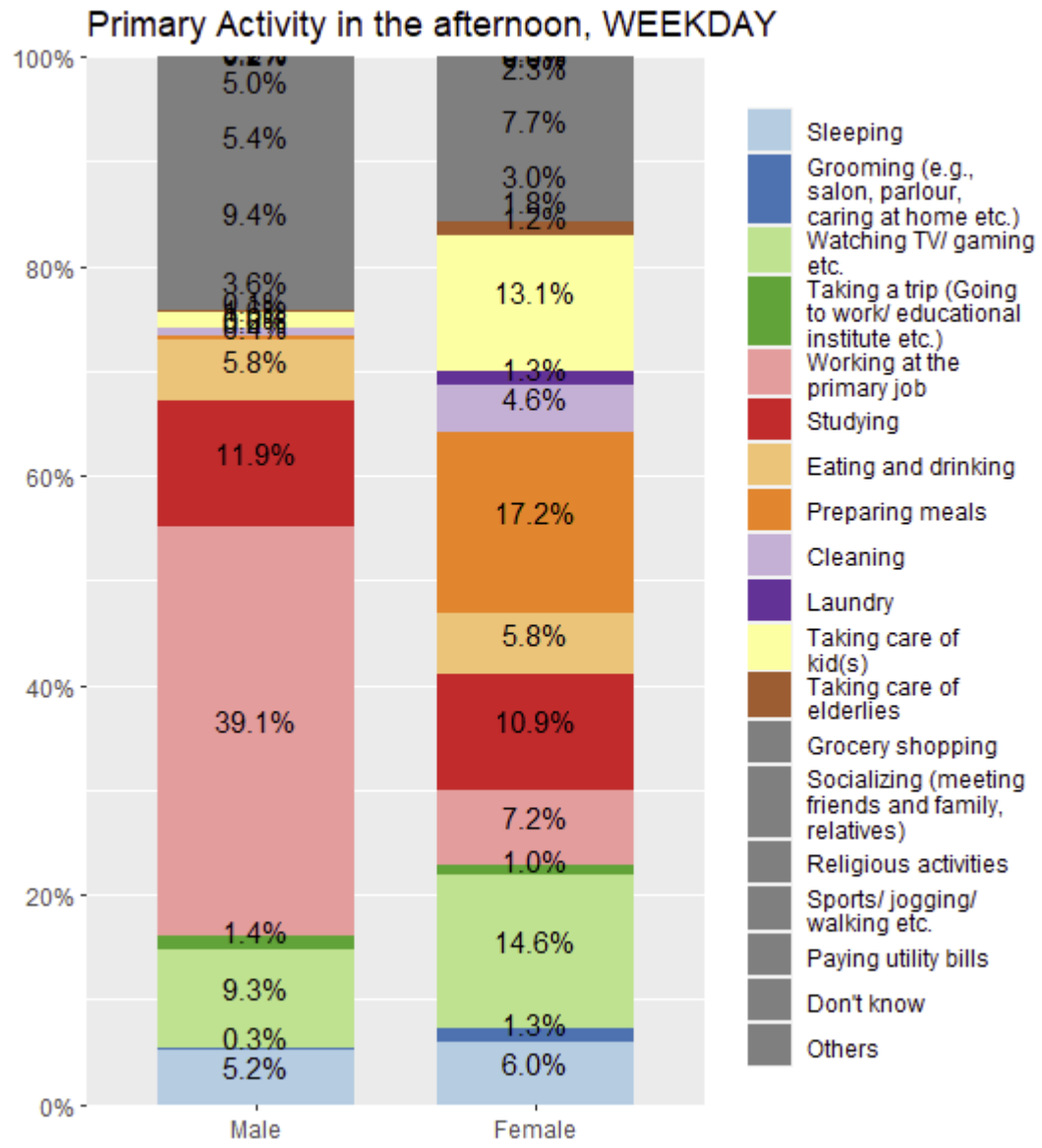
Formal Settlement

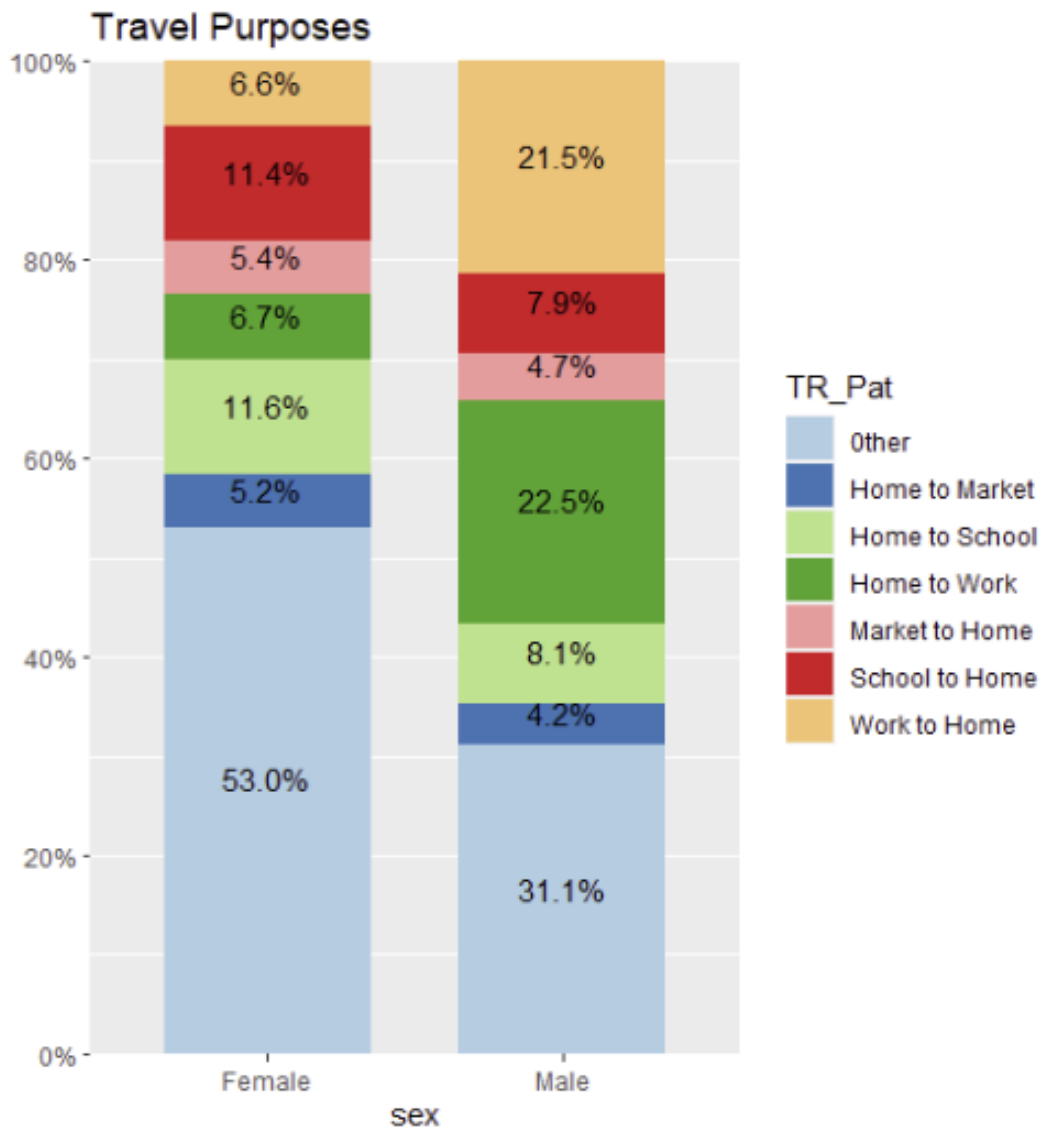


Informal Settlement

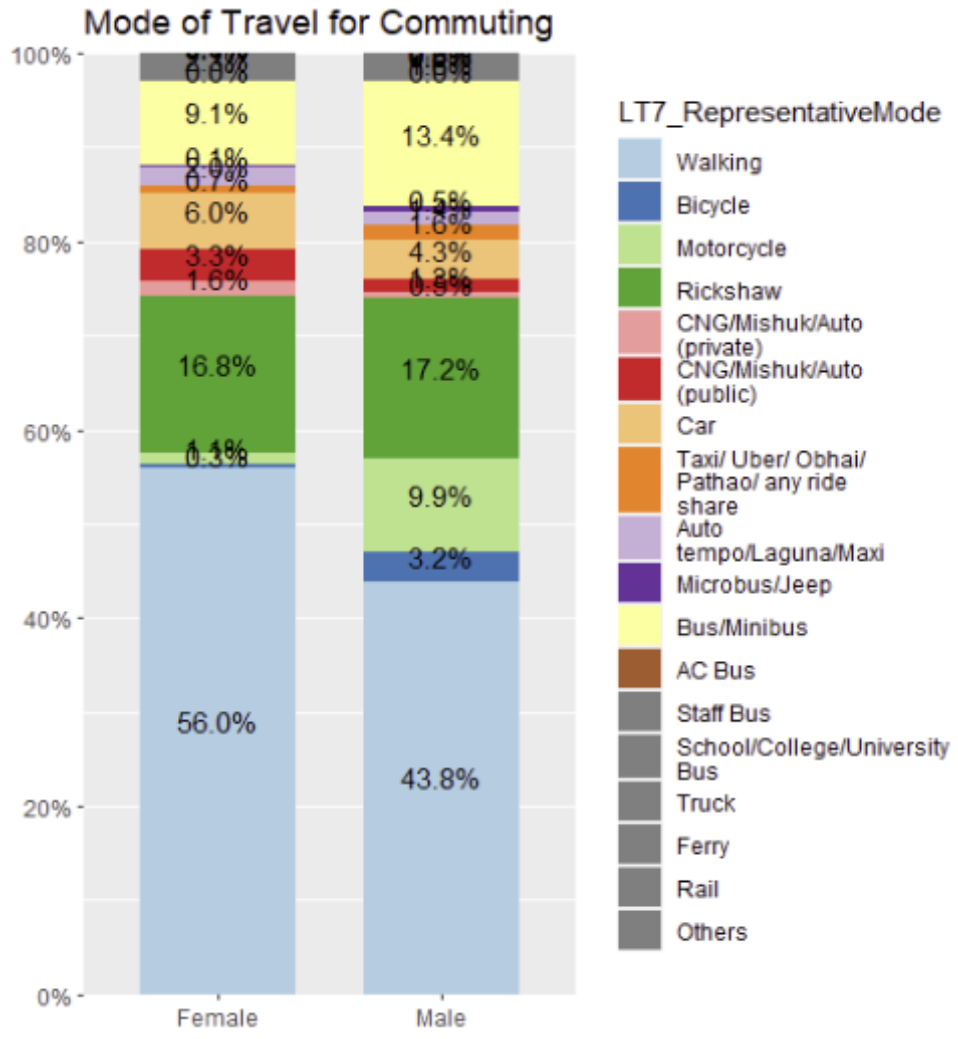


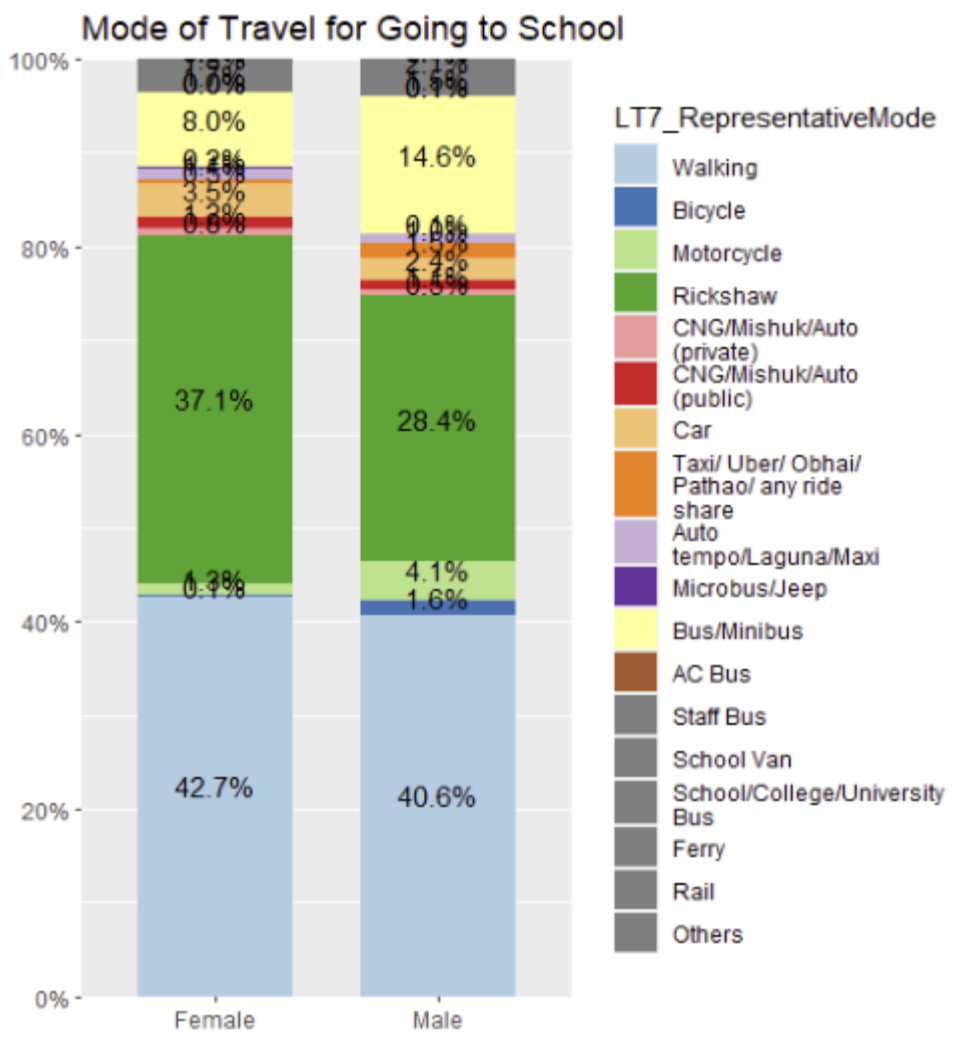
People's life and transport



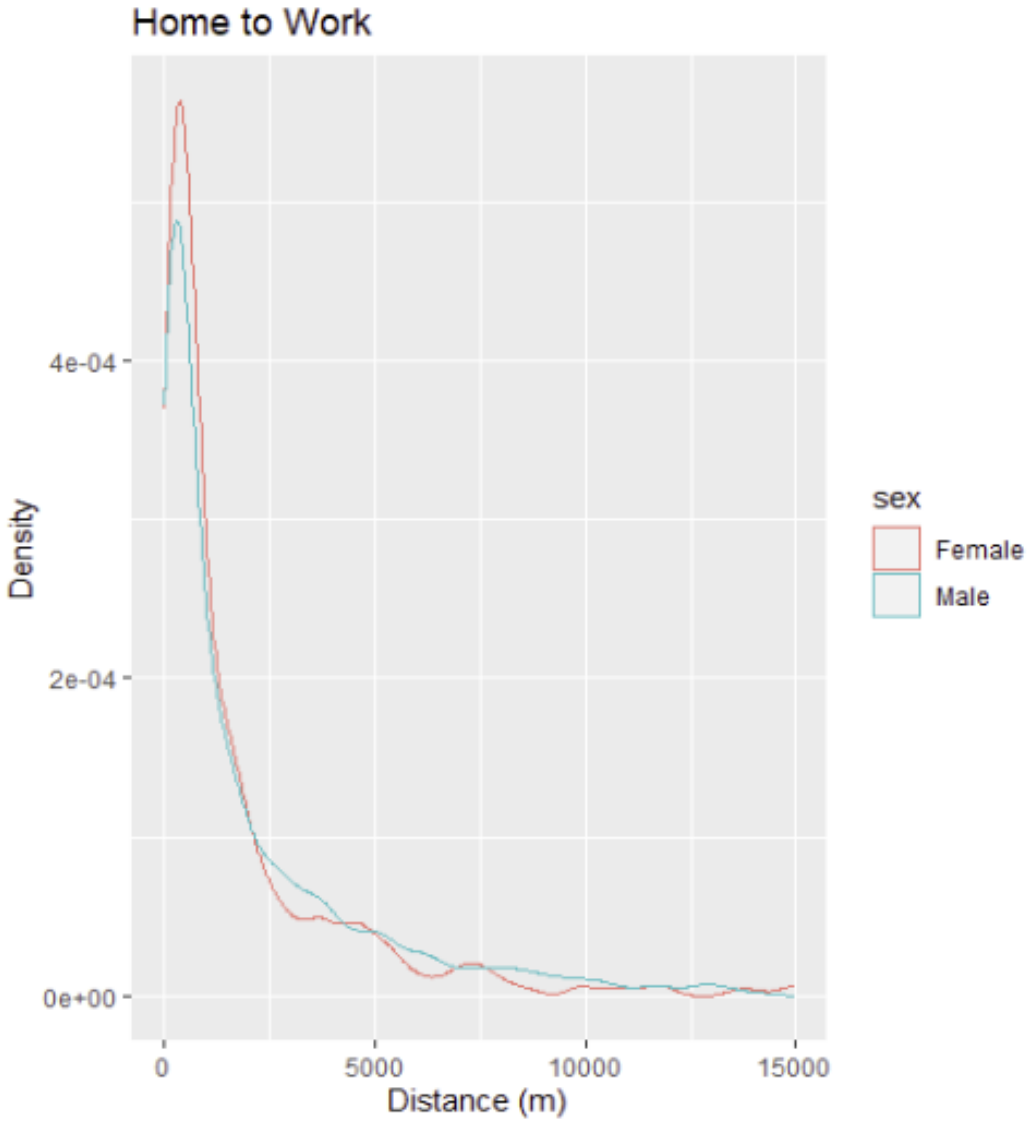


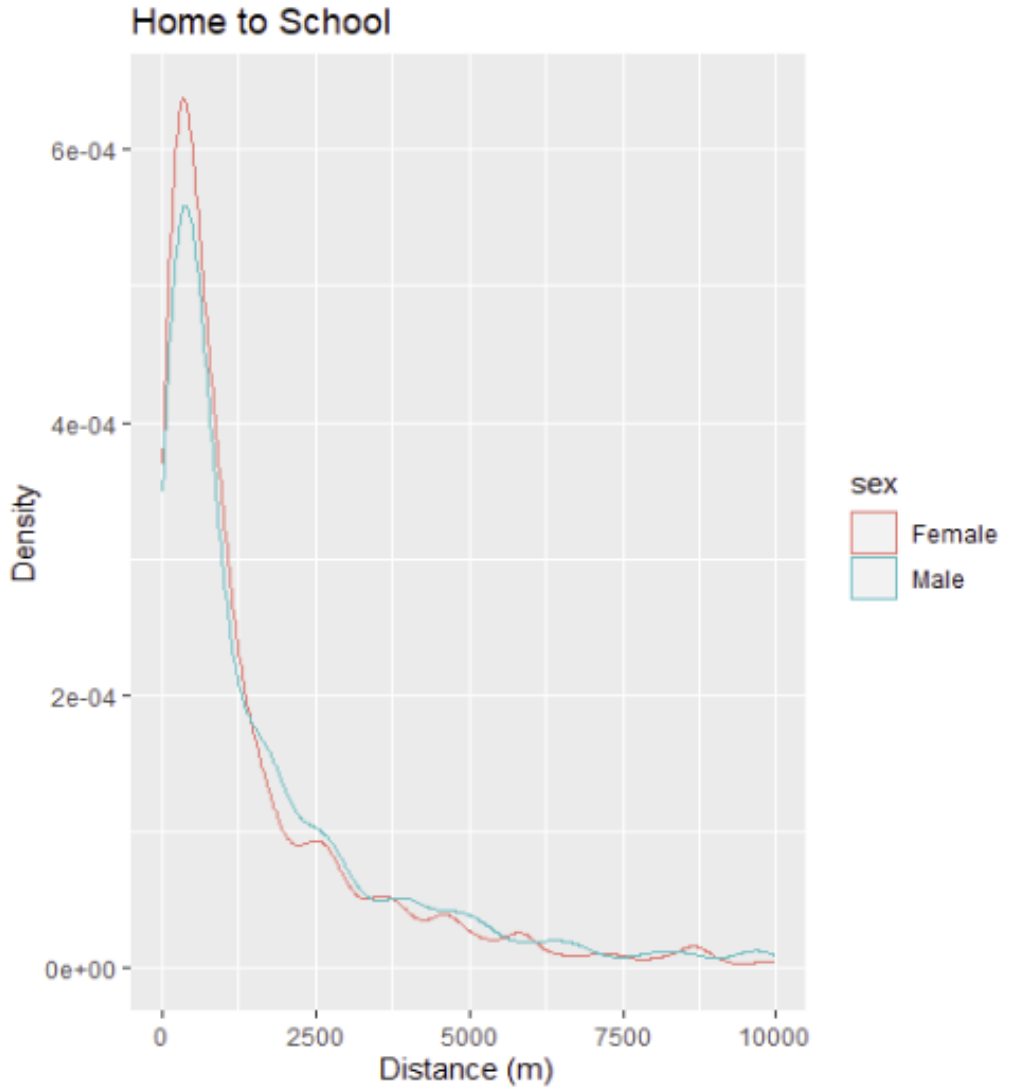
Main Mode of Travel (主な移動手段)





Distribution of Commuting Distance
（通勤・通学距離）





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Thank you!