GEDES Workshop

# Research Internship on Transport Planning at OCG, Japan

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**Course: GEG.P672 Sustainable Engineering Program Off-campus Project (GEDES) F**

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**@ Hanaoka Laboratory**

# Outline

- Overview of the Company, Project and My Role
- Background and Motivation
- Objectives and Research Questions
- Methodologies and Activities
- Key Findings
- Lessons Learned and Policy Implications
- Connection to Graduate Attributes (GA0D and GA1D)
- Conclusion and Feedback

# Overview

- Internship Place: Oriental Consultant Global (OCG) Co., Ltd – Tokyo Office

## OCG at A Glance

| Years of the Establishment | Number of employees | Annual sales | Countries worked |
|---|---|---|---|
| 1957 | 1,461 as of 1st of December 2024 (including Overseas Subsidiaries) | US$474mil 2023-24 (consolidated) | 150+ |


## PROJECT SERVICES

## GLOBAL NETWORK

Oriental Consultants Global is active worldwide having conducted projects and studies in more than 150 different countries. We maintain overseas office in Manila, Colombo, Maputo, Cairo, Antananarivo, Jakarta, Bangkok, Hanoi, Dhaka and the following Subsidiaries:

- INDONESIA : PT. Oriental Consultants Indonesia
- MYANMAR: Oriental Consultants Japan Co., Ltd.
- INDIA: Oriental Consultants India Private Limited
- QATAR: Oriental Consultants Gulf W.L.L
- THAILAND: Oriental Consultants Thailand
- PHILIPPINES : Oriental Consultants Philippines Inc.
- EAST AFRICA : OCG East Africa Limited
- LATIN AMERICA : OC Latin America, S. A.

# Overview

## List of Projects by OCG Co., Ltd in Bangladesh (on-going)

- Updating Revised Strategic Transport Plan (URSTP) for Dhaka Bangladesh
- Expanding Bangladesh's Road Capacity
- Hazrat Shahjalal International Airport Expansion Project (Construction of Terminal 3)

# Overview

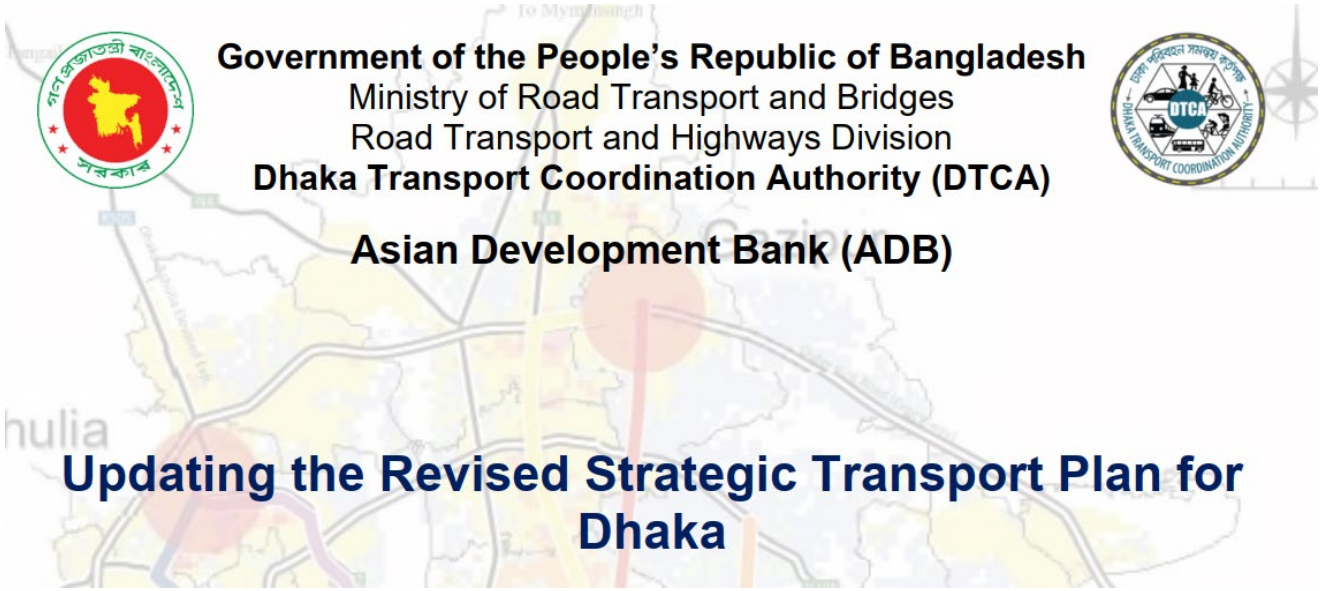
- Internship under:

Transport Planning and ICT Division

✓ It is a joint division, and I worked particularly with the Transport Planning team.

Duration: October to December 2025

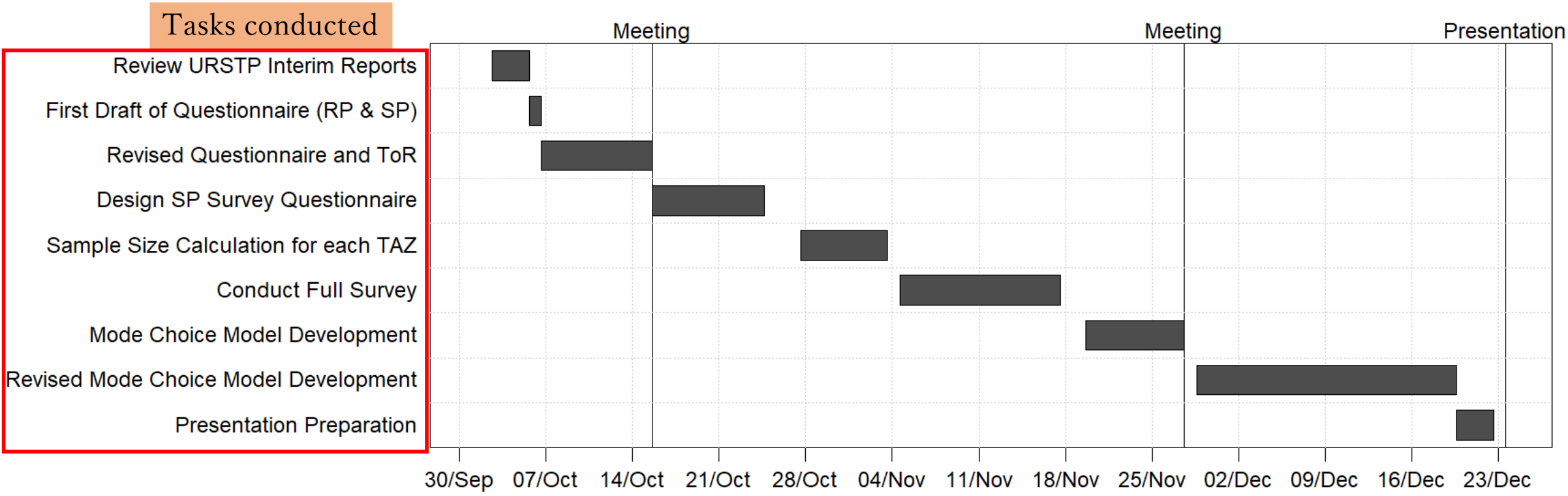
**Project:** Updating the Revised Strategic Transport Plan (URSTP) for Dhaka



# Overview

## My Role:

- Office visits: 2 days per week.
- Regular meeting with Transport planning team when necessary.
- Two meetings were carried out with the project director



# Background

- Interim report 3 of URSTP recommended bus transport improvement as an urgent issue
- Next step of the project: Bus Transport Improvement and Proposal of New Bus Service for the Rickshaw users.

Rickshaw as the informal mode

→400,000 Rickshaw Drivers > lower-income group + unorganized laborship
→Higher cost (8.3 Tk/km) compared to Bus and Lagunas
→Average speed = approx. 8kph at peak time
→Auto-rickshaws = no licensing procedure


| | Fatal | Grievous | Simple | Not Injured | Subtotal |
|---|---|---|---|---|---|
| Bus/Minibus | 7 | 3 | 18 | 1515 | 1543 |
| Car / Jeep | 12 | 22 | 27 | 565 | 626 |
| Motorcycle | 234 | 122 | 36 | 177 | 570 |
| Truck | 9 | 2 | 7 | 548 | 566 |
| 3 Wheelers | 6 | 7 | 7 | 68 | 88 |
| Rickshaw | 98 | 45 | 25 | 99 | 267 |
| Others | 35 | 32 | 19 | 477 | 564 |
| Total | 401 | 233 | 139 | 3449 | 4224 |

NB: URSTP Interim Report 3

# Motivation

- **Context**
  - ✓Urban transport challenges in Dhaka
  - ✓Need to evaluate alternatives to rickshaw-based commute
- **Motivation**
  - ✓ Explore if current rickshaw users would shift to a new bus service considering travel time, waiting time, and cost
- **Relevance**
  - ✓ Bridging academic theory with real-world transport issues

# Objectives and Research Questions

- **Primary objective**

✓ To examine the willingness of rickshaw users to adopt a new bus service.

  - The outcomes will be used in the interim report 4 in the URSTP.

- **Key Research Questions**

✓ How do travel time, waiting time, and cost affect mode choice?

✓ What trip/demographic factors drive the choice between rickshaw and bus?

- **Survey Design**

✓Stated Preference (SP) survey with two alternatives: Rickshaw vs. New Bus Service

# SP Survey Design

→$L^{MA}$ **design method -** Orthogonal Main Effect Design considering full-factorial case Here, **L** level factors are used to create each choice set containing **M** alternatives of **A** attributes.

Three attributes: Travel time. Waiting time and Cost, Two Alternatives (Rickshaw and New Bus Service)

Questionnaire is developed focusing on 3 attributes, 3 levels and 2 alternatives. Current scenario is the travel attributes of Rickshaws and alternative scenario is proposed new bus services. Respondents need to address one option from the box. As the survey will be conducted via phone survey (approximately 5mins/person), therefore, we prepare questionnaire with 3 blocks. Each blocks contain 3 choices of questions so that respondents can answer quickly

New Bus Condition: with AC, High-level security, (the travel time include the traffic congestion delay)
Environmental Condition: Sunny weather (November)

The sample respondents were selected from the Household Information Survey (HIS) data whose main travel mode is Rickshaw

| | | | |
|---|---|---|---|
| Waiting Time | 50% | 100% | 150% |
| Travel Time | 0% | 50% | 100% |
| Cost | -25% | -50% | -75% |

Alternative w.r.t Rickshaw trip information

# SP Survey Sample Size Calculation

→ Sample size of trip count of rickshaw users (main mode) for each ward union or TAZ is calculated as

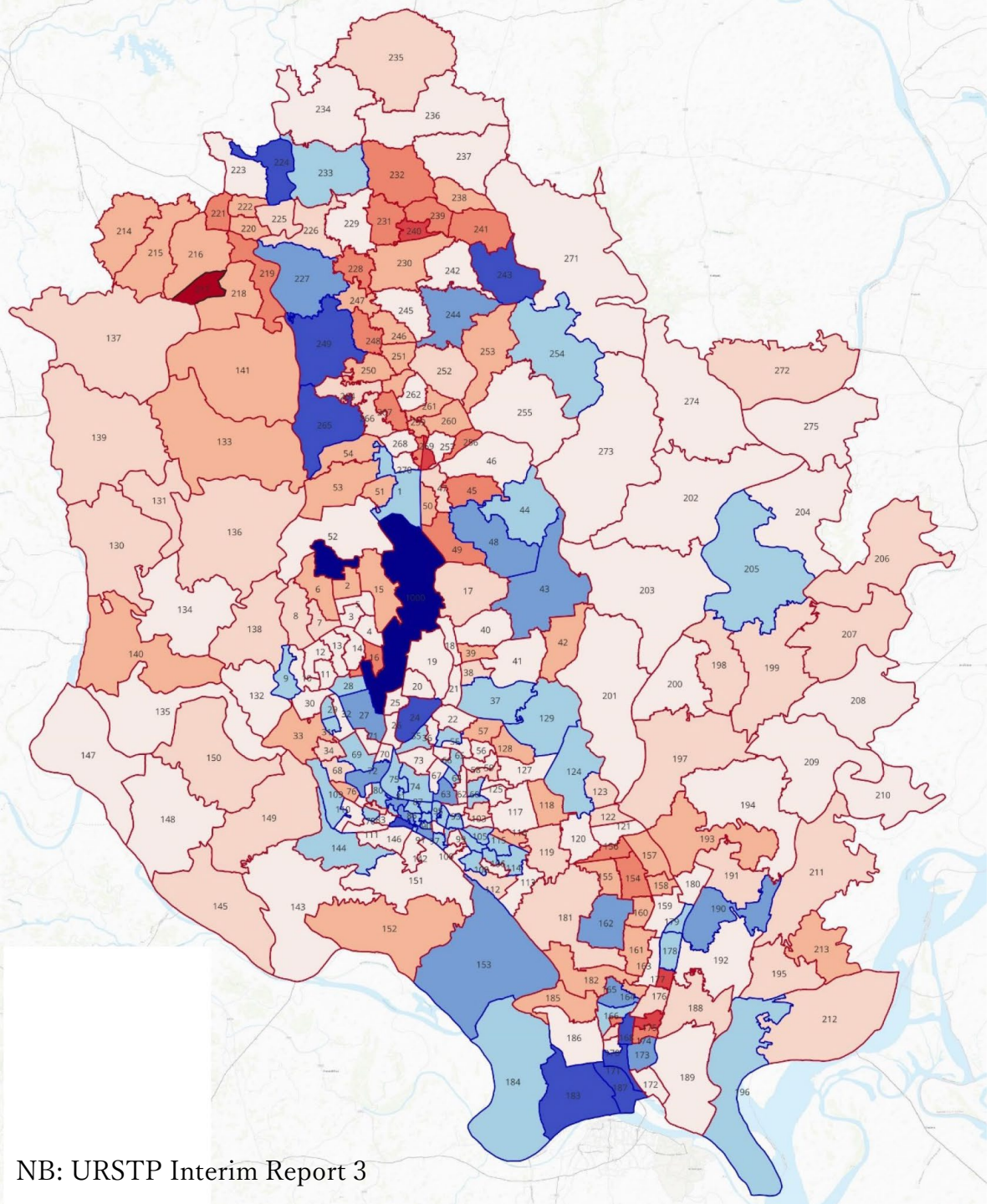
$$n = \frac{3.24(CV)^2}{d^2}$$

Here, CV = Coefficient of Variation: $\frac{Standard\ Deviation\ of\ trip\ count}{Mean\ trip\ count}$

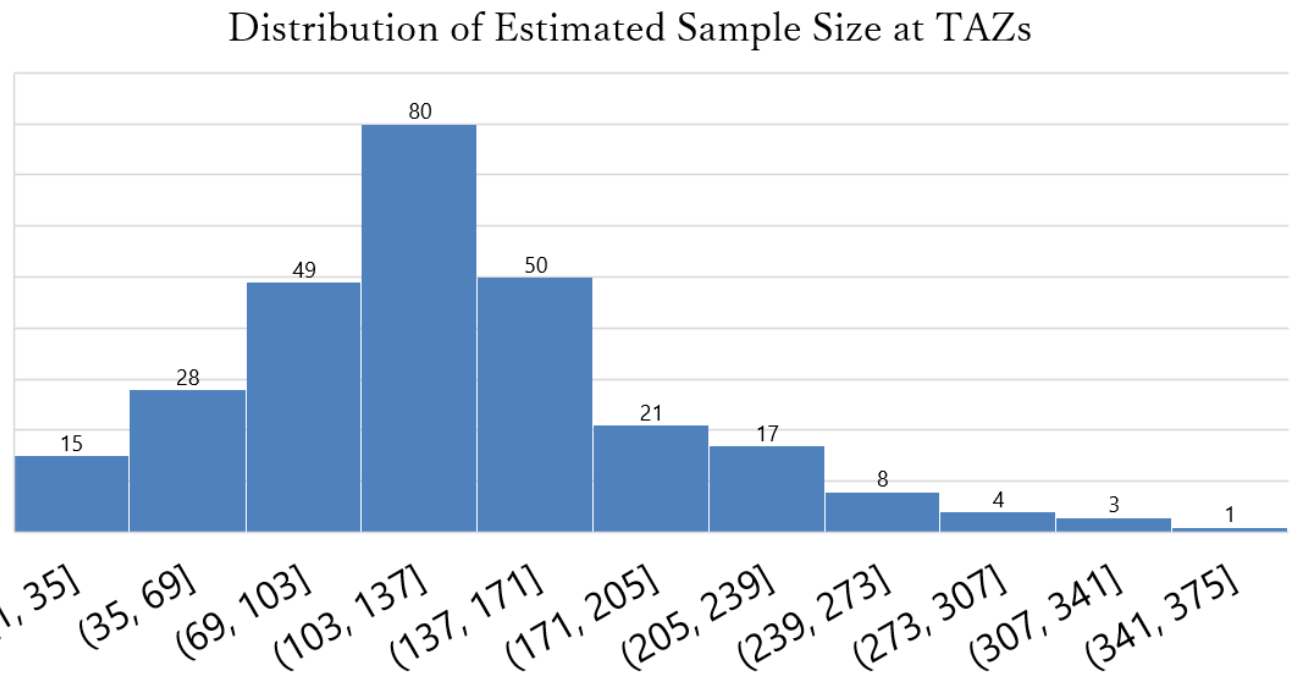
D = Tolerance level (10%); Confidence Interval = 90%

This sample size formula is application when n > 11 i.e., total trip count per TAZ is more than 11.

# Sample size of each of 276 TAZs



NB: URSTP Interim Report 3




TAZ: Traffic Analysis Zone

# Binary Logit Model

In Discrete Choice Model, the probability of a traveler to choose mode, i instead of mode j is usually expressed by

$$P_i = \Pr(U_i > U_j); here\ i \neq j$$

Here, $P_i$ is the probability that a traveler selects mode, i and $U_i$ is the utility of mode, i. This utility can be divided into two parts: observed variables $(V_i)$ and random part $(\varepsilon_i)$. Therefore,

$$U_1 = V_1 + \varepsilon_1 : New\ Bus\ Service$$
$$U_2 = V_2 + \varepsilon_2 : Rickshaw$$

$\varepsilon_i$ follows Gumbel distribution, so the difference of $\varepsilon_1 - \varepsilon_2$ follows logistic distribution. The probability of choosing, i becomes:

$$P_i = \frac{e^{V_i}}{e^{V_1} + e^{V_2}}$$

# Binary Logit Model

So, the two alternatives are:

$$P_{1:New\ bus\ service} = \frac{e^{V_1}}{e^{V_1} + e^{V_2}}$$

$$P_{2:Rickshaw} = \frac{e^{V_2}}{e^{V_1} + e^{V_2}}$$

Here, the $V_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki}$

where, $X_{ki}$ is k[th] attribute of alternative, i, and $\beta_k$ is the coefficient representing the influence of attribute $X_k$ on the utility. In our case,

$$V_1 = \beta_0 + \beta_1(cost_{new\ bus\ service}) + \beta_2(waiting\ time_{new\ bus\ service}) + \beta_3(in-vehicle\ time_{new\ bus\ service})$$

$$V_2 = \beta_0 + \beta_1(cost_{rickshaw}) + \beta_2(waiting\ time_{rickshaw}) + \beta_3(in-vehicle\ time_{rickshaw})$$

Estimation method: Maximum likelihood; Confidence Interval: 90%

# Key Findings and Analysis

## ❑Model Outcomes

- Trip Information

→Reduced travel cost and in-vehicle time are more likely to increase bus ridership and to achieve modal shift from Rickshaw to Bus for all trip purposes

- Demographic Information

→High income group and males are more likely to use new bus service

### Home-based Work

| Variables | Estimate | Standard Error | z | p-value |
|---|---|---|---|---|
| Constant | 1.722 | 0.54 | 3.180 | 0.001 |
| Trip Information | | | | |
| In-vehicle time (min) | -0.061 | 0.019 | -3.455 | 0.0005 |
| Cost (Taka) | -0.068 | 0.020 | -3.391 | 0.0007 |
| Demographic Information | | | | |
| HH Income (base: Low-income) | | | | |
| High-income | 1.392 | 0.794 | 1.752 | 0.080 |

### Home-based Education

| Variables | Estimate | Standard Error | z | p-value |
|---|---|---|---|---|
| Constant | 3.849 | 0.906 | 4.25 | 0.000 |
| Trip Information | | | | |
| Waiting Time (min) | -0.103 | 0.036 | -2.877 | 0.004 |
| In-vehicle time (min) | -0.073 | 0.022 | -3.329 | 0.000 |
| Cost (Taka) | -0.117 | 0.028 | -4.213 | 0.000 |
| Demographic Information | | | | |
| HH Income (base: Low-income) | | | | |
| Middle-income | -1.338 | 0.507 | -2.637 | 0.008 |

### Home-based Others

| Variables | Estimate | Standard Error | z | p-value |
|---|---|---|---|---|
| Constant | 1.576 | 0.821 | 1.917 | 0.055 |
| Trip Information | | | | |
| In-vehicle time (min) | -0.052 | 0.022 | -2.401 | 0.016 |
| Cost (Taka) | -0.088 | 0.024 | -3.738 | 0.000 |
| Demographic Information | | | | |
| Gender (base: Female) | | | | |
| Male | 0.996 | 0.319 | 3.125 | 0.002 |

### Non-home based Work

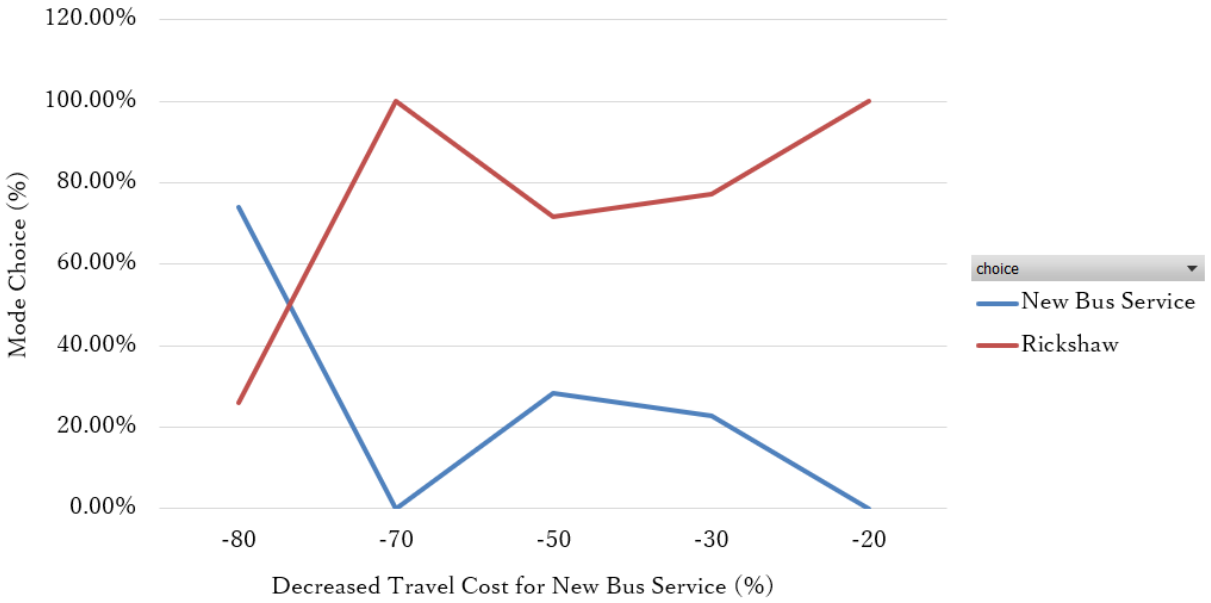
| Variables | Estimate | Standard Error | z | p-value |
|---|---|---|---|---|
| Constant | 1.403 | 1.109 | 1.266 | 0.206 |
| Trip Information | | | | |
| Cost (Taka) | -0.085 | 0.031 | -2.719 | 0.007 |

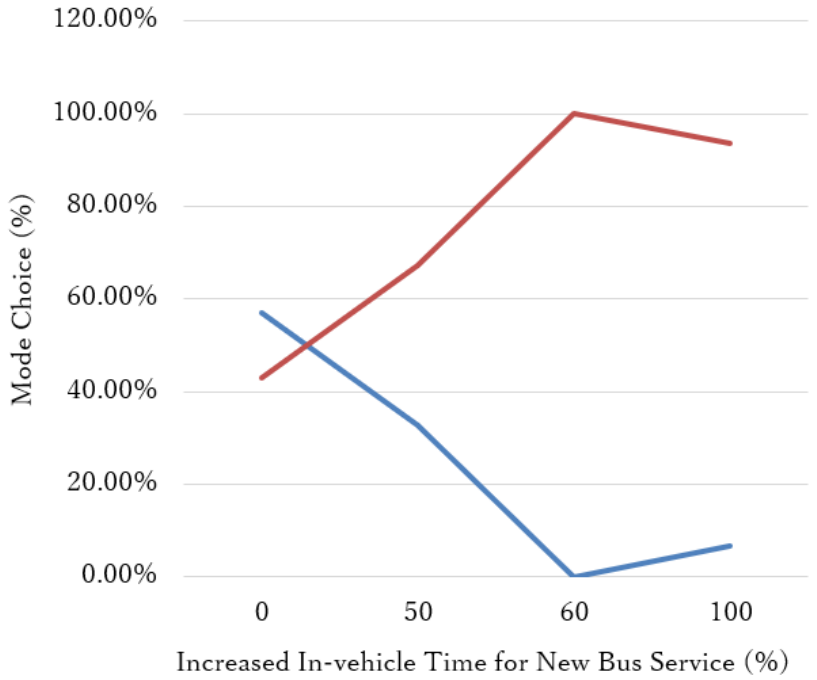
### Non-home based Others

| Variables | Estimate | Standard Error | z | p-value |
|---|---|---|---|---|
| Constant | -0.603 | 0.956 | -0.631 | 0.528 |
| Demographic Information | | | | |
| Male | 1.378 | 0.701 | 1.965 | 0.050 |

# Key Findings and Analysis

- Cost Sensitivity: >60% (average) reduction in rickshaw cost increases bus choice
- Time Sensitivity: >50% (average) increase in in-vehicle time favors rickshaw
- People are more willing to spend time during travel with Rickshaw > possible for habits, easy accessibility, door-to-door service, etc.
- It seems people in Dhaka city <u>are less willing to pay more for new bus service and less tolerable in case of travel time</u>.




Home-based Work

# Policy Recommendation

Soft policy based:

→Easy to recommend new bus services – may be modular vehicles

→Earning relies on Rickshaw rides, so can not wipe out Rickshaw as a mode entirely > a part and parcel mode for the daily commuters; people don't want to wait; accessibility is higher.

→ Future survey on the Rickshaw pullers about the new bus service

→What if – offer them "job shift" towards a new mode > new job creation

→Benefit-Cost analysis required for new bus service

→New bus service as substitute as environmental friendly as (or close to) Rickshaw

→Focus on bus design due to narrow arterial and collectors in Dhaka city

# Future Usage of this Tasks Conducted

- ✓The model estimates will be used in the travel demand forecasting of the proposed new-bus service in Dhaka City for Interim Report 4
- ✓The estimates will be used to predict modal shift percentage of each 276 TAZs of Dhaka City
- ✓A recommendation may be made in the next phase of this project to test modular bus service in the routes of Rickshaws to see the reaction and usage patterns of new bus services by the road users.

# Internship Impressions

- Through this internship, a deeper understanding of transport planning is developed. It is clear that many groups in Bangladesh and Japan are working to solve transport problems to ensure better mobility and livability.
- There is a lot of non-technical work involved in an engineering project, such as business coordination (logistics, hiring local staff, etc.) and administrative work (preparing reports, etc.)
- Transport planning needs co-ordination and need transparent level of communication among the personnel. For instance: OCG officials need to work with local authorities in Bangladesh such as: Ministry of Road Transport and Bridges, Roads and Highways Department of Bangladesh, Dhaka Transport Coordination Authority, etc.
- In academia, we tend to learn theories. In industries, we tend to learn where to use those theories for decision-making and purpose-based works through multi-angled views, extensive discussions, keeping deadlines and preparing for briefing sessions.

# Conclusions and Final Feedback

- **Summary**
  - Successfully executed a comprehensive research project bridging theory and practice
  - Identified key factors influencing modal shift in urban transport
- **Key Takeways**
  - Continuous learning, proactive communication, and collaboration are vital
  - Interdisciplinary approaches enrich problem-solving in transport planning
- **Advice for Fellow Students**
  - Be Curious: Ask questions early—don't wait to clarify doubts
  - Collaborate: Trust and support your team; knowledge sharing accelerates progress
  - Stay Committed: Meeting deadlines are crucial—small delays may have significant impacts on the overall project outcomes

# Final Presentation Day at OCG Tokyo Office on December 24, 2024