



Global Initiative of Academic Networks (GIAN)

BRINGING SYNERGY ACROSS DIFFERENT TRANSIT MODES IN INDIA BY ADDRESSING CHALLENGES FOR SUSTAINABLE TRANSPORT MODES

JUNE 23 - 27, WARANGAL, INDIA

Instructors

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LECTURE OUTLINE

Introductions

Course Objectives

Course Schedule

Course Logistics

Introduction

INTRODUCTIONS

Faculty

Students

NAVEEN ELURU



Naveen Eluru



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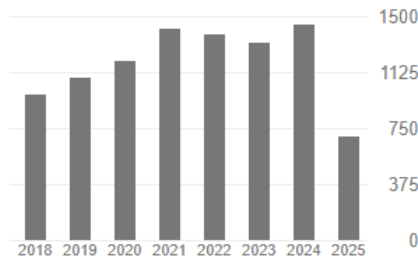
[Transportation](#) [travel behavior](#) [discrete choice models](#) [transportation safety](#)
[Emerging Transportation M...](#)

TITLE	CITED BY	YEAR
A mixed generalized ordered response model for examining pedestrian and bicyclist injury severity level in traffic crashes N Eluru, CR Bhat, DA Hensher Accident Analysis & Prevention 40 (3), 1033-1054	804	2008
How land-use and urban form impact bicycle flows: Evidence from the bicycle-sharing system (BIXI) in Montreal A Faghieh-Imani, N Eluru, AM El-Geneidy, M Rabbat, U Haq Journal of transport geography 41, 306-314	647	2014
An analysis of bicycle route choice preferences in Texas, US IN Sener, N Eluru, CR Bhat Transportation 36, 511-539	563	2009
A copula-based approach to accommodate residential self-selection effects in travel behavior modeling CR Bhat, N Eluru Transportation Research Part B: Methodological 43 (7), 749-765	382	2009
The impact of demographics, built environment attributes, vehicle characteristics, and gasoline prices on household vehicle holdings and use	360	2009

Cited by

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Professor and Graduate Program Director

Department of Civil, Environmental and Construction Engineering, University of Central Florida

<https://people.cecs.ucf.edu/neluru/publications/>

RESEARCH OVERVIEW

Build choice/econometric models for understanding behavioral processes

Focus on explainable data analytics drawing on microeconomic theory to predict the decision processes into the future

Incorporate econometrics, data analytics, optimization and micro-simulation in large scale quantitative regional transportation models

Utilize these advances to study the interaction among individuals, households, firms, and communities in a system of systems framework

The quantitative frameworks have been applied in transportation and other inter-disciplinary areas

RESEARCH OVERVIEW

Travel Demand Modeling

- Build high fidelity regional travel demand models for a changing world (hybrid work, increasing vehicle ownership and freight)
- Quantify the impact of urbanization on mobility demand, infrastructure, energy transition, pollution and climate change

Transportation Safety

- Improve stand alone econometric methods for modeling crashes to enhance current understanding of crash occurrence and severity
- Enhance current approaches to safety modeling by exploring multiresolution interactions in a unified framework

Emerging Mobility

- Develop approaches to proactively predict the impact of emerging mobility alternatives and non-motorized last mile modes
- Incorporate these new mobility alternatives within travel demand modeling approaches

RESEARCH OVERVIEW

Public Transportation

- Study current public transportation systems to understand current ridership numbers and provide improvement strategies
- Improve complementarity between traditional public transportation and personalized emerging mobility alternatives

Resilience

- Improving transportation infrastructure resilience for disasters (floods, heat waves and cyclones)
- Decision making during disasters and community recovery post-disasters

Climate Change and Sustainability

- Impact of transportation on energy demand and air pollution with changing vehicle fleets
- Proactive land use planning to improve sustainable patterns of urban evolution

**IN THIS GIAN
COURSE**

We will introduce emerging opportunities and challenges for public transportation across India. Then we will provide exposure to quantitative approaches that can offer data-driven solutions to address the various challenges

TEACHING PHILOSOPHY

- I want the course to be interactive
- I encourage you to be open and discuss any questions
- My objective is not to cover syllabus but to “uncover” material, so you learn [quote attributed to Dr. Chandra Bhat]
 - I am ok repeating the material as needed so all of you understand
- The slides and course material are online at <https://people.cecs.ucf.edu/neluru/courses/gian-2025/>
- If typing, try <https://tinyurl.com/5eawhun2>
- I will use Mentimeter to seek feedback

STUDENT BACKGROUND

- Connect to Mentimeter
 - Course expectation Survey
(<https://www.mentimeter.com/app/presentation/all1aovg6ypdxqgz9f4i7ofsdd43sok9/edit?source=share-invite-modal>)
 - Student Background
(<https://www.mentimeter.com/app/presentation/alczcroxks4i3vbwj9t94jtyz5ubq8u/edit?source=share-invite-modal>)
 - Software experience
(<https://www.mentimeter.com/app/presentation/alnemmmua6gipivj2twp2nugqdofmfar2/edit?source=share-invite-modal>)

COURSE OBJECTIVES

Overview of public transportation systems in India

Introduce modelling approaches that can identify determinants of public transit and emerging mobility demand

Provide an in-depth discussion of methods relevant for public transportation data in India

Illustrate the methods developed with real world use case data from the Indian context

Devise strategies to promote public transportation usage by leveraging emerging mobility alternatives synergistically

COURSE MODULES

Introduction	• Public Transportation – An Introduction
Public transport data	• Background on data components useful for public transportation system analysis, their compilation and consistency analysis
Modeling approaches for public transit analysis	• Introduce traditional frameworks for public transit analysis – linear regression, discrete choice models (such as multinomial logit, ordered logit, and count models)
Emerging models for public transit data analysis	• Flexible discrete choice models (NL, ML, discrete continuous models) and machine learning models (KNN, RF, SVM, Decision Tress and Gradient Boost)
Integrating emerging modes with public transit	• Bringing it all together to leverage emerging modes and data analytics to improve public transportation across India



INTRODUCTION MODULE

PUBLIC TRANSPORTATION

A mode of transport that serves all users in the community for a pre-determined fare

Offer increased accessibility to members that either do not own or rely on private vehicles

Can potentially offer capacity and environmental benefits by reducing the need for private vehicle modes

Often the only mode of transportation for disabled, low income and vulnerable populations

PUBLIC TRANSPORTATION – IMPORTANT TERMS

What is public transportation

- A shared transportation service usually operated on a fixed schedule and route

Operators

- Operated by public or private operators

Service Area

- Include an urban area, states, country or world

Traditional Modes

- Bus, train, light rail, trams, metro, ferry and air

Emerging Modes

- Ridesharing, car-pooling, micro-mobility (Bike sharing, e-scooter) and micro-transit

PUBLIC TRANSPORTATION AROUND THE WORLD

Figure 16: Mode Share in New York

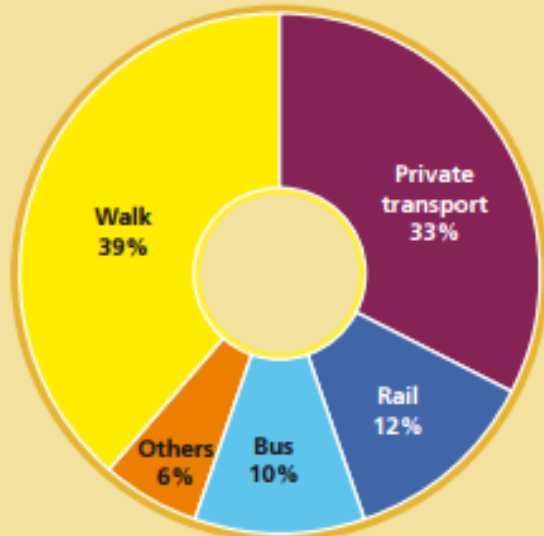


Figure 4: Mode Share in Beijing

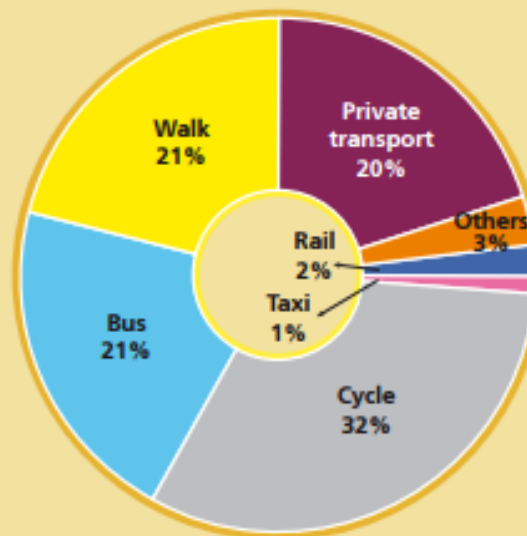
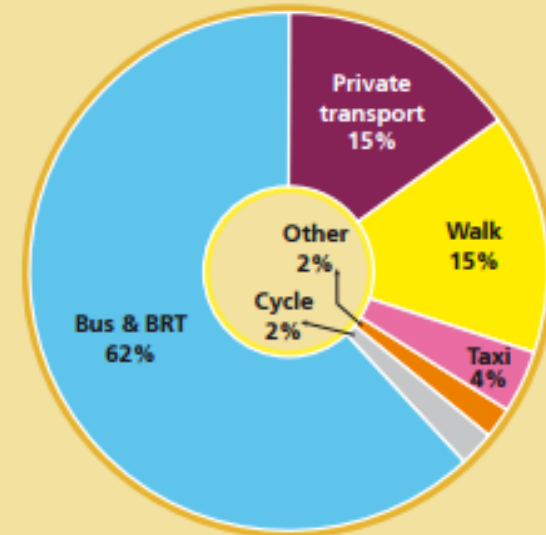
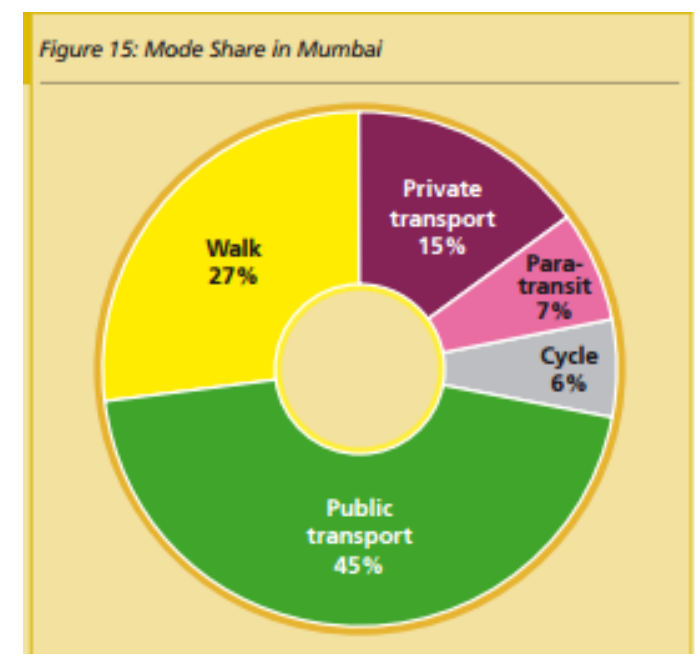
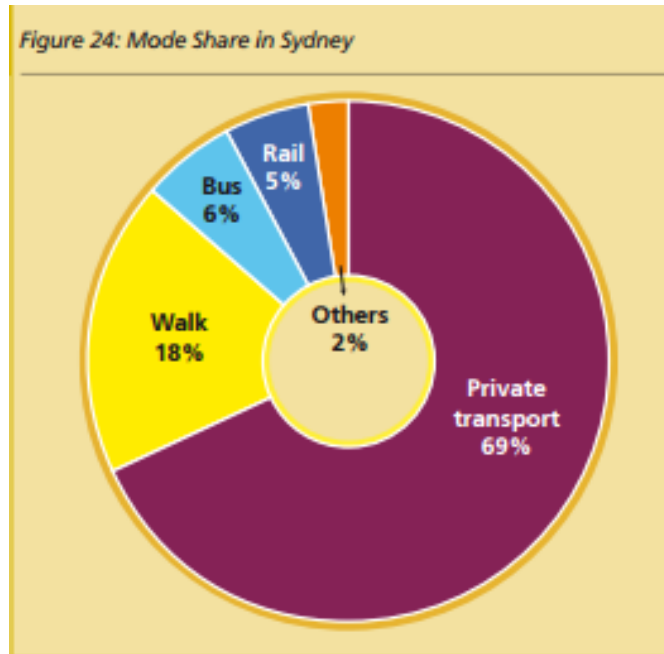
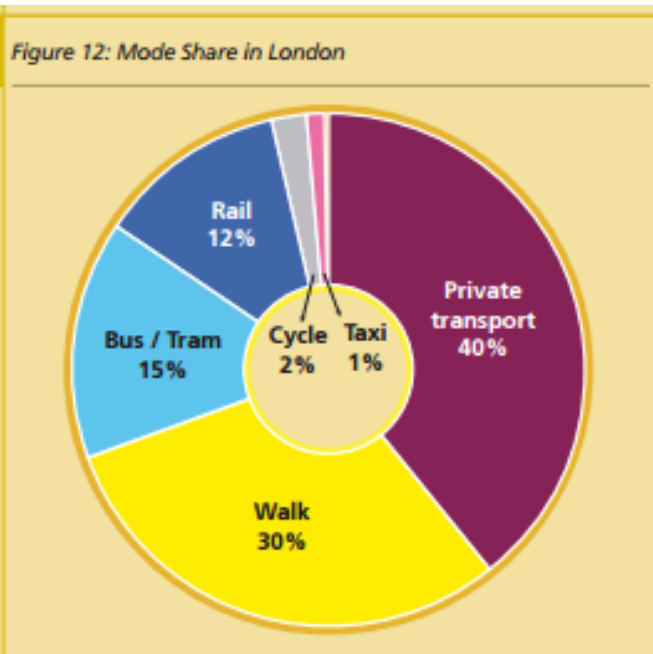


Figure 6: Mode Share in Bogota



Source: Journeys - <http://www.lta.gov.sg/ltaacademy/doc/J11Nov-p60PassengerTransportModeShares.pdf>

PUBLIC TRANSPORTATION AROUND THE WORLD



Source: Journeys - <http://www.lta.gov.sg/ltacademy/doc/J11Nov-p60PassengerTransportModeShares.pdf>

URBAN MOBILITY READINESS INDEX

The index has an overall ranking and three sub-indices that provide insights into three distinct and important facets of urban mobility

Urban Mobility Readiness Index

Mobility readiness is holistically measured by 71 KPIs across social impact, infrastructure, market attractiveness, system efficiency, and innovation.

Sustainable Mobility sub-index

First launched in 2021, the sub-index measures cities' efforts to build greener, more efficient and sustainable mobility ecosystems.

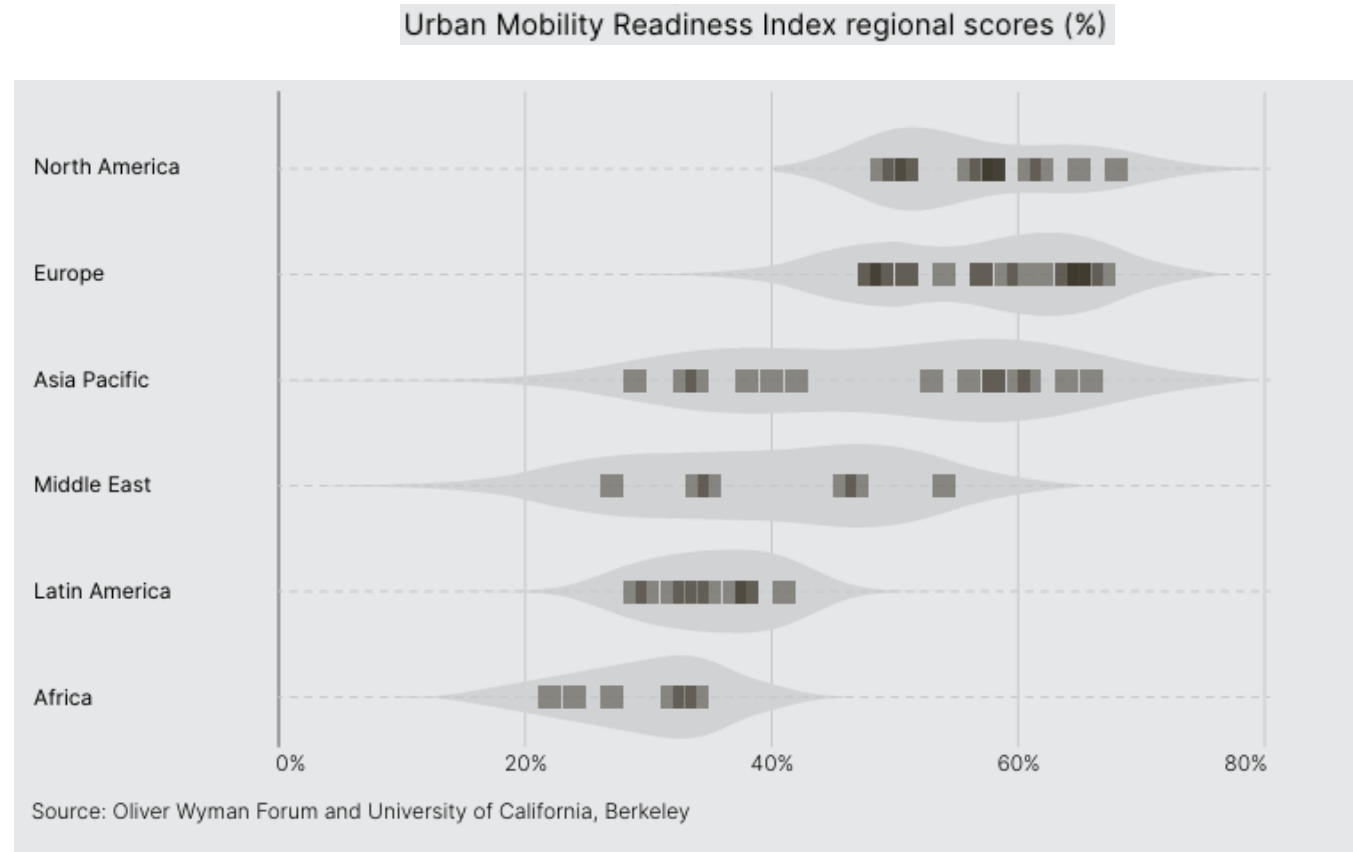
Public Transit sub-index

In its third year, the sub-index measures cities on public transit density, efficiency, and utilization rate.

Technology Adoption sub-index

New this year, the sub-index measures cities' preparedness for new mobility solutions and technologies.

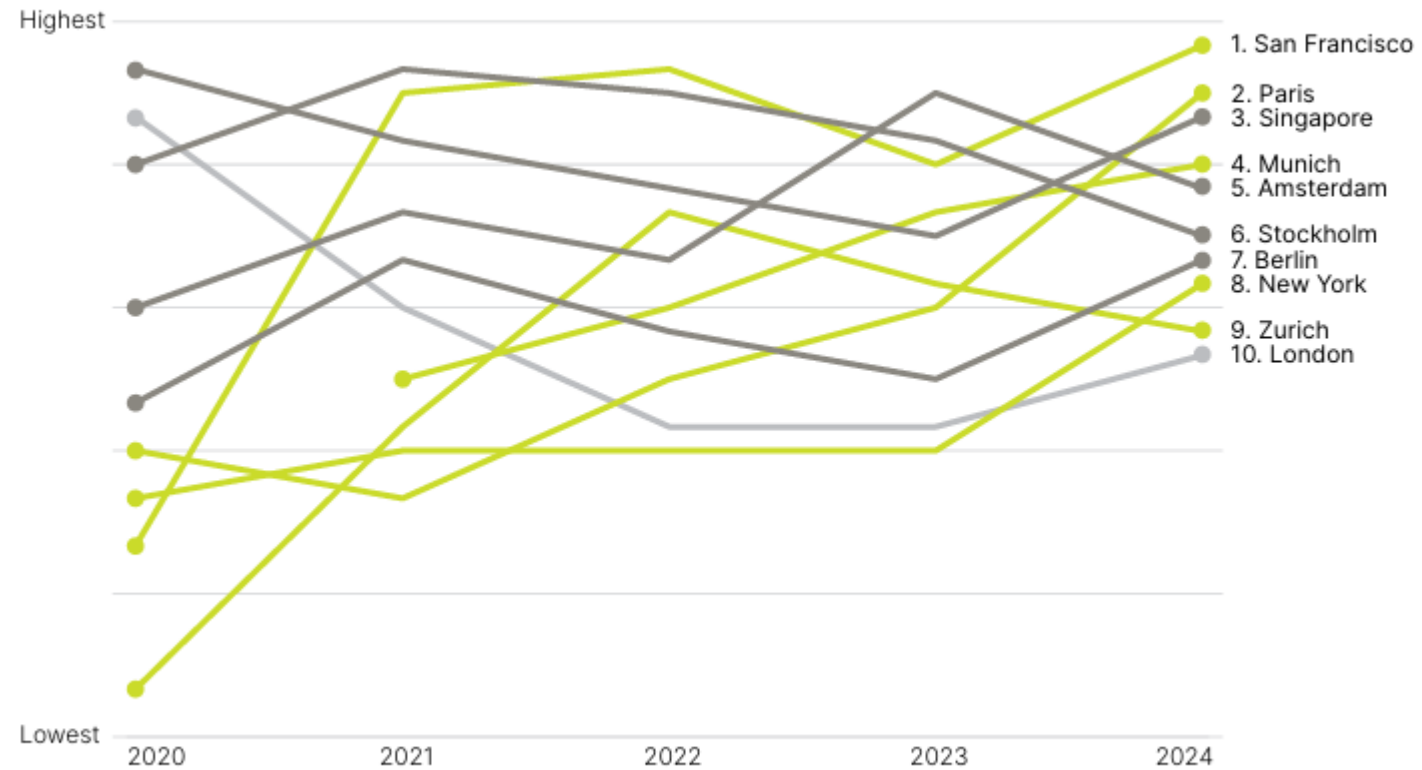
RANKING OF URBAN PUBLIC TRANSPORTATION



CITIES

Top city relative rankings 2020-2024

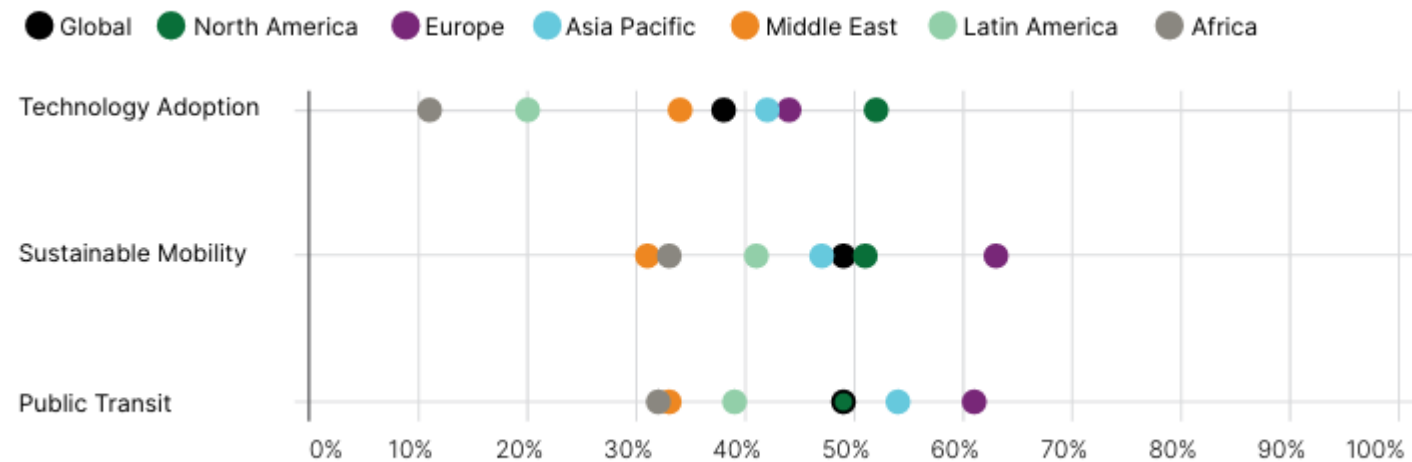
— Climbing — Stable — Falling



Source: Oliver Wyman Forum and University of California, Berkeley

SCORES ACROSS COUNTRIES

Regional and global sub-indices average scores (%)



Source: Oliver Wyman Forum and University of California, Berkeley

NORTH AMERICA

Dimensions of the Urban Mobility Readiness Index score

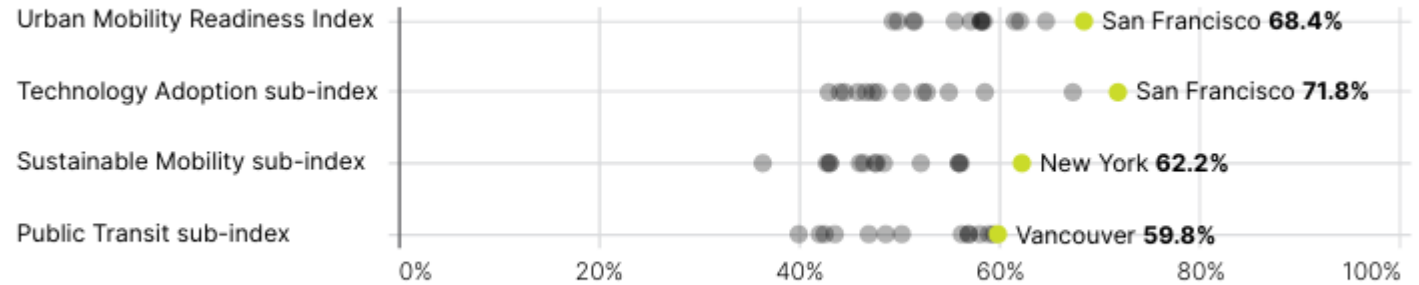
Regional scores in percentage across the five dimensions compared with global average

■ North America ■ Global



Source: Oliver Wyman Forum and University of California, Berkeley

● Top scorers



Source: Oliver Wyman Forum and University of California, Berkeley

City	2024	vs. 2023
San Francisco	1	↑ +3
New York	8	↑ +4
Boston	14	↑ +5
Los Angeles	15	↑ +8
Washington, DC	21	↓ -3
Montreal	22	↑ +5
Vancouver	23	↓ -1

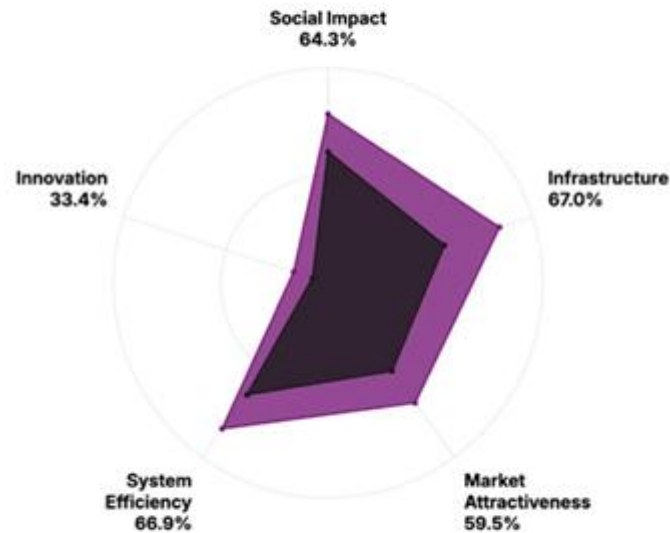
Chicago	24	↓ -5
Toronto	28	↓ -2
Atlanta	30	↓ -2
Houston	34	↓ -2
Dallas	35	↑ +1
Detroit	38	n/a
Austin	39	n/a

EUROPE

Dimensions of the Urban Mobility Readiness Index score

Regional scores in percentage across the five dimensions compared with global average

■ Europe ■ Global

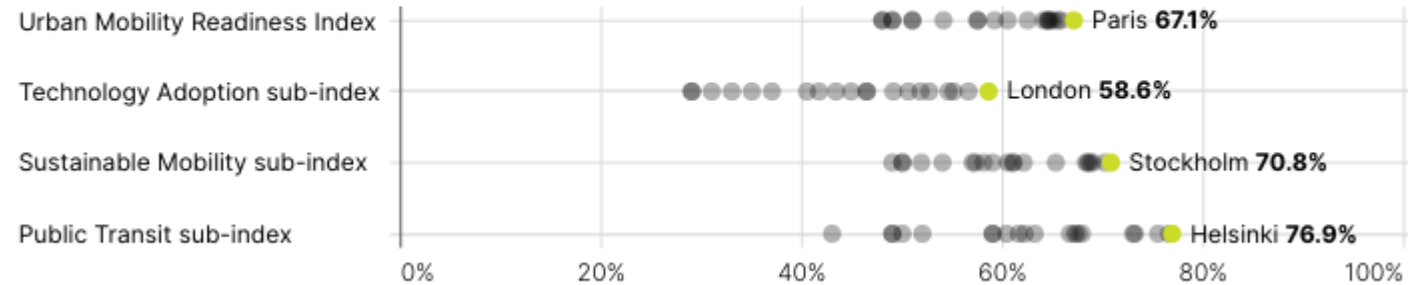


Source: Oliver Wyman Forum and University of California, Berkeley

Regional Urban Mobility Readiness Index and sub-indices overview

Distribution of European cities' scores in percentage

● Top scorers



Source: Oliver Wyman Forum and University of California, Berkeley

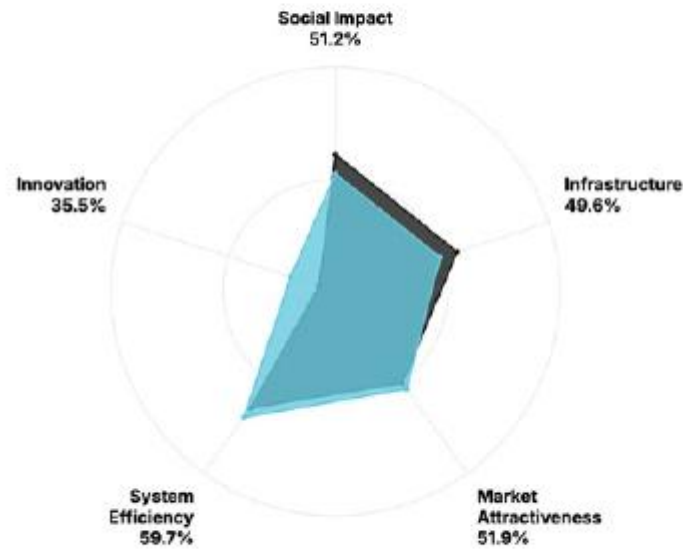
City	2024	vs. 2023
Paris	2	↑ +6
Munich	4	↑ +1
Amsterdam	5	↓ -3
Stockholm	6	↓ -3
Berlin	7	↑ +3
Zurich	9	↓ -2
London	10	↑ +1
Helsinki	11	↓ -10
Copenhagen	13	↓ -4
Oslo	17	↓ -3
Vienna	19	n/a
Madrid	26	↓ -5
Barcelona	27	↓ -2
Milan	31	↑ +3
Dublin	36	↓ -1
Warsaw	37	= 0
Rome	40	↑ +3
Lisbon	41	n/a
Istanbul	42	↓ -1

ASIA-PACIFIC

Dimensions of the Urban Mobility Readiness Index score

Regional scores in percentage across the five dimensions compared with global average

■ Asia Pacific ■ Global

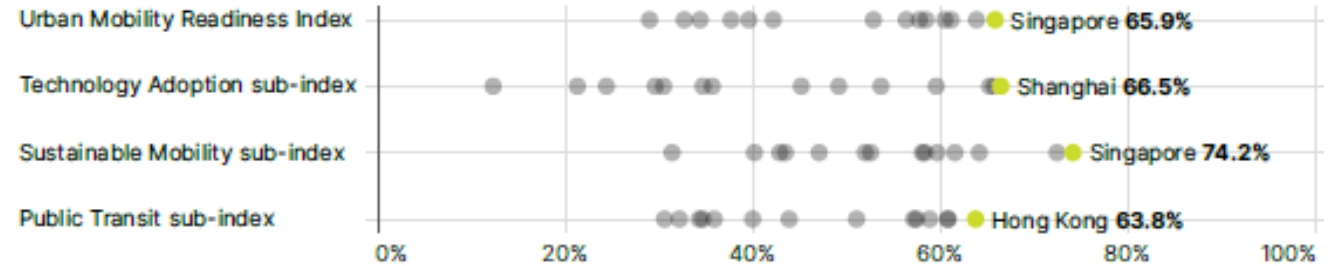


Source: Oliver Wyman Forum and University of California, Berkeley

Regional Urban Mobility Readiness Index and sub-indices overview

Distribution of Asian Pacific cities' scores in percentage

● Top scorers



City	2024	vs. 2023
Singapore	3	↑ +3
Seoul	12	↑ +1
Hong Kong	16	↓ -1
Tokyo	18	↓ -2
Beijing	20	↑ +11
Shanghai	25	↑ +8

Sydney	29	↓ -6
Melbourne	33	↓ -3
Kuala Lumpur	46	= 0
Bangkok	48	↓ -1
Jakarta	51	↓ -2
Delhi	55	↓ -3
Mumbai	60	= 0
Manila	65	= 0

MOBILITY INDEX COMPONENTS

What should we use as a metric

- Measurable components (travel time, accessibility to jobs, grocery and health care, public transit density, utilization and affordability)
- Subjective components (perception, comfort, information, safety and convenience)
- Aspirational components (technology adoption rate, and system goals)

Important elements for metric

- Data on public transit ridership and fare collection
- Impact on employment
- Effect on community [property values, transit oriented developments]

USEFUL RESOURCES

- Littman T. A., Evaluating Public Transit Benefits and Costs Best Practices Guidebook (accessible from <https://www.vtpi.org/tranben.pdf>)

CASE STUDY

We recently developed a framework to understand the equitable consideration of transportation demand for Transportation Network Companies (such as Uber/Lyft)

- Parvez D. A., Tirtha S. D., Bhowmik T., Peeta S., Eluru N., (2024) “Understanding the Role of Transportation Network Companies in Addressing Transportation Demand: A Chicago Case Study”, Presented at the Transportation Research Board (TRB) Annual Meeting, Washington D.C., 2024
- We present this case study to illustrate a mechanism to develop useful data driven metrics for analysis of public transit systems

REFERENCES

- Urban Mobility Readiness Index 2024, accessed from <https://www.oliverwymanforum.com/mobility/urban-mobility-readiness-index.html> on June 15, 2025