SUMMARY REPORT

INTERNATIONAL CASE STUDIES ON QUALITY OF LIFE IMPACTS OF SUSTAINABLE TRANSPORT

WCTR 2026 Special Session

9 July 2026 |4:20 PM to 6:00 PM CEST | *Toulouse School of Economics* | *Toulouse, France*

Organised by WCTR SIG-F4 in collaboration with IGSTL

Chair: Prof. Ashish Verma, Indian Institute of Science, Bengaluru

Executive Summary

The WCTR 2026 Special Session, "International Case Studies on Quality of Life Impacts of Sustainable Transport," brought together five international perspectives to examine a central question in contemporary transport planning: how can mobility systems be evaluated not only by how efficiently they move people, but also by how they shape health, safety, accessibility, equity, well-being and urban livability?

Chaired by Prof. Ashish Verma of the Indian Institute of Science, Bengaluru, with Ms. Ann Das as the Rapportuer, the session was organised by WCTR SIG-F4 in collaboration with the International Group on Sustainable Transport and Livability (IGSTL). It combined city-level policy experience from Vienna, methodological advances in accessibility analysis from London, gender sensitive public transport analysis from Montreal, a virtual walkability experiment from Bangkok, and a quality of life and Sustainable Development Goal framework from India.

Across the presentations, three broad conclusions emerged. First, conventional transport indicators such as travel time, speed, cost and capacity remain necessary, but are insufficient on their own, therefore, for improving the quality of life of individuals through transport planning an holistic approach which constitutes objective and subjective transport indicators must be taken into account while planning. Second, sustainable transport requires coordinated policy packages rather than isolated interventions. Third, the quality and distribution of transport outcomes matter: the same network can produce very different experiences depending on income, gender, household responsibilities, destination quality, street conditions and institutional context.

The session therefore called for a people-centred approach in which transport policies are evaluated against their contribution to healthier, safer, fairer and more liveable communities. It also emphasised that international lessons should be adapted rather than copied, particularly when applying experience from established high-income cities to rapidly growing urban regions in developing economies.

Session Overview

Session title	International Case Studies on Quality of Life Impacts of Sustainable Transport
Date and time	9 July 2026, 4:20 PM CEST
Venue	AMPHI D, WCTR 2026, Toulouse, France
Organisers	WCTR SIG-F4 in collaboration with IGSTL
Chair	Prof. Ashish Verma, Indian Institute of Science, Bengaluru
Geographical perspectives	India, Vienna, London, Montréal and Bangkok

The special session was designed to connect transport planning with the wider concept of quality of life. Rather than treating sustainable transport only as a question of reducing emissions or increasing modal shares, the presentations considered how transport systems affect daily experience, access to opportunities, social equity, physical and mental health, neighbourhood satisfaction and the livability of cities.

Chair and Guest Speakers

Panelist	Institution	Role	Presentation focus
Prof. Ashish Verma	Indian Institute of Science, Bengaluru, India	Session Chair and Presenter	Understanding Quality of Life impacts of Sustainable Transport: Case Studies from India
Prof. Guenter Emberger	TU Wien, Austria	Guest Speaker	Vienna's Path to Livability: Sustainable Transport Policy as a Driver of Quality of Life
Dr. Abhilash Chandra Singh	Trinity College Dublin, Ireland	Guest Speaker	Can accessibility measures be used to capture qualitative impacts of transport?
Prof. Martin Trépanier	Polytechnique Montréal, Canada	Guest Speaker	Gender Differences in Public Transport Trip Components
Prof. Kazuki Nakamura	Meijo University, Japan	Guest Speaker	Exploring Perceived Walkability in Sustainable Street Design Scenarios: A Virtual Experiment in Bangkok

Opening and SIG-F4 Context

Prof. Ashish Verma opened the session by introducing the speakers and situating the discussion within the objectives of WCTR SIG-F4. He emphasised the group's focus on improving the understanding of well-being and quality of life impacts within transport systems, and outlined its principal knowledge sharing activities: the Sustainable Transport and Livability (TSTL) journal, the international webinar series, and the World Symposium on Sustainable Transport and Livability (WSSTL).

Prof. Ashish Verma introducing the World Symposium on Sustainable Transport and Livability (WSSTL) and highlighting its objectives and activities during the opening of the special session.

Particular attention was given to the symposium's distinctive format such as (1) Sustainable Transport and Well-being, (2) Sustainable Transport and Health and Happiness (3) Sustainable Transport and Quality of Life, Equity and Social Justice (4) Sustainable Transport and Safety, Accessibility, Affordability and Environmental Quality (5) Sustainable Transport and Disaster Resiliency (6) Other aspects of Sustainable Transport related to Liveability and Quality of Life. This opening established the session as part of a wider, continuing effort to bring together transport researchers, practitioners and institutions around questions of livability, sustainability and human well-being.

Vienna's Path to Livability: Sustainable Transport Policy as a Driver of Quality of Life

Central argument

Prof. Guenter Emberger presented Vienna as an example of a city that has successfully reduced the dependence of mobility on private car use. By 2024, public transport, walking and cycling together accounted for approximately 74% of trips. He attributed this result not to a single flagship intervention, but to a sustained policy transition over several decades.

Prof. Guenter Emberger describing Vienna's path to livability through public transport and transforming urban mobility through research.

> ***"Long-term policy consistency-not isolated individual measures, produces true urban transformation."***
>
> *-Prof. Günter Emberger*

Historical transition and policy package

Vienna's transition was rooted in a gradual shift away from post war car oriented planning. The city's first pedestrian zone and first on-street parking charges were introduced in 1975. Public transport organisation and traffic calming measures were progressively strengthened, while walking and cycling facilities expanded. The first shared space initiative was introduced in 2018, and by 2022 all 23 districts were covered by parking management.

The presentation distinguished between "pull" measures, which make sustainable modes more attractive, and "push" measures, which reduce the relative convenience of car use. Affordable, frequent and integrated public transport represented the pull side. Parking regulation, pricing and the Parkpickerl residential permit system represented the push side.

Why parking management mattered

Parking management was presented as one of Vienna's most effective and still underutilised policy tools. By removing free, unrestricted all-day parking, the city reduced commuter traffic, lowered parking search activity and released public space for wider footpaths, cycle lanes, parklets and other uses. The wider lesson was that investment in public transport alone rarely changes behaviour if driving and parking remain cheap and convenient.

Institutional and future challenges

Prof. Emberger emphasised that the principal barriers are political and institutional rather than technical. Cities already possess many of the tools required to promote sustainable mobility, but consistent implementation depends on public legitimacy, coordination across agencies and long-term political commitment. He also stressed that the relationship between transport and quality of life must increasingly include climate-change adaptation, disaster resilience and the protection of vulnerable urban systems.

London: Can accessibility measures be used to capture qualitative impacts of transport?

The limitation of conventional accessibility measures

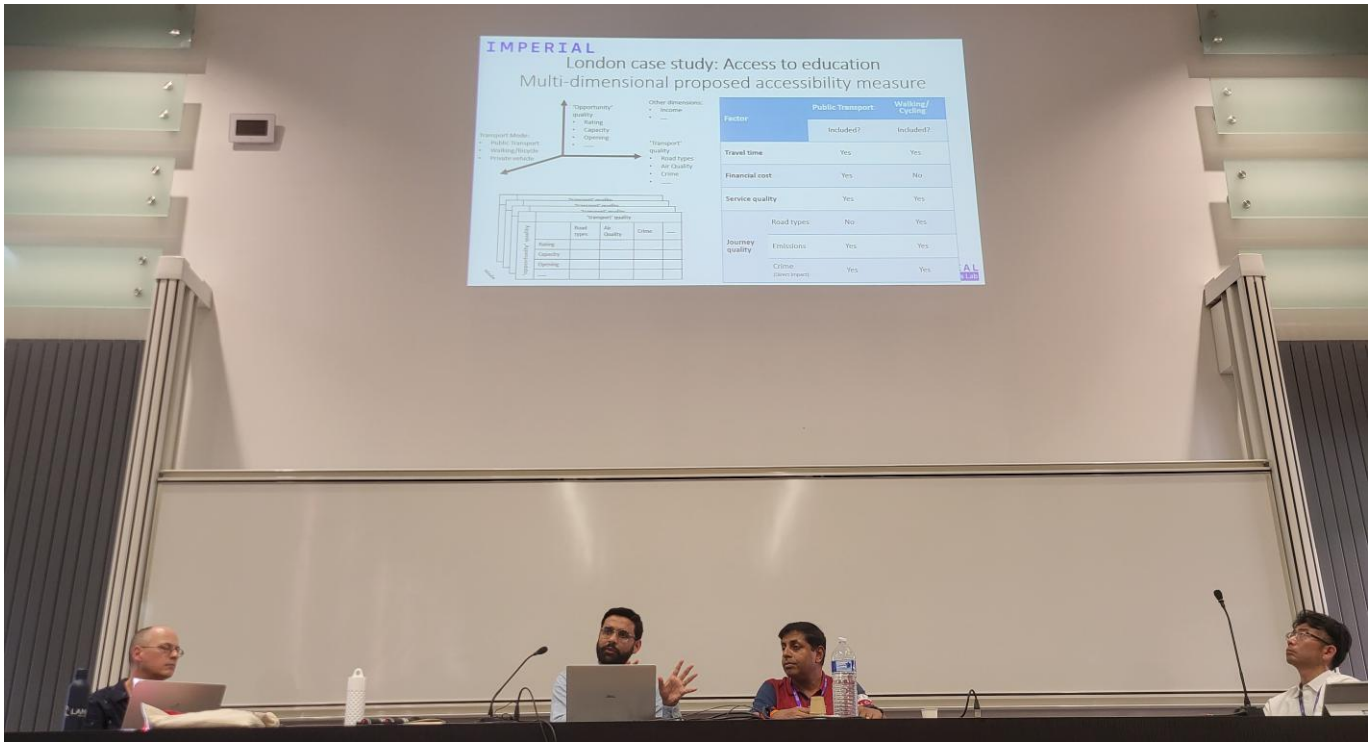
Dr. Abhilash Chandra Singh asked whether commonly used accessibility measures can adequately capture the qualitative impacts of transport. Accessibility based planning normally evaluates how well land use and transport interact to allow people to reach schools, employment, health care and other opportunities. However, commonly used tools including cumulative opportunity measures, isochrones and gravity based measures are typically constructed primarily from travel time and financial cost.

> ***"Regional accessibility planning needs to take these qualitative factors into account, not just travel time."***
>
> *- Dr. Abhilash Chandra Singh*

The presentation argued that two important dimensions are frequently missing. The first is journey quality: personal safety, road safety, exposure to pollutants, stress and mental health burden. The second is destination or opportunity quality: whether the school, hospital or service being reached is highly rated, adequately resourced, open at the required time and capable of meeting users' needs.

London education case study

The London case study examined access to education using an enhanced multidimensional framework. It combined public transport journey information with emissions data, crime data, road network characteristics, household information and measures of destination quality. Public transport data covered London Underground, Overground, bus, tram, Docklands Light Railway and National Rail services; environmental and safety indicators included PM2.5, nitrogen oxides and recorded crime.



Dr. Abhilash C. Singh presenting the London case study on access to education and explaining a multidimensional accessibility framework that incorporates journey quality, safety, emissions, crime and destination quality.

The analysis found that conventional accessibility measures overestimated accessibility by around 8% on average when air pollution and crime impacts were omitted. Accessibility was only loosely associated with population density, probably because denser areas contain a greater concentration of local facilities. Within the preliminary model, household income was not correlated with accessibility, although the study noted that the equity analysis requires further development.

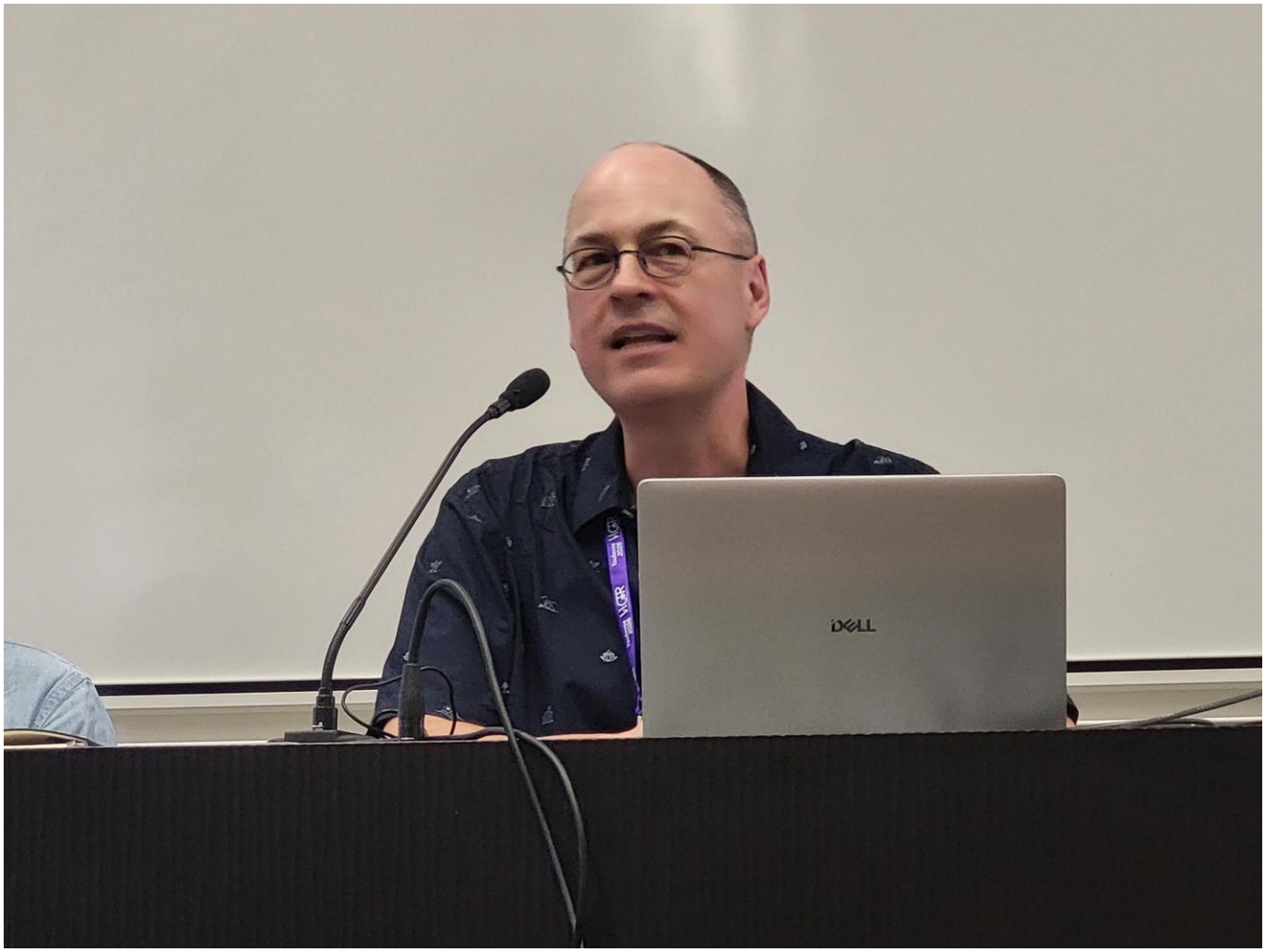
Implications for planning

The principal implication was that proximity does not automatically equal meaningful accessibility. Two journeys of the same duration may differ significantly if one exposes a traveller to unsafe streets, high pollution or severe stress, or if the destination reached is unsuitable or of poor quality. Regional accessibility planning should therefore incorporate qualitative factors when the policy objective is to improve quality of life.

The study also acknowledged methodological challenges. Combining qualitative factors into a single index requires assumptions about the value of safety, health and environmental quality. However, transport appraisal and health economics already apply comparable valuation methods, suggesting that the challenge is manageable rather than conceptually unprecedented. Future work proposed additional road-safety and perception data, alternative multidimensional formulations, more destination types and application in other cities.

Equity, sustainability and ridership

Prof. Martin Trépanier examined how public transport in vehicle speeds differ between men and women in the Montreal metropolitan region. The study framed the issue through three linked concerns: (1) equity, because transport resources should respond to the needs of different users; (2) sustainability, because people are more likely to leave the car at home when public transport meets their needs; and (3) ridership, because more attractive services can generate demand and justify further investment.



Prof. Martin Trépanier presenting findings on gender differences in public-transport trip components and in-vehicle speeds in Montréal.

> ***"There are differences within the differences."***
>
> *- Prof. Martin Trépanier*

Using the 2023 household travel survey of Montreal's regional transport authority, the analysis compared single-mode public transport trips. In vehicle trip speed was examined through the lens of gender and

across three groups of variables: household income, trip purpose and household typology. A slow public transport trip was defined as one operating at 20 km/h or below. The insights of these analysis is detailed

Gender and income

Men experienced public-transport trips that were approximately 1 km/h faster on average than women's trips. Speeds increased from low income to middle-income and high-income groups, with a difference of approximately 3.5 km/h between the lowest and highest income categories. Importantly, the gender gap was more pronounced among low income travellers than among middle and high income groups.

The difference also varied by transport mode. The income and gender related pattern was reproduced for bus journeys, but not for Metro or light-rail trips. This suggests that the structure of surface services, routing, congestion and stop spacing may contribute more strongly to unequal journey speeds than segregated rapid-transit systems.

Gender and trip purpose

Trip purpose produced a clear hierarchy. Shopping trips were the slowest, work trips the fastest, and return-home trips fell between them. The difference between shopping and commuting trips reached approximately 4 km/h. Although men were faster on average across the trip purpose groups, the male female speed gap did not differ significantly between shopping, work and return-home trips.

The broader interpretation was important. Because women often undertake a larger share of shopping and care-related travel under prevailing household roles, they may be disproportionately represented in the trip types associated with slower services, indirect routes and local-stop patterns.

Gender and household type

Household structure revealed the most complex pattern. Single retired people and single parent households experienced the slowest speeds. Single adults and parents with young children had similar, relatively faster speeds, while households without children recorded the fastest journeys. The largest difference among household categories was approximately 4 km/h.

Women were slower than men in most household groups. However, the pattern reversed among single-parent households, where women experienced faster trips than men. This interaction illustrated the presentation's central phrase "differences within the differences" and demonstrated why an overall gender average cannot fully describe transport inequity.

Future research and policy relevance

The study proposed examining where slower journeys arise across access, waiting, riding, transfer and egress stages; comparing bus, Metro and other modes; and identifying opportunities to increase public transport speeds for women. The findings point toward more targeted planning, in which service design is informed by the travel patterns and household responsibilities of different groups rather than by average users alone.

Exploring Perceived Walkability in Sustainable Street Design Scenarios - A Virtual Experiment in Bangkok

Walkability as a quality of life pathway

Prof. Kazuki Nakamura explored how street design shapes perceived walkability in the context of Bangkok. The presentation linked walkability to a sequence of human outcomes: access, safety, comfort, pleasurability, happiness and ultimately quality of life. It also highlighted the distinctive organisation of many Asian local streets, where vendors, paratransit, pedestrians, motorcycles and congested traffic compete for limited space.

Prof. Kazuki Nakamura presenting the Bangkok case study on perceived walkability and sustainable street-design scenarios.

"Walkability improvement can contribute to quality of life enhancement through positive perceptions of streets."

- Prof. Kazuki Nakamura

Virtual street experiment

A virtual street environment was used to test how changes in neighbourhood street design influenced willingness to walk. Participants evaluated scenarios involving a base street, vendors, smart small vehicles, combinations of vendors and smart vehicles, street widening and additional building setbacks. They assessed perceived safety, comfort, pleasurability and willingness to walk under each scenario.

Main findings

Willingness or happiness to walk was positively related to physical health, mental health and life satisfaction. Existing walkers also reported greater neighbourhood satisfaction. Structural equation modelling indicated that setbacks improved perceived safety, while combinations of street widening and smart small vehicles with road diet measures could improve walkability.

Vendors were perceived negatively in scenarios where they reduced already limited pedestrian space. This did not imply that vendors are inherently incompatible with walkability. Rather, their contribution to active street life depends on whether the street design protects sufficient space for safe and comfortable pedestrian movement. The findings therefore supported context sensitive design instead of the wholesale removal of local street activity.

Understanding Quality of Life (QoL) impacts of Sustainable Transport: Case Studies from India

Why transport quality of life matters

Prof. Ashish Verma concluded the presentations with Indian case studies on the quality-of-life impacts of sustainable transport. He positioned transport as a pathway to well-being, health and happiness, but also as a system that interacts with economic growth, standards of living and patterns of motorisation.

Prof. Ashish Verma presenting Indian case studies on the quality of life impacts of sustainable transport during the WCTR 2026 SIG-F4 special session.

> ***"Can India saturate car ownership at a much lower level and decouple car ownership and use from the standard of living?"***
>
> *-Prof. Ashish Verma*

The question was presented alongside international evidence showing a strong rise in car ownership as GDP per capita increases, particularly during middle stages of economic development. The challenge for India is whether rising incomes and improved living standards can be achieved without reproducing the same level of car dependence observed in many higher-income countries.

Transportation Quality of Life Index

Prof. Verma described the development of an objective Transportation Quality of Life Index. The framework integrates four principal dimensions: mobility, environmental quality, health and accessibility. Within these dimensions, multiple indicators are combined to evaluate how alternative transport strategies influence quality of life.

The presentation explained how scenarios were developed and assessed, including public transport expansion, non-motorised transport improvements, cleaner vehicle technologies and energy transition measures. Rather than evaluating these interventions only through traffic or emissions outcomes, the index provides a broader measure of their combined contribution to urban well-being.

Transport and the Sustainable Development Goals

A further component examined how sustainable-transport measures contribute directly and indirectly to the Sustainable Development Goals. Relevant pathways include road safety, health, air quality, accessibility, social inclusion, climate action and sustainable urban development. The presentation noted that transport's contribution is often dispersed across multiple SDGs and may not be adequately represented by a small number of formal transport indicators.

The Indian contribution therefore argued for a composite quality of-life perspective that can reveal benefits extending beyond mobility itself. This approach is particularly important during periods of rapid economic growth, when transport investments and urban form can lock cities into either car-dependent or more sustainable development pathways.

Shared themes and insights

Moving beyond conventional performance measures

All five presentations challenged narrow performance measures. Vienna showed that modal share and infrastructure must be interpreted within long term institutional change. London demonstrated that time based accessibility can hide unsafe and unhealthy journeys. Montréal showed that average speed can conceal unequal experiences. Bangkok linked street perception to health and life satisfaction. India brought these dimensions together through a composite quality of life framework.

The importance of policy packages

The session repeatedly showed that isolated interventions are unlikely to transform mobility. Public transport investment requires supportive land use, traffic restraint, parking management and safe walking access. Street improvements require adequate space and context sensitive management of vendors and

local services. Accessibility indicators require multiple data sources and explicit consideration of quality. Sustainable transformation therefore depends on coherent policy packages.

Distributional effects and hidden inequalities

A central theme was that benefits and burdens are not evenly distributed. Income influenced public transport speed in Montréal, and gender differences were larger within lower-income groups. London's work highlighted the need to examine who is exposed to pollution, crime and poor quality opportunities. Bangkok's results suggested that different user groups may perceive street safety and comfort differently. These findings support disaggregated evaluation rather than reliance on network wide averages.

Quality of life as both outcome and planning criterion

Quality of life emerged not simply as a secondary benefit of transport policy, but as an organising criterion. It provides a way to integrate mobility, environment, health, accessibility, safety, social inclusion and subjective experience. This perspective also allows transport policy to be connected more directly to the SDGs and to wider debates about economic development and livability.

Discussion and Audience Reflections

The discussion considered how policies demonstrated in Vienna could be translated to cities such as Jakarta and to other developing economy contexts. The exchange underscored that Vienna's results depended on a long historical process, strong institutions, compact urban form, public transport capacity and sustained political commitment.

Audience Reflections

The key lesson was therefore not to reproduce individual measures mechanically, but to understand the underlying policy logic. Developing cities may adapt parking management, traffic calming, affordable public transport and people-oriented street design, but the sequence, scale and institutional arrangements must

respond to local governance capacity, income levels, informal transport, landuse patterns and public expectations.

The discussion also reinforced the need to connect technical analysis with implementation. Whether measuring accessibility, diagnosing gender disparities, designing walkable streets or evaluating quality of life, evidence must be translated into institutional responsibilities, funding priorities and policy choices.

Key Outcomes

Quality of life should become a core transport performance measure. Transport systems should be assessed not only through travel time, speed and capacity, but also through health, safety, accessibility, environmental quality, equity and well-being.

Sustainable mobility requires coordinated and sustained policy. Vienna demonstrated that long-term transformation depends on combining public transport and active mobility with parking management, traffic calming, compatible land use and institutional continuity.

Accessibility must represent the quality of the journey and destination. The London study showed that conventional measures can overstate accessibility when pollution, crime, stress, road conditions and opportunity quality are ignored.

Equity cannot be understood through overall averages. The Montréal analysis showed that gender, income, trip purpose, household structure and transport mode interact to produce different public transport experiences.

Street design can influence health, mode choice and happiness. The Bangkok experiment demonstrated that perceived safety, comfort and pleasurability shape willingness to walk and are associated with physical health, mental health and life satisfaction.

Economic growth need not require equivalent growth in car dependence. The Indian contribution highlighted the possibility of improving living standards through sustainable mobility while evaluating progress through quality of life and SDG frameworks.

International experience must be adapted to local context. Policies should be transferred through their underlying principles, not copied as isolated measures without regard to local institutions, urban form, income and governance conditions.

Implications for Research and Policy

- Develop multidimensional transport performance frameworks that integrate objective indicators with perceived journey quality and well-being.
- Use disaggregated analysis to identify how transport outcomes vary by gender, income, trip purpose, household structure, age and transport mode.
- Combine public transport investment with parking management, traffic calming, walking and cycling facilities, and coordinated land use planning.
- Include pollution exposure, personal safety, road safety, stress and destination quality in accessibility based planning.
- Design local streets to protect pedestrian space while accommodating community services, informal activity and emerging low-speed mobility technologies.

- Assess sustainable transport strategies against their direct and indirect contribution to the Sustainable Development Goals.
- Treat climate adaptation and disaster resilience as integral components of future sustainable mobility policy.
- Adapt international lessons to local institutional and economic conditions through phased implementation and continuous evaluation.

Conclusion

Across the five international perspectives, the session established that sustainable transport is not simply about moving people more efficiently. It is about improving how people experience mobility and urban life. The presentations showed that transport decisions shape access to education and services, exposure to pollution and crime, the distribution of travel time and speed, willingness to walk, neighbourhood satisfaction, economic opportunity and long-term patterns of urban development.

The session also demonstrated that technical solutions alone are insufficient. Lasting change requires policy consistency, institutional capacity, political commitment and the careful adaptation of international experience to local context. Transport systems should therefore be evaluated by whether they enable people to live healthier, safer and more fulfilling lives not only by whether they move faster.

Collectively, the session called for transport planning that is people-centred, evidence based and explicitly measured by its contribution to healthier, safer, fairer and more liveable communities.