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URBAN SOLUTIONS

Sustainable Mobility



INTERVIEW
Jan Vapaavuori

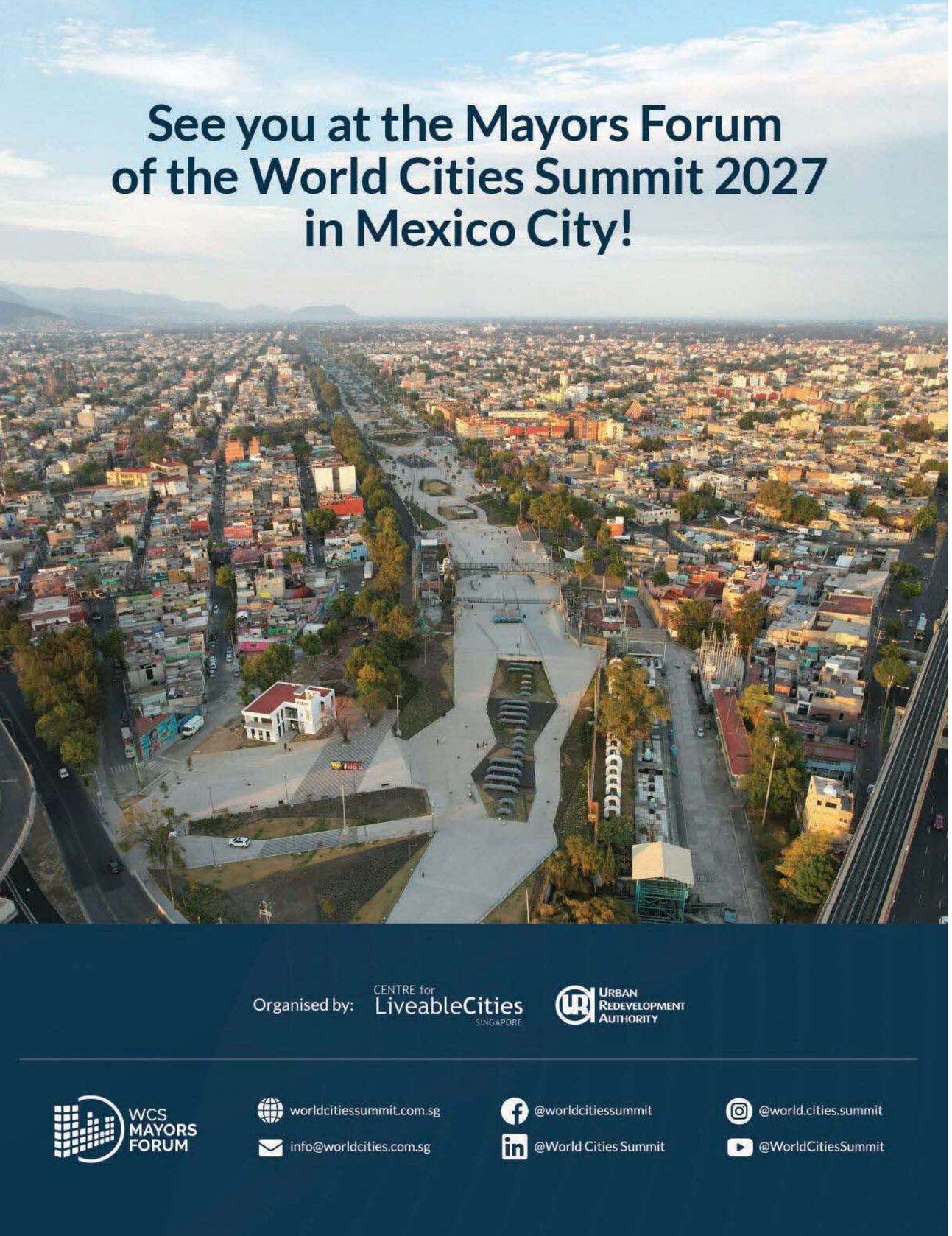
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CASE STUDY
Vienna
Bogotá
Sacramento

A biannual magazine published by CENTRE for LiveableCities SINGAPORE



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CENTRE for LiveableCities SINGAPORE

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Set up in 2008 by the Ministry of National Development and the then-Ministry of the Environment and Water Resources, the Centre for Liveable Cities (CLC)'s mission is to distil, create and share knowledge on liveable and sustainable cities. CLC's work spans four main areas—Research, Capability Development, Knowledge Platforms, and Advisory. Through these activities, CLC hopes to provide urban leaders and practitioners with the knowledge and support needed to make our cities better. For more information, visit www.clc.gov.sg.

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Cover Image: Cyclists and pedestrians along Bencoolen Street, Singapore.
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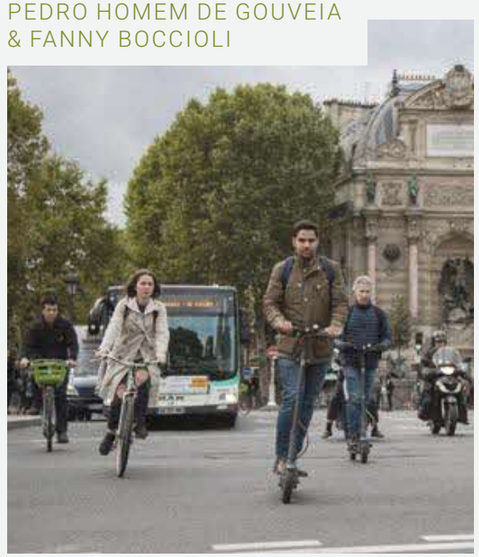


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From the Executive Director

Advancing Sustainable Mobility for More Liveable Cities

Mobility is fundamental to how we experience our cities. It determines how easily we reach jobs, schools, services and one another. But the way we move also shapes the streets and neighbourhoods around us, the air we breathe, our health and well-being, and whether our cities feel accessible, inclusive and enjoyable to live in.

As cities seek to reduce emissions, adapt to changing climatic conditions and respond to evolving urban needs, rethinking how we move offers opportunities that extend far beyond transport. This issue of *Urban Solutions* explores how sustainable mobility can contribute to more resilient and liveable cities, bringing together perspectives from everyday journeys to questions of governance, infrastructure and urban transformation.

Different Routes to Sustainable Mobility

Cities are pursuing different paths to sustainable mobility. Singapore's North-South Corridor demonstrates how transport infrastructure can be planned as part of a wider urban system, integrating public transport, walking and cycling while reconnecting neighbourhoods and reclaiming more space for people. India's experience demonstrates how experiments in walking and cycling can build momentum for change, while Shenzhen's experience offers lessons in advancing sustainable mobility at scale. Sacramento Valley Station illustrates how a major transport investment can catalyse wider urban regeneration, integrating mobility with housing, public space, energy and water.

The mobility landscape is evolving too. POLIS examines how European cities are adapting governance approaches to shared micromobility, while Helsinki's former Mayor Jan Vapaavuori argues for a systemic approach that brings together public transport, active mobility, technology and emerging services.

Measuring What Matters

The possibilities extend beyond mobility itself. CLC's research explores how a cross-domain lens can reveal the wider impacts of mobility interventions, helping decision-makers make more informed and integrated choices. Tim Stonor, meanwhile, shows how spatial analysis can help cities better understand the underlying conditions that enable walking and cycling. Together, they show how better evidence and broader measures of success can inform planning decisions and help cities understand how changes unfold over time.

Sustainable mobility must respond to the distinct needs and conditions of each city, from climate and geography to urban form, institutions and culture. There is no single blueprint. Cities must chart their own paths, recognising opportunities for wider benefits while navigating competing priorities and trade-offs.

Ultimately, sustainable mobility is not simply about moving people more efficiently. I hope the perspectives shared in this issue encourage us to think more broadly about how the choices we make can accelerate the transition to sustainable mobility at scale and help create cities that are more connected, inclusive, resilient and liveable.

Hwang Yu-Ning

Executive Director
Centre for Liveable Cities

IN CONVERSATION WITH
JAN VAPAAVUORI

Helsinki Proves a Smooth, Safe and Low-Emission Transport System is Possible

Jan Vapaavuori is Chairman of Finnvera and runs an advisory practice focused on urban development, real estate and energy. He served as Mayor of Helsinki (2017–2021), Vice-President of the European Investment Bank (2015–2017) and Finnish Minister of Economic Affairs (2012–2015). He holds a Master of Laws from the University of Helsinki and an Honorary Doctorate from Hanken School of Economics.



Image: Sanna-Mari Jäntti

> Cars have remarkably low utilisation rates estimated at around 5%, on average. This economic irrationality, combined with concern about climate change and sustainability, may lead to fewer people owning cars.

Helsinki is widely recognised for its systemic, holistic approach to transport and mobility over decades—and has achieved impressive results. What was your approach as Mayor that contributed to this?

One of my guiding principles was that "you cannot Google a vision". A leader's most important responsibility is to understand where the world is heading and to look at issues broadly.

Mobility is a perfect example. The impact of electrification and zero-emission mobility is relatively easy to understand, even though difficult questions remain, such as how to build sufficiently comprehensive charging infrastructure in an urban environment.

The rise of the sharing economy is equally foreseeable. Cars have remarkably low utilisation rates, estimated at around 5%, on average. This economic irrationality, combined with concern about climate change and sustainability, may lead to fewer people owning cars—however, this does not necessarily mean less driving, only less need for parking.

Services combining different modes of transport will also become increasingly common. As digitalisation makes it possible to reach consumers easily and in real time through different applications, this is only the beginning of what is to come. The future of autonomous vehicles is more uncertain, particularly in terms of timing.



A robot bus combining innovative design and flexible service.
Image: Jussi Hellsten / © Forum Virium

Understanding the requirements of this new world of mobility is extremely challenging. Yet political leaders, urban planners and transport planners designing future cities must understand how these developments—electrification, the sharing economy, new mobility services and autonomous vehicles—transform the world simultaneously.

And the list does not end there. City bikes and electric scooters, e-commerce logistics, changing leisure activities, and evolving mobility needs and preferences are already reshaping cities. At Slush 2019, a technology and start-up event in Helsinki, I discussed flying cars with Tencent—and it was not the only time I encountered the idea that part of urban mobility might move into the air.

You have emphasised that cities have a central role in this transformation. What does that mean in practice?

Autonomous vehicles are a good example. They were already a major topic I discussed with leading technology experts during my term as Mayor.

The message then was that the technology was already relatively mature, while regulatory, cultural and other factors were slowing its introduction.

What stayed with me most, however, was something I was told at Google: ultimately, cities determine where, how and under what conditions autonomous vehicles become part of the transport system.

Political leaders, urban planners and transport planners designing future cities must understand how these developments—electrification, the sharing economy, new mobility services and autonomous vehicles—transform the world simultaneously.

Once the technological and regulatory challenges are solved, many of the key questions will be logistical: Where can autonomous vehicles pick up passengers? Where can they drop them off? Where do the vehicles go when nobody is inside them?

Only cities can answer these and many similar practical questions. Using technological innovation to transform everyday life at scale requires a systemic approach. And in urban environments—where most of humanity lives—cities bear that responsibility.

Building a sustainable transport system requires long-term commitment. Urban infrastructure changes slowly, and in small increments within a single electoral term. How has Helsinki developed its transport system so consistently over several decades?

Every generation of political decision-makers—particularly in multiparty democracies—wants to do things differently from its predecessors. That is part of democracy and often a good thing. But with major systemic issues, it can also be a serious challenge.

On issues critical to a nation's survival, such as defence, consensus can survive from one electoral term to the next. Finland is a good example. Transport is not quite as existential, so its direction must be anchored elsewhere.

Geography has been a fundamental driver of Helsinki's transport policy. The city centre sits on a peninsula—with inherently difficult access—so limiting private car traffic became a practical necessity long ago to keep the city moving.

The best way to achieve this was to build a high-quality public transport system. This fitted naturally with the Nordic welfare-state philosophy, which values equal opportunities for people to move around and participate. It leverages strong public support for action on climate change, which favours public transport, walking and cycling.

Helsinki's consistent approach rests on a combination of practical necessity, Nordic welfare values and climate considerations—which enjoy broad public support.

During your term as Mayor, one key theme was concern about increasing physical inactivity. Why did tackling it require a fundamentally new approach—and what did that mean for the city's role?

Physical inactivity is a complex modern problem that no single intervention can solve. In Helsinki, we tackled it through a broad and unique approach.

It required widening our perspective—expertise, attitudes, insight, commitment and new ways of working—and mobilising creativity across different professions, academic disciplines and stakeholder groups.

The city's role also expanded far beyond building sports facilities and supporting sports clubs, to become a developer of the urban environment, a source and shaper of awareness, an adviser and motivator, a supporter of civic organisations, an educator and a promoter of health literacy.

In international discussions, I often emphasised that our surroundings should encourage physical activity in ways people do not consciously notice.

Increasing physical activity should not be left solely to individual choice as our environment influences behaviour more than we realise. If walking and cycling are faster and more pleasant, people become more active. The ideal outcome is people moving more without consciously deciding to exercise.

As Mayor, you also sought to connect the processes of different city departments to a broader strategic vision. Why was this important?

Transport planning has a very long time horizon. Numerous projects are underway simultaneously, all at different stages. As Mayor, I did not consider it realistic—nor desirable—to immerse myself in all of them. Instead, I approached the issue from another direction.



One of the busiest corners in the city centre is the crossing of Mannerheimintie and Kaivokatu streets.
Image: Jussi Hellsten / © City of Helsinki

The key was to connect transport policy to the city's broader vision and strategy. Leadership, even in very large organisations, revolves around fairly basic things. The success of cities rests on pragmatic problem-solving rather than political manoeuvring. Modern political leadership should be about precisely this: less politics in politics.

I concluded that Helsinki needed a different strategy: one with a clear objective or mission, expressed in language people could understand, and capable of inspiring employees and residents. I wanted a genuinely strategic plan.

My starting point was that the strategy should fit in a single sentence—and our ambition should be nothing less than the best in the world. My first thought was the world's most sustainable city, but Copenhagen had claimed that space, and many cities emphasised climate and sustainability. My second thought was the world's leading smart city, but Singapore had claimed that position, and most of the world's leading cities aspire to be both sustainable and smart.

Eventually, I decided our strategy should be built around becoming "the most functional city in the world". I knew it was not a media-friendly slogan, but that did not bother me. What mattered was that it was relevant.



Helsinki 365. Aleksanterinkatu is the main shopping street in Helsinki.
Image: Jussi Hellsten / Helsinki Partners



The new Kruunuvuorensilta bridge, connecting Korkeasaari and Kruunuvuorenranta, is the longest and tallest bridge in Finland. It is also globally exceptional as bridges of this size have not been built for the sole use of public transport, pedestrian traffic and cycling. The bridge is interesting not only due to its size, but also the advanced traffic thinking behind its design.
Image: Nicole / Passenger X / Helsinki Partners

A functional city serves its residents, businesses and visitors. The beauty of the concept was its focus on everyday life. Urban functionality is also relatively non-political, allowing implementation without unnecessary political tensions.

There was a broader logic too: a city cannot be functional unless it is smart and sustainable. It must also be safe, resilient, and many other things. In that sense, the vision was broader and more ambitious than the alternatives.

The concept also drew on perhaps the greatest strength of the Nordic model: its holistic approach. A functional city has many strengths and few weaknesses. Everything matters: different issues are connected through cause and effect. Problems cannot be addressed in narrow silos. The strategy was therefore to strengthen the city's ability to manage itself as a whole.

Of course, functionality is difficult to define and measure, but that did not trouble us too much. For me, functionality was an attitude and a way of thinking.

A functional city serves its residents, businesses and visitors. The beauty of the concept was its focus on everyday life. Urban functionality is also relatively non-political, allowing implementation without unnecessary political tensions.

I was pleased that we never imposed an official definition. Every city employee could interpret it in their own way. At my farewell reception, I said that I believed the strategy had empowered more city employees than perhaps any other single objective—and that every interpretation of its deeper meaning was valid if it moved the city in the right direction.

Naturally, the functional city also became an overarching principle for transport. In a functional city, people move smoothly using different modes of transport. Public transport timetables are reliable. Even by car, you can reasonably predict how long a journey will take. Once these principles are understood, many practical conclusions follow.

One lesson I learned as Mayor was that good policies usually have several good arguments behind them—and sometimes one works better than another.

There are important climate reasons for promoting public transport, walking and cycling. But there are equally strong health arguments. A population that walks and cycles a lot is healthier, both physically and mentally. A city that sensibly limits private car traffic is also safer and more pleasant—but none of this works unless public transport is smooth, reliable and efficient.

Although Helsinki remains one of the cities most committed to combating climate change, it would not have been wise to justify transport policy too heavily in terms of climate alone. When climate arguments are combined with health, safety, quality of life and functionality, people understand the rationale more easily—and resistance diminishes.

On the safety of Helsinki's transport system: from as many as 30 traffic deaths in the late 1980s, to a full year without a single traffic fatality by July 2025. What explains this remarkable turnaround?

Helsinki's road-safety record cannot be explained by any single measure. It is the result of decades of mutually-reinforcing policies.

Lower driving speeds are probably the single most important factor, reducing the likelihood and severity of collisions. The physical street environment has also been redesigned to reduce speeds, using raised pedestrian crossings and intersections, traffic islands, narrower street sections, roundabouts and other solutions that encourage—or force—drivers to slow down. Visibility and intersection design have also been improved, with particular attention to pedestrian and cyclist safety.

Helsinki's strong emphasis on public transport means that people drive relatively less compared with other cities. Enforcement has also increased. So, this is not the result of a campaign or exceptionally skilled Helsinki drivers, but of a transport system designed for fewer human mistakes to have fatal consequences.

But we cannot be certain that is where development will lead—and even if we could, we cannot sit back and wait. What is essential is to avoid making decisions today that may prove unnecessary or counterproductive in the future.

This has not always been easy. Lowering speed limits generates opposition. Helsinki has proceeded gradually, avoiding abrupt changes. Many changes have been justified by something difficult to argue with: hard data. When statistics show certain locations are demonstrably more dangerous, the case for change is strong.

Ultimately, Helsinki's experience demonstrates something fundamental: a transport system can be smooth, safe and low-emission at the same time. These objectives need not compete; designed well, they reinforce each other.



Cyclists travel along Helsinki's waterfront, where dedicated cycling infrastructure connects neighbourhoods and recreational destinations.
Image: Sakari Röyskö / Helsinki Partners

Looking back, are there aspects of Helsinki's mobility journey you would approach differently today, or lessons that became clearer only with hindsight?

The greatest challenge in developing a transport system is having to live in the present while looking into the future. We may eventually end up with a system dominated by autonomous electric vehicles. If so, many concerns related to both climate change and road safety will largely disappear, and cars will require considerably less urban space.

But we cannot be certain that is where development will lead—and even if we could, we cannot sit back and wait. What is essential is to avoid making decisions today that may prove unnecessary or counterproductive in the future.

During my own time as Mayor, Helsinki invested heavily in light rail. I still sometimes wonder whether these will prove too heavy and inflexible for a fundamentally different mobility environment in the longer term.

SINGAPORE

The North-South Corridor:

Reimagining Journeys of Tomorrow

For decades, urban road infrastructure was built around a single goal: moving more cars efficiently. Singapore's North-South Corridor challenges that logic. Running 21.5 kilometres along the length of the island, the corridor combines an expressway with dedicated bus lanes, cycling and walking paths, and public spaces—shaped through integrated planning, placemaking and collaboration with the communities who will use them.





Ong Eu-Gene has spent 30 years with the Land Transport Authority of Singapore across transport modelling, strategic planning and policy, development control, active mode planning and infrastructure development. He oversees car-lite policies and the central area transport planning team responsible for developing an urban mobility network that is future-proofed for Singapore.

Preliminary concept along Marymount Road: lush planting with meandering paths to create a unique commuting experience.
Image: Land Transport Authority (LTA) and Henning Larsen



Overview of the proposed preliminary concepts from Henning Larsen Design Team.
Image: Land Transport Authority (LTA) and Henning Larsen

Walking, cycling and using public transport are no longer viewed as complementary modes, but as the foundation underpinning a sustainable urban mobility system.

As cities grapple with climate change, rapid urbanisation and growing expectations for healthier, more liveable environments, the development of transport infrastructure is undergoing a profound transformation. For decades, road infrastructure development has largely centred on expanding capacity to accommodate greater numbers of cars. While this approach improved level of service for drivers, it competes with other needs—such as commuters' experience on public buses and trains, pedestrians' experience in crossing larger road intersections, and cyclists' experience of using roads.

Leading cities are shifting towards a different paradigm—one that prioritises moving people rather than vehicles, integrates transport with land use, and places sustainability and quality of life at the heart of infrastructure investment. Walking, cycling and using public transport are no longer viewed as complementary modes, but as the foundation underpinning a sustainable urban mobility system.

Singapore's North-South Corridor (NSC) exemplifies this transformation and represents a new approach, as successful sustainable mobility is not achieved through infrastructure alone. The NSC demonstrates the impact of integrated transport–land use planning, long-term investment, and active participation from the communities who will ultimately use and shape the streets.

From Road Infrastructure to Mobility Infrastructure

Stretching 21.5 km from Woodlands in northern Singapore to the city centre, the NSC was initially conceived as an expressway to meet travel demand from growing towns in the north into the city. As Singapore continued to shift towards more sustainable modes of transport, the project evolved into something considerably more ambitious.

Instead of building another expressway, Singapore adopted a multimodal approach to developing the NSC—one that integrated an expressway (viaduct and tunnel), dedicated bus priority lanes on selected stretches, continuous cycling paths and enhanced pedestrian connectivity.

By integrating high-capacity public transport with active mobility infrastructure, the NSC supports Singapore's long-term vision of making travel more attractive, convenient, comfortable and accessible using "Walk-Cycle-Ride" (WCR) modes. Cyclists benefit from wider, more seamless cycling paths providing uninterrupted connections along the corridor. New pedestrian crossings make it safer and easier for residents to reach amenities and access public transport nodes. Bus commuters, meanwhile, enjoy more pleasant journeys as dedicated bus lanes enable more reliable and efficient bus travel.

This philosophy aligns with an emerging international consensus that future transport infrastructure should maximise accessibility rather than vehicle throughput. Streets are increasingly recognised as not merely transport corridors but also public spaces that support economic activity, community interaction and urban well-being.

Inter-Agency Efforts as the Enabler of Transformation

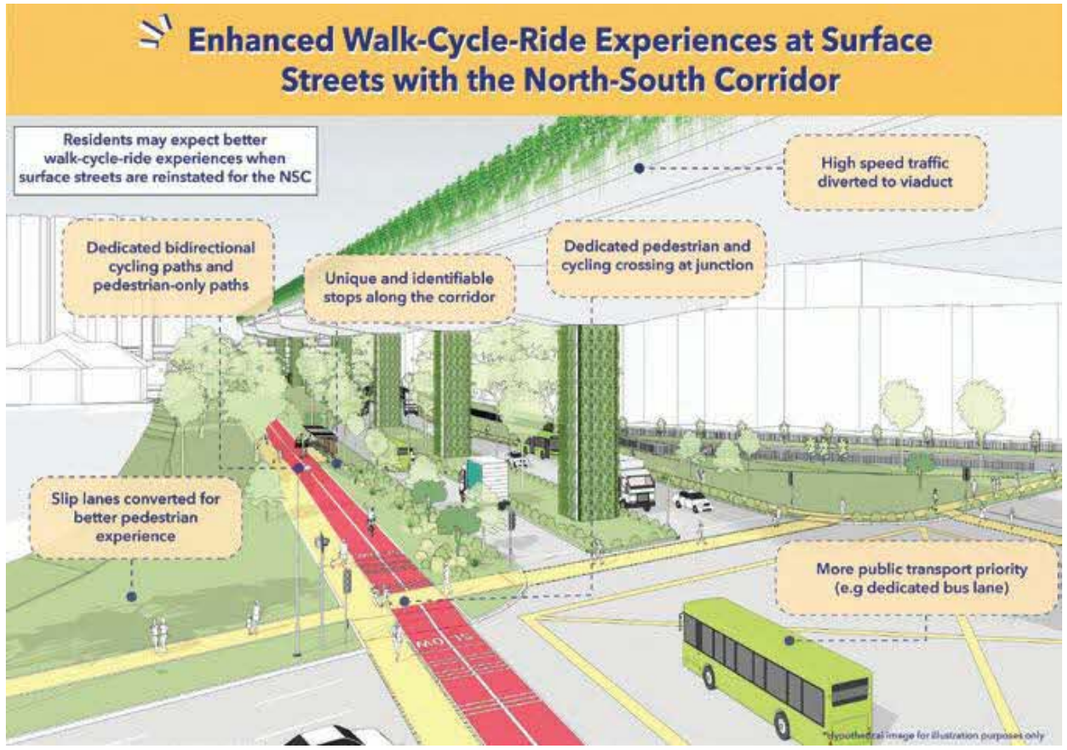
Transforming mobility at scale requires more than engineering excellence. It demands agency stakeholders capable of aligning transport, land use, environmental sustainability and community aspirations over extended planning horizons.

Singapore's integrated institutional framework has been instrumental in enabling this transition. Close coordination between the Land Transport Authority (LTA), the Urban Redevelopment Authority (URA), the National Parks Board (NParks) and other public agencies ensures that the NSC supports wider national objectives for sustainable development, urban liveability and climate resilience.

Rather than treating transport planning as an isolated technical exercise, the corridor has been developed alongside broader land use strategies—such as housing developments and park connector networks—and future growth plans. This integrated approach enables infrastructure investments to generate multiple benefits across transport, environmental and social outcomes.



NSC ambassadors participating in the induction training.
Image: Land Transport Authority (LTA)



Preliminary concept illustrating WCR experiences along the NSC's surface streets.
Image: Land Transport Authority (LTA) and Henning Larsen

Streets as Places for People, Not Simply Corridors

Perhaps the most significant transformation represented by the NSC is the recognition that streets are more than transport infrastructure. They are also public spaces that influence how people interact, travel, exercise, gather and experience the city.

As traffic is diverted into the expressway, the surface streets present a unique opportunity to be reimagined as greener, more people-friendly environments. This transformation reflects the principles of placemaking—where streets are designed not only for movement but also as places for social interaction, recreation, biodiversity and community identity.

Wide, shaded footpaths, dedicated cycling routes, generous landscaping, improved accessibility and enhanced connections to parks, neighbourhood destinations and community spaces all contribute to creating streets that people actively choose to use, rather than simply pass through.

The NSC demonstrates how transport investment can simultaneously deliver mobility, environmental and placemaking outcomes.



NSC focus group discussions.
Image: Land Transport Authority (LTA)



NSC cycling tour.
Image: Land Transport Authority (LTA)

CITY FOCUS

Streets designed with communities are more likely to encourage walking, cycling and social interaction because they respond to how people live, rather than solely to technical performance indicators.

Co-Creating the Surface Streets Master Plan

A defining feature of the NSC has been the emphasis on engaging communities in shaping the future of the surface streets. Recognising that successful public spaces must reflect the needs and aspirations of those who use them, LTA adopted a collaborative approach to developing the Surface Streets Master Plan.

LTA invited residents, businesses, schools, cyclists, accessibility groups and community organisations to participate in envisioning and co-designing the future character of the corridor. Through public exhibitions, design workshops, focus group discussions, stakeholder dialogues and digital engagement platforms, participants contributed ideas on how the transformed streets could better support daily life.

For wider engagement, LTA recruited 44 NSC Ambassadors. Comprising mostly residents living along the corridor, they worked closely alongside LTA to seek ideas and feedback from the public. Their on-the-ground efforts brought in a broad range of perspectives to shape the Surface Streets Master Plan, ensuring it reflects the lived experiences and aspirations of the communities it serves.

The conversations consistently extended beyond conventional functions of a road. Participants expressed aspirations for safer pedestrian crossings, continuous cycling connections, more greenery, improved universal accessibility, spaces for community interaction, better integration with neighbourhood amenities and opportunities to strengthen local identity.

These insights enriched the planning process by complementing technical analyses with lived experience. Community members offered perspectives on daily travel patterns, local destinations, safety concerns and neighbourhood character that are often difficult to capture through conventional traffic modelling assessments alone.

Importantly, this engagement was not simply about consultation; it reflects the importance of co-creation. Streets designed with communities are more likely to encourage walking, cycling and social interaction because they respond to how people live, rather than solely to technical performance indicators. Communities became active partners in shaping the public spaces along the NSC that they would eventually use, manage and care for.

The NSC therefore illustrates that sustainable mobility is as much a social endeavour as an engineering challenge.

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The success of integrated transport corridors should instead be assessed through broader outcomes, including increases in public transport ridership, walking and cycling mode share, reduced carbon emissions, improved accessibility, enhanced road safety, public health benefits, and stronger community well-being.

Encouraging Behavioural Change

Infrastructure alone cannot transform mobility. Ultimately, sustainable transport depends upon people choosing different ways of travelling.

The NSC has been designed to make those choices easier. More priority for public buses, together with safer, more comfortable cycling and pedestrian infrastructure, collectively reduces many of the barriers that discourage active mobility.

These investments complement Singapore's broader transport demand management policies, including vehicle ownership controls, electronic road pricing and continued expansion of the rail network. Together, they create an ecosystem where public transport and active mobility become the mode of choice.

Behavioural science increasingly suggests that travel habits change when attractive alternatives become available. People rarely choose to walk or cycle solely because of environmental awareness—they do so when routes are safe, convenient, comfortable and enjoyable. Likewise, public transport becomes more attractive when it is reliable, integrated and time-competitive.

By combining infrastructure, policy and urban design, the NSC addresses both the practical and psychological dimensions of behavioural change.

Measuring Success of Roads Beyond Traffic Performance

Traditional road projects have often been evaluated using indicators such as vehicle speeds, road capacity and congestion levels. While these measures remain relevant, they are no longer sufficient under the refreshed Land Transport Master Plan 2040.

The success of integrated transport corridors should instead be assessed through broader outcomes, including increases in public transport ridership, walking and cycling mode share, reduced carbon emissions, improved accessibility, enhanced road safety, public health benefits, and stronger community well-being.

Equally important are less tangible outcomes, such as public trust, civic ownership and the quality of public spaces created through collaborative planning.

For the NSC, success will ultimately be measured not only by how efficiently vehicles move, but also by how effectively transformed surface streets support healthier lifestyles, stronger communities and more sustainable travel choices.



NSC walking tour.
Image: Land Transport Authority (LTA)

A Model for Future Cities

The NSC demonstrates that sustainable mobility is no longer solely about transport infrastructure. It is about creating integrated urban systems where engineering, planning, placemaking, landscaping, governance and communities work together to improve everyday life.

Its greatest contribution may therefore lie beyond the infrastructure itself. The project illustrates how inter-agency collaborations, long-term planning and community co-creation can produce transport solutions that are not only more sustainable, but also more inclusive, resilient and responsive to local aspirations.

For cities seeking to accelerate the transition towards low-carbon mobility, several lessons emerge. Mobility infrastructure should prioritise people rather than vehicles. Investment decisions should recognise the wider economic, environmental and social returns generated by active and public transport. Streets should be designed as places that support community life as well as movement. Most importantly, governments should view citizens not simply as users of infrastructure, but as partners shaping it.

The future of sustainable mobility will not be determined solely by the infrastructure we build, but also the relationships we cultivate between public institutions, professionals and communities. When governments provide vision and leadership, practitioners contribute technical expertise, and citizens bring local knowledge and lived experience, streets become more than transport corridors. They become shared civic spaces that strengthen social cohesion, support healthier lifestyles and contribute to more resilient, inclusive and climate-responsive cities.

The NSC offers a compelling example of this new model of city-making. It shows that the transition from car-oriented infrastructure to people-centred mobility is not simply a technical endeavour, but a collective one. Placemaking, collaborative governance and co-creation are as essential to its success as engineering excellence.

In an era when cities around the world are searching for practical pathways towards net-zero and liveable urban futures, this integrated approach provides a valuable blueprint for accelerating sustainable mobility at scale.

SHENZHEN

Green Mobility-Led Urban Development:

Shenzhen's Transport Practices for Building a City of Symbiosis

Shenzhen's green mobility-led approach shows how transport can shape urban structure, support liveability and strengthen connections between people, the city and nature.





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Gangxia North Hub: An underground urban living room at the heart of Shenzhen.
Image: vcg.com

Introduction: What Kind of Mobility Does a Fast-Growing High-Density City Need?

Shenzhen is a city shaped by rapid transformation. Over the past four decades, this small border town—which sits on less than 2,000 km^2 of land—has grown into a megacity with over 18 million permanent residents. This extraordinary pace of urbanisation has created new transport challenges—ranging from a growing call to support urban expansion and improve connectivity across a polycentric city, to making efficient use of limited land to meet rising expectations for greener and more liveable urban environments.

In response, Shenzhen has progressively developed an approach to green mobility-led urban development, in which transport is not treated simply as infrastructure for moving people, but as an important tool for shaping the city itself. This approach can be understood through three interrelated dimensions: using transport networks to shape urban structure and guide spatial development; integrating transport infrastructure with urban functions and public space; and using green mobility to support more liveable, healthy and sustainable urban life.

Viewed through the Urban Index of Shenzhen (UIS), these practices also reflect a broader evolution in the relationship between transport and the city—one that goes beyond transport efficiency alone to consider how mobility can contribute to a city's capacity to evolve, coexist with nature and urban life, and, ultimately, improve people's everyday experiences.

Using Mobility to Shape Urban Structure: From Road Structure to Rail-Oriented Development

A Mobility Backbone for Supporting Urban Expansion

In the early stages of its development, Shenzhen faced the key challenge of supporting rapid urban growth within a limited land area. In 1985, the *Master Plan for the Shenzhen Special Economic Zone (1985–2000)* was developed, taking into account the city's mountain-and-sea topography and east–west linear form to establish a polycentric, cluster-based urban structure. Three major east–west arterial roads—Shennan, Beihuan and Binhe—formed the backbone of the city's expansion, with Shennan Avenue designated as a major public transport corridor. Together, these networks helped shape Shenzhen's early urban growth.

As the Special Economic Zone expanded to cover the entire city in 2010, demand for longer-distance travel between urban clusters continued to grow, making further road expansion increasingly unsustainable. This led Shenzhen to establish rail transit as the backbone of its comprehensive transport system—marking a shift from road-supported expansion to rail-led development. Through successive rounds of rail planning and construction, the city built a network aligned with its polycentric, cluster-based spatial structure. In particular, rail express lines strengthened connections between peripheral clusters and the central city. This brought outlying areas within a 45-minute commuting catchment and enabled previously separated clusters to function as a connected urban system.

TOD: Creating Mobility and Urban Development Synergies

As Shenzhen grew in density, the city turned increasingly to Transit-Oriented Development (TOD) to better integrate rail transit with land use. Careful management of development intensity around rail stations using the Shenzhen Urban Planning Standards and Guidelines ensured homes, jobs, commercial activities and public



Rail express lines connect the city nodes with peripheral clusters.
Image: Shenzhen Urban Planning & Land Development Research Center

services were concentrated in areas with high public transport accessibility. Today, average development intensity within 500 metres of rail stations is about 1.8 times the city-wide average, while 81% of commuters can complete a one-way journey within 45 minutes.

> **Transport is not merely infrastructure that responds to urban growth; it also plays an active role in shaping how urban space and functions are organised.**

Alongside rail planning and construction, Shenzhen also adopted a coordinated approach to underground space development to integrate different facilities and functions around rail stations. Projects such as Chegongmiao Fengshengding Commercial Street, Link City Mall and the Keyuan Avenue underground complex demonstrate the benefits of developing above- and below-ground spaces together. This integrated approach allows rail transit to support surrounding development, while the concentration of activities and passenger flows, in turn, helps sustain rail operations.

From arterial roads supporting early urban expansion to rail networks reshaping connections across the city, and TOD integrating transport with land development, Shenzhen's transport system has evolved together with the city itself. Transport is therefore not merely infrastructure that responds to urban growth; it also plays an active role in shaping how urban space and functions are organised.

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Creating Compound Spaces: From Single Mobility Facility to Integrated Urban Development

As Shenzhen has shifted from rapid outward expansion towards high-density development under increasingly tight land constraints, its transport challenges have also changed. The question is no longer simply whether transport services are available, but how limited urban space can be used more efficiently.

Going Vertical: Space-Sharing Enhances Transport Facilities and Urban Functions
Traditionally, bus depots occupied standalone sites and served a single function. In a high-density city such as Shenzhen, however, this low-density model is increasingly difficult to sustain. Since 2014, Shenzhen has restructured its bus depot system with comprehensive multi-storey depots that accommodate operational functions such as parking, charging and maintenance, while ancillary terminals support passenger services, including dispatching, boarding and alighting.

The Shenzhen Urban Planning Standards and Guidelines further require residential, commercial and transport-hub developments above specified thresholds to incorporate ancillary bus terminals. More than 150 such terminals have now been completed across the city.

Beyond addressing the land requirements of bus facilities, this approach reflects a broader shift in how transport infrastructure is planned in a high-density city: rather than occupying additional standalone land, transport facilities are increasingly integrated with other urban functions. By moving from single-level to vertical development and from single-purpose to mixed-use space, Shenzhen has created a more efficient and integrated relationship between its transport infrastructure and the surrounding city areas.



Bus terminal integrated with urban functions—Shangjun Garden, Shenzhen.
Image: Shenzhen Urban Planning & Land Development Research Center

Shaping Greener Urban Life Through Mobility: From Green Travel to Urban Liveability

As Shenzhen enters a more mature stage of urban development, its transport planning priorities are also changing. In the past, the primary focus was on operational efficiency. Today, there is greater focus on people's travel experience, urban liveability, environmental protection and healthier lifestyles.

Mountains-Sea-City Linkage Plan: Connecting Ecology, Recreation and Everyday Life
Walking and cycling are among the lowest-carbon forms of mobility and offer some of the most direct ways for people to experience the city. In a subtropical, high-density city like Shenzhen, however, the quality of active mobility depends not only on network continuity, but also on how well streets respond to heat, strong sunlight and frequent rainfall. Seemingly small improvements—such as providing shade, rain protection and continuous pedestrian crossings—can have a direct impact on whether people are willing to walk or use public transport.

Shenzhen has continued to improve its active mobility network, with particular attention given to continuous pedestrian routes and weather-protected walkways around rail stations. In doing so, transport planning has gradually shifted from simply providing routes to prioritising people's actual travel experience. Green mobility, in other words, depends not only on whether infrastructure exists, but also on whether people are willing to use it.

Active mobility networks do more than support daily travel; they also help connect the city with its natural environment. Nearly half of Shenzhen's territory consists of mountains, forests, rivers, lakes and coastal areas. While transport systems have traditionally focused on connecting people with urban functions, Shenzhen is increasingly leveraging walking and cycling networks to strengthen connections between people, the city and nature.

Mobility Hubs: From Transfer Facilities to Urban Living Rooms
Traditional transport hubs have been designed primarily to move passengers efficiently. Gangxia North Hub represents a different approach: beyond enabling transfers, can a transport hub also become a place where people choose to stay?

Located in Futian CBD, Gangxia North Hub integrates four metro lines, bus services, commercial uses and public space within approximately 206,000 m² of underground space. With sunken plazas and skylights bringing in natural light, the hub is transformed from a purely functional transfer space into a vibrant urban public space with activities that encourage people to stay, meet and spend time.

This reflects a broader shift in the role of transport infrastructure—from simply enabling movement to supporting public life. In line with Shenzhen's approach to green mobility-led urban development, transport hubs are no longer merely nodes that connect different parts of the city; they are also becoming important components of urban space and everyday life.

From integrating bus depots with urban functions to combining multimodal hubs with public spaces, Shenzhen has gradually moved away from the traditional model of standalone, single-purpose transport facilities. Within a highly constrained urban environment, transport infrastructure increasingly shares space with retail and public activities, creating more integrated and efficient urban places.



Mountains-Sea-City Linkage Plan: Western Coastal Bike Path beneath expressway (Xiwan–Qianhai Bay Section).
Image: vcg.com

The Mountains-Sea-City Linkage Plan—structured around the ecological framework of "One Ridge, One Belt and Twenty Corridors"—integrates ecological restoration, river management, waterfront parks and active-mobility networks into a connected public-space system. By linking mountains, sea, city and parks, green mobility becomes not only a means of travel, but also a way of bringing nature, recreation and everyday life closer together.

The Western Coastal Bike Path is one such example. Stretching about 50 km, it connects natural and urban landscapes—including Xiwan Mangrove Park, Qianhai, Shekou and Shenzhen Bay Park. A 6 km section between Xiwan and Qianhai Bay repurposes under-viaduct space as a multifunctional public area for cycling, jogging and recreation. As active-mobility infrastructure extends beyond its transport function to become part of the city's public-space network, it connects people more closely with nature and everyday urban life. What green mobility creates is therefore not only more convenient travel, but also an urban lifestyle that is healthier, more comfortable and more connected to nature.

Green Transformation: From Electric Vehicle to Urban-System Integration

Vehicle electrification is a key pathway in Shenzhen's transition towards greener mobility. In 2017, the city achieved full electrification of its bus fleet, followed by its taxis and ride-hailing vehicles. Shenzhen now has approximately 1.628 million new energy vehicles. Such a large-scale shift requires more than vehicle replacement alone. It also depends on coordinated support from urban planning and infrastructure provision. Shenzhen has incorporated charging-facility requirements into its urban planning standards and promoted their integration into bus depots, public parking facilities, transport hubs and existing petrol-station sites. Around 1,098 ultra-fast charging stations are now operational across the city, forming an increasingly comprehensive charging network.

Behind this large-scale transition is a broader change in the relationship between mobility and urban space. Rather than simply adding new facilities in response to emerging technologies, Shenzhen has adapted its transport-related spaces and infrastructure systems to address changing mobility needs. This reflects the city's ability to continuously evolve in response to technological change, while also strengthening the integration of transport, infrastructure and urban development.

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> **Green mobility becomes not only a means of travel, but also a way of bringing nature, recreation and everyday life closer together.**

Conclusion: The End Goal of Transport Planning Is Not Transport Itself

Looking back at Shenzhen's transport development, what emerges is a process of continuous adaptation alongside the city's growth. The UIS provides one way of interpreting this evolution, looking at three dimensions: Transformation, Symbiosis and Aspiration.

Transformation is reflected in the city's ability to respond to emerging challenges at different developmental stages by continuously adjusting its transport strategies. Symbiosis lies in the evolving relationship between transport, urban functions, the natural environment and public space, allowing transport to generate broader urban value. Aspiration, in turn, speaks to the ultimate question behind these efforts: what kind of urban life do we want to create?

Looking ahead, Shenzhen will continue to improve transport efficiency and infrastructure while placing greater emphasis on the quality of urban life. Future efforts will focus on using land space more efficiently, responding better to climate change, strengthening connections with the city's mountain-and-sea landscapes, and improving everyday travel experience.

Ultimately, transport planning is about shaping space, building the city and improving daily life through mobility. This logic underpins Shenzhen's green mobility-led urban development and provides an important pathway towards becoming a City of Symbiosis.

LEE KUAN YEW WORLD CITY PRIZE Network

MEXICO CITY
2024 PRIZE LAUREATE

MEXICO CITY

The Tarjeta MI: A System to Advance the Right to Mobility in Mexico City

Mexico City's Tarjeta MI brings nine transport systems together through a common payment platform, showing how technology, institutional coordination and territorial inclusion can create a simpler, more connected and accessible mobility system.





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Hidalgo Station, an interchange between Metro Lines 2 and 3, recorded 3.03 million passenger entries across both lines during the first quarter of 2026.
Image: Official archive of the Secretariat of Mobility (SEMOVI)

In cities, mobility is usually understood through the lens of infrastructure: new lines, stations, corridors and transport systems. Mexico City's experience adds a complementary and fundamental perspective: improving the daily experience of millions of residents through governance, institutional coordination and technological innovation.

The integration of every public transport mode under a single Integrated Mobility Card, the *Tarjeta MI*, shows how these tools can help build a simpler, more connected and more accessible system for travellers, while strengthening the capacity of institutions to work in coordination.

> The challenge was to ensure that the integrated mobility policy would also benefit those who depend most on public transport and travel the greatest distances every day.

The Challenge

Every morning, millions of people in Mexico City use a combination of the Metro, the Metrobús, the Cablebús, the buses of the Passenger Transport Network, the Light Rail, the Trolleybus, Ecobici bicycles, the Interurban Train and the Suburban Train to reach their destination.

Before 2019, these modes of transport were run by separate agencies, each using different ticketing and payment systems. Residents had to queue at different ticket windows or use different cards for each leg of what was, in practice, a single journey—and in the process, accumulated numerous plastic cards.

Fragmented payment, however, was only the most visible aspect of the problem. The city had to address, simultaneously, the technological fragmentation of its transport systems, coordination among the institutions responsible for operating them, and a fundamental public policy question: how to ensure that the benefits of integrated mobility reach residents and areas facing the greatest barriers to getting around.

The first challenge was technological: the city had to integrate an existing network, comprising systems built at different times, with different technologies and uneven capabilities. To do this, it needed a solution that could operate across this diverse network, guarantee secure and reliable transactions on a massive scale and offer flexibility to incorporate new transport modes and new forms of access. The difficulty lay in building a common technological platform without interrupting the daily operation of one of the largest and most complex public transport networks in Latin America.

The second challenge was institutional. Integration required coordinating various agencies—each with its own mandate, management structure and procedures. For the user, a trip might be a single journey; for the administration, this could involve several



The Tarjeta MI carries the Integrated Mobility identity developed under Lance Wyman's creative direction, drawing on the design language of the 1968 Mexico City Olympic Games and the Mexico City Metro.
Image: Official archive of the Secretariat of Mobility (SEMOVI)

institutions. The city had to align criteria on fare collection, data and technological standards, without diminishing the authority of each agency.

The third challenge was territorial justice. Since 2014, Mexico City's Mobility Law has recognised mobility as a right of every person. That right, however, is not exercised under equal conditions across the capital. The challenge was to ensure that the integrated mobility policy would also benefit those who depend most on public transport and travel the greatest distances every day.

Fragmentation was not only administrative; it was also territorial. As in many major cities, the core Metro network is concentrated in central areas, while the most vulnerable and excluded communities live in the periphery, and often need to combine several services to complete their journeys. It was therefore especially important for integration to reach these areas.

The Solution

The response addressed the problem across four interconnected dimensions. Integration ceased to be a decision left to each transport agency and became a citywide project. The 2014 Mobility Law empowered Mexico City's Secretariat of Mobility (SEMOVI) to regulate, standardise and manage the capital's toll and fare collection systems. Under this mandate, SEMOVI led the process through the Integrated Public Transport System Committee (CSITP)—a collegiate body it chairs, which brings together the heads of the public transport agencies.

When integration was extended to concessioned transport services operated by private companies, SEMOVI coordinated the process with the Transport Regulatory Agency, which deployed the system vehicle by vehicle and corridor by corridor. By 2025, more than 300 vehicles along five corridors accepted the Tarjeta MI—reducing cash handling on board and strengthening service safety.



Designed by Pablo Peña, Mexico City's Integrated Mobility map brings the capital's public transport modes into a single visual network under the 2019 "One City, One System" framework.
Image: Official archive of the Secretariat of Mobility (SEMOVI)

To enable technological integration for its public infrastructure to evolve over time, the city adopted an open, royalty-free and interoperable technology standard based on Calypso, which is used by transport systems around the world. By not depending on a single supplier's proprietary technology, the city could bring in different equipment and vendors under one shared standard and also expand the system as the network grew.

Implementation progressively replaced the former access and fare collection mechanisms without interrupting daily operations. New validators, top-up machines and processing systems were installed, and the equipment of each agency was adapted to recognise the same card. On the Metro, modernisation culminated in 2024 with the replacement of magnetic tickets across all 12 lines.

For users, the change meant they no longer needed a different ticket or card for each system. A single balance covers the entire journey and can be topped up at more than 380 Metro ticket offices, 400 vending machines, more than 12,000 neighbourhood shops—with a strong presence in the outlying boroughs—and through the CDMX App.

The technological architecture also required an institutional architecture. Having a single card required SEMOVI and the operating agencies to agree on matters that each had previously managed independently: how to record transactions, share data and compensate each operator. In 2020, CSITP agreements established a set of rules. Each agency retained its own fares and the operation of its service, while the means of access, transaction records and revenue settlement became shared practices. Governance thus became the condition for interoperability to work in practice.

Integration continued to expand. In 2024, the Mexico City–Toluca Interurban Train and new route-based transport services were progressively incorporated into the Tarjeta MI ecosystem, extending interoperability beyond the capital's own systems.

Under the current Mexico City administration, this expansion also acquired a digital dimension. In December 2025, the Virtual Tarjeta MI was integrated into the CDMX App, allowing users to access the network with their phones using Near Field Communication (NFC) technology. At its launch, SEMOVI reported that more than 60,000 virtual cards had been issued; by February 2026, they were enabled for use on all 1,800 validators across the Metro's 12 lines. Digitalisation was conceived as an expansion of options, with the physical card remaining available to users without a compatible phone or who prefer to continue using it.

In April 2026, the current administration extended integration to a metropolitan scale by making Tarjeta MI a means of payment on the Suburban Train. As this federal-run rail service connects Mexico City with the State of Mexico—the neighbouring state with which it forms a single metropolitan area—and with Felipe Ángeles International Airport, this shared mobility experience marks a new policy milestone for the millions of people who travel within the metropolitan region every day.

Today, a single card—the Tarjeta MI—grants access to all nine transport systems. The solution was not a single intervention but the combination of four dimensions. The Tarjeta MI directly integrated payment and technology: one medium and one balance for all systems, built on a common standard. Institutional coordination was the condition for achieving this, and the expansion of the network towards the periphery formed part of a broader transformation of the city's mobility, for which the card provided a common gateway. Together, they turned a single card into a new way of exercising the right to mobility and of experiencing the city.



Constitución de 1917 Station on Cablebús Line 2 opened in August 2021. The line carries up to 75,000 trips per day and cuts travel time in half to just 40 minutes along its 10.6 km route, contributing to more dignified and inclusive mobility in Mexico City.
Image: Official archive of the Secretariat of Mobility (SEMOVI)

The Results

By its sixth anniversary in October 2025, the Tarjeta MI had recorded more than 11.9 billion trips, with over 33 million cards issued and an average of more than nine million trips per day. The Metro alone accounts for approximately 4.5 million of these daily trips.

The scale of this transformation has been recognised internationally. The Tarjeta MI received the Calypso Award in 2022, was a finalist at the Transport Ticketing Awards in 2023 and earned an honourable mention at the 2025 Sustainable Transport Awards. In 2024, the city's progress in transport and digital transformation was among the reasons for which Mexico City was awarded the Lee Kuan Yew World City Prize.

On the ground, the Cablebús transport system, launched in 2021, delivered the most visible effects in the steep, peripheral territories, which historically had fewer transport alternatives and where combining several services was part of daily travel routines. A 2024 evaluation by ITDP Mexico and the Inter-American Development Bank found that the Cablebús—which incorporated the Tarjeta MI from its first line—reduced users' travel times by almost 45% and the average cost per trip by almost 10%. Furthermore, it doubled—and in some cases, even tripled—access to employment, health and education opportunities reachable within an hour's travel.

On its newest line, which has a capacity of 34,000 passengers per day, travel time fell from 40 to 21 minutes, according to Mexico City's Electric Transport Service. These benefits derive from the expansion of the network, while the Tarjeta MI ensures new segments are easily integrated through a common means of payment.

Challenges remain. The first is metropolitan: millions of people travel daily between Mexico City and the State of Mexico, and the integration of these journeys depends, above all, on agreements between governments and operators that are still under discussion. The second is to complete the incorporation of concessioned transport and the digital option roll-out across all services. These are the next steps for a policy that seeks to recognise mobility as a right and to respond to the way people actually live and move across the capital's metropolitan territory.

The evolution of the Tarjeta MI reveals the reach of this vision: an initiative that had set out to simplify access to transport ended up bringing together decisions on governance and coordination around one central goal—to improve the everyday experience of those who rely on the network. Advancing the right to mobility for all means carrying that perspective beyond both the card itself and the boundaries of a single city—ultimately, better transport conditions will translate into better opportunities for living, working, studying and enjoying the city.

[1] Lee Kuan Yew World City Prize, "2024 Prize Laureate — Mexico City", leekuanyewworldcityprize.gov.sg

[2] ITDP México and Banco Interamericano de Desarrollo (BID), "Lecciones aprendidas en la implementación del Cablebús", mexico.itdp.org, September 2024.

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VIEWPOINT

ASWATHY DILIP

The Future of India's Streets: From National Challenge to State-Led Transformations



Aswathy Dilip is the Managing Director of ITDP India. Together with her team, she works with national, state and city governments to advance sustainable and equitable urban mobility. Their work spans safer walking and cycling streets, travel demand management reforms, high-quality, clean mass transit and transport electrification.

The National Challenge has proven that Indian cities can build pilots quickly. The harder question is whether the institutions needed to sustain and scale them can be built too.

In 2020, India attempted an ambitious National Challenge, comprising two programmes aimed at developing Healthy Streets for people—instead of vehicles—across more than 100 cities simultaneously.[1]

Led by the Ministry of Housing and Urban Affairs (MoHUA) under India's Smart Cities Mission, with technical support from ITDP India, the two programmes—Cycles4Change and Streets4People—set out to help cities redesign and build street networks that offer continuous, safe and enjoyable walking and cycling infrastructure, in support of the Healthy Streets vision. Their ambition was not only about developing the streets, but also the institutions that would keep building them long after the national spotlight moved on.

Four years on, the Challenge has delivered substantial results: hundreds of kilometres of new footpaths and cycle tracks across 48 cities that residents now use and treat as their own, alongside dozens of newly-established city-level institutions that can scale this work. Its legacy, however, is uneven—many cities that had built pilot networks have struggled to carry on the efforts once the initial funding and focus ended. Only a handful of cities continue to build on the vision.

This article examines what made the Challenge work, where it succeeded, why and where momentum stalled, and what that means for the governance reforms that India needs. Executing the projects under the Challenge proved to be the easier part. The harder test, and what this article turns to next, is whether India can set a mandate, secure funds and build sustainable institutions beyond the Challenge itself. This means less reliance on the national government's ability to mobilise a hundred cities into readiness within a span of time, and more on the state governments' ability to create systems that embed Healthy Streets as the norm, beyond timelines.

Before the Challenge: A Familiar Pattern of Vehicle-Centric Thinking

India's own policy had pointed the way long before 2020: the 2006 National Urban Transport Policy stated that urban mobility should move people, not vehicles.[2] Yet the default civic response remained vehicle-centric, such as road widening and flyovers. The consequences were visible: poor road safety, worsening congestion and deteriorating air quality. A handful of cities—Chennai, Bengaluru and Pune—broke from this pattern early on. Working closely with external technical partners and local champions, they adopted non-motorised transport policies and invested in walkable networks. But they were the exceptions rather than the norm.



Kohima took a bold step and transformed the Old NST parking lot (left) into a vibrant community space for pedestrians, cyclists and food vendors (right) by adding pop-up curbside seating, colourful paint markings and planters. To invite citizens from different communities, the city hosted a four-day street carnival in this new pop-up public space.
Image: ITDP India

How the Challenge Model of Creating Healthy Streets Unfolded

Since 2015, India's Smart Cities Mission has been providing around 100 cities with national funding for a menu of eligible project types to support area-based development. The Challenge plugged into this framework.

The timing coincided with the pandemic, when cities worldwide were testing tactical urbanism—quick, low-cost changes to street space that could be rolled out without months of planning. The National Challenge drew on this spirit, incorporating a Test-Learn-Scale methodology: cities would pilot temporary interventions with paint, cones and planters, before committing capital to permanent infrastructure. This lowered the cost of failure and public resistance to change, offering many tier two and tier three cities a low-risk way to experiment with what could work.

Cities were evaluated across three pillars: Action (on-ground infrastructure), Foundation (institutions such as policies, design cells and interdepartmental committees), and Communication (citizen engagement). Infrastructure alone rarely survives without the other two. A street with no maintenance budget tends to erode; one where residents haven't been brought along tends to draw resistance; and one with no policy behind it stays just that, a single street, never a network.

The Challenge ran over two seasons, each featuring two stages. In Season 1, over 100 cities participated in both programmes. In Stage 1, most cities piloted temporary interventions. The strongest performers then advanced to Stage 2 which saw the conversion of pilots into permanent infrastructure, adoption of policies, and setting up of interdepartmental committees. At this point, the two programmes merged into a single Healthy Streets push.

Adopting Season 1's two-stage format, Season 2 saw 53 more cities participate in the Challenge—they included new entrants, and others from Season 1 that were given a second chance to test pilots with more guidance.

What the Challenges Delivered

By the time the Challenge wound down in 2024, the results were substantial. Between March 2022 and June 2023 alone, 48 cities built more than 350 km of footpaths and 220 km of cycle tracks, with a further 1,400 km underway.



A cyclist seen using the newly demarcated cycle track in New Town Kolkata. The city began its India Cycles4Change journey by rolling out a city-wide public bicycle-sharing system with 500 cycles and implementing a network of cycle tracks.
Image: ITDP India

The institutional scaffolding kept pace. Thirty-three cities set up Healthy Streets interdepartmental committees, 15 adopted formal policies, and 19 completed three-year action plans.

Communication ran alongside this: over 60,000 residents were surveyed, and 150,000 people took part in on-ground events.

Two cities illustrate the extent of programme roll-out on the ground.

Kohima, a small hill city in Nagaland, had to solve a problem few other Challenge cities faced: convincing residents that cycling on steep slopes could be safe. It built a training arena and ran workshops to teach hill-gradient cycling, backed by regular events. Its push to turn three former parking areas into plazas for its 1.8 km walkable street project drew support from a wide coalition of local institutions. There were more cyclists on Kohima's streets during this period than ever before.

Nagpur built its work around data rather than convention. Before designing anything, it surveyed 15,000 residents to understand what stopped them from walking or cycling—their inputs helped shape the plan, including the Resident Welfare Associations' choice of pilot neighbourhoods. This data also backed the city's biggest move: a ₹66 crore (approximately S$11.6 million at the time of inception) project converting a 6 km highway stretch into a pedestrian- and cyclist-friendly corridor. A Healthy Streets Design Cell was eventually constituted to anchor the programme and support the city's plans to scale further.

After the Challenge: The Emerging Patterns

When the National Challenge ended in January 2024, three things went with it: the clear direction and structure to keep prioritising streets, the Smart Cities Mission funding, and its technical support.

Without these, the resulting outcomes have been mixed. Some cities dissolved the city-level institutions they had built and reverted to funding what they always had—the carriageway. In a handful of cities, work continued because external stakeholders stayed in the relationship that the Challenge started. In cities such as Gurugram and Kochi, technical partners kept engaging with city agencies, with funding from the cities' own budgets rather than any national scheme. But the scale hasn't matched what's



A scene from Pimpri Chinchwad's Linear Garden, where the pilot has turned into a project prioritising network-level transformation at scale. Pimpri Chinchwad has developed a city-wide Harit Setu Master Plan to connect green spaces and create walking- and cycling-friendly neighbourhoods in the city.
Image: ITDP India

needed: without a central vision guiding them, the pace depends on what each partnership alone can sustain.

The pattern that began to emerge was one that owed nothing to the Challenge itself: a small number of states started to set their own direction. Uttar Pradesh's CM-GRIDS scheme, launched in 2023 with a budget of ₹500 crore (approximately S$92.5 million at the time of launch), showed what this can look like: a state-wide vision for "complete streets" supported by a new dedicated agency—the Urban Road Infrastructure Development Agency (URIDA)—for planning, monitoring and maintaining the network. Uttar Pradesh remains the exception rather than the rule: of India's 28 states, only a few have taken this kind of independent action so far.

India's Two New Levers

In 2026, two developments presented India with a new opportunity. The first was the Supreme Court's ruling that walking on a safe footpath is a fundamental right, under Article 19(1)(d)—read with Article 21, this gives pedestrian rights explicit priority over vehicular movement. Streets are no longer a discretionary choice for a city or state. The second was MoHUA's new Urban Challenge Fund (UCF) which offers cities financing across a wide range of eligible urban investments—including streets and footpaths.[3]

Of the two, the mandate is what's genuinely new; India has had funding channels for urban infrastructure before. But a mandate needs money behind it to become a footpath, and the UCF is where that money can come from. What happens next depends on what states and cities do with both.

States Must Take the Mantle from Central Government

The National Challenge has proven that Indian cities—given the right method and enough pressure—can build pilots quickly, across strikingly different urban typologies. It also revealed something quieter: pressure applied from the top over a fixed time may deliver quick results, but the larger vision may not sustain.

The next generation of reform needs to address this. Putting in place the mandate, funding and institutions dedicated to building good streets—so that they are a norm regardless of who occupies the commissioner's office or where



Photo from a capacity development workshop site visit hosted for the cities as part of the national challenges.
Image: ITDP India

the next ad-hoc grant comes from—is key. That work cannot be led from the national capital alone, nor depend on individual champions within city governments. It has to be embedded in state-level governance—and 2026 has handed states an opening: the national mandate now exists, together with funding from the UCF. The final step now is for states to choose to use these deliberately.

Three linked moves would do it. To implement the Supreme Court's mandate, states now need to adopt acts or rules embedding walking as a fundamental right and establish minimum standards of safe pedestrian infrastructure as a baseline for any street to be built or redeveloped. Pairing that mandate with a dedicated share of UCF money, alongside state and city funds, will ensure that cities have a funded channel to act on, not an unfunded obligation. And they need to build their own institutions—technical cells and interdepartmental monitoring bodies—to provide guidance and ensure continuity in the face of leadership change and engineer transfers.

Do this, and the next decade could look very different from the last. The Challenge proved that a pilot can work on a single street or in a single neighbourhood. What India needs to build is the machinery to scale a pilot into a neighbourhood-wide network, and a neighbourhood network into a citywide one. India's top court has now made the right to walk safely explicit. But whether that right acquires the institutional structure it deserves will depend on whether India's states are willing to do what the National Challenge could not: persevere until every Indian street is a healthy street.

[1] Healthy Streets refers to ITDP India's framework for designing streets that prioritise walking, cycling and access to public transport over private vehicles, encompassing both physical infrastructure and the institutional conditions needed to sustain it.

[2] Ministry of Housing and Urban Affairs, National Urban Transport Policy https://www.mohua.gov.in/static/uploads/2025/10/0da700a8b86f2faee310bd49592ee99a.pdf

[3] PIB Delhi, "Cabinet approves Rs. One Lakh Crore Urban Challenge Fund to Drive Market-Led Urban Transformation", Press Release, 14 February 2026, https://www.pib.gov.in/PressReleasePage. aspx?PRID=2227986&reg=3&lang=2

VIEWPOINT

TIM STONOR

Unlocking Latent Demand for Walking and Cycling Through the Use of Spatial Network Modelling



Tim Stonor is an architect and urban planner and Managing Director of Space Syntax, an urban planning and design practice that uses data-driven approaches to understand how spatial design influences the social, economic and environmental performance of cities. He is a Visiting Professor at The Bartlett, University College London, a Harvard Loeb Fellow, and an Ambassador for the UK Design Council.

This article explores how spatial networks facilitate walking and cycling in cities, and in doing so, how they enable a 'movement economy' that sustains public transport and urban employment.

The Global Trend Towards Walking, Cycling and Public Transport

Cities and countries throughout the world are investing heavily in walking, cycling and public transport infrastructure. Their general aim is to offer people a realistic alternative to driving and, in doing so, to pursue the multiple benefits that occur when people drive less, including improved physical health and economic wealth, reduced social isolation, carbon emissions, traffic volumes and congestion.

There is, quite reasonably, a debate about the best ways of doing so: Should cities implement high-quality cycling and public transport infrastructure? Should they invest in lighting and paving improvements? And how can these individual interventions work together as part of a wider urban system?

When we think about space, we tend to think about individual streets, parks or public spaces. Of course, the local design of cities matters: public spaces need to be well paved, landscaped and lit, and buildings need to engage with them. But what matters too is how these individual elements are connected at a wider scale, as spatial networks. The way streets, parks and public spaces connect can influence how easily people move between them, and how movement is distributed across the city.

This article explores how spatial networks facilitate walking and cycling in cities, and in doing so, how they enable a 'movement economy' that sustains public transport and urban employment. It describes proven techniques that can be used by cities to create spatial networks, and provides examples where these methods have been used in practice to transform urban mobility.

What Does Research Tell Us About the Importance of Spatial Networks?

1. Spatial Connectivity is Measurable
When it comes to encouraging more walking and cycling, space matters greatly—but perhaps in ways that aren't immediately obvious.

Over the last 50 years, academic research has found consistent relationships between more connected spatial networks and higher overall levels of walking and cycling.



Analysis of cycle movement in London in 1999: Warm colours indicate frequently used routes, cool colours indicate underused cycle routes and white routes were not used by respondents at all.
Image: Space Syntax Limited / Central London Partnership

Spatial connectivity can be measured using specially developed spatial algorithms that analyse street networks and identify the spatial hierarchy from more to less connected streets. The algorithms consider the different routes that can be taken between street segments across the network and identify both the metric distance—the shortest route in terms of the physical distance travelled, and the geometric distance—the simplest route between origins and destinations.

This second aspect of measuring distance is an innovative feature of these 'space syntax' models, without which correlations are much weaker. This seems to be the case because, when navigating cities, the human brain is thinking not only about how far away a destination is, but also how that destination can be reached in the least convoluted way possible. The lesson for street network designers is clear: keep it simple!

This can be particularly useful when deciding where to intervene. Space Syntax's work on cycling in Central London used spatial analysis alongside observed cycling patterns to identify routes, barriers and opportunities for improvement. Its London Pedestrian Routemap applied the same principle to walking, using research into walking patterns and spatial accessibility to identify key routes and strategic opportunities.

2. Spatial Networks Fuel the 'Movement Economy'

Research has shown time and again that more connected streets typically gather higher levels of movement than less connected ones and tend to correlate with the presence of more retail and commercial land uses. In other words, spatial networks organise movement patterns, which in turn influence land use patterns: shops locate along the most connected streets where people are going to be moving anyway; their presence then attracts even more movement. This reinforcing relationship between spatial connectivity, movement and land use distribution is often described as the 'movement economy'.

This relationship is typically stronger in historically evolved towns and cities than in car-dominated places that have been planned by siloed professionals. When urban settlements grow slowly and incrementally, they instinctively tend towards networks with highly connected streets lined by shops, businesses and civic buildings, or 'Main Streets', along which run public transport routes. These Main Streets are fed by multiple side streets lined by businesses and residential buildings. Side streets then lead into local street networks, where the predominant land use is housing, supported by schools and community buildings.

Some of the densest places have among the lowest levels of driving; others have among the highest. What distinguishes many places with less driving is that they are not only denser, but also spatially networked across different scales.

This also helps explain why density alone does not necessarily produce sustainable mobility. Research in the UK suggests that lower-density areas—those with fewer than 50 people per hectare—generally have drive-to-work mode shares of around 75%, with some significantly higher. People in these areas not only drive more, but also tend to drive further.

But does the reverse follow? Does higher density automatically produce more walking? Unfortunately, it is not that simple. Some of the densest places have among the lowest levels of driving; others have among the highest. What distinguishes many places with less driving is that they are not only denser, but also spatially networked across different scales.

Density creates proximity. Connectivity makes that proximity usable. To reduce car dependence, cities need both.

3. Main Streets Are the 'Secret Sauce' of Spatial Networks

Space syntax algorithms measure connectivity at different scales, picking out three key types of streets: a) those that are most important for channelling shorter, local journeys along them; b) those that are important for longer-distance movement; and, crucially, c) those that are important at both scales, or 'multi-scale places'. These multi-scale places often form the Main Streets of towns and cities. Their combination of local and wider movement also helps explain why many develop into successful commercial locations, making them key assets within the movement economy.

Crucially, in addition to being fed by side streets, Main Streets carry movement over longer distances through the wider urban network. In this way, Main Streets are fed by a dual movement economy: the local movement of pedestrians, cyclists and short vehicle trips, as well as the global movement of public transport and private vehicles travelling longer distances.

This dual economy is the 'secret sauce' of spatial networks. If local spatial networks are

isolated from each other, they may not generate enough footfall to support much retail. However, once connected by Main Streets, multiple local networks can achieve a critical mass: local movement that is turbo-charged by the larger-scale global movement.

How Can Planners and Designers Respond to These Research Findings?

These findings offer practitioners both a mindset and a methodology to identify spatial network potentials and to plan cities away from car-dominance towards walking, cycling and well-used public transport. As the 'lowest common denominator' of urban planning and design, space can also provide a common language between professional silos, helping different disciplines understand how their individual decisions interact.

1. Use Spatial Modelling Early in the Planning Process

Although complex modelling can be undertaken to factor in the effects of other influences—such as light and shade levels, footpath width and quality, or even building façade attractiveness—simple spatial models provide powerful tools in their own right, early in the planning process. This is especially important in data-poor situations when other information may not be available. Indeed, spatial layout information is sometimes the only data available at the early stages of designing a new urban area.

In these circumstances, spatial modelling allows for the testing and optimisation of designs at a much earlier stage than conventional traffic modelling. This space-first approach can be used to inform land uses, density distributions, street widths and public transport corridors.

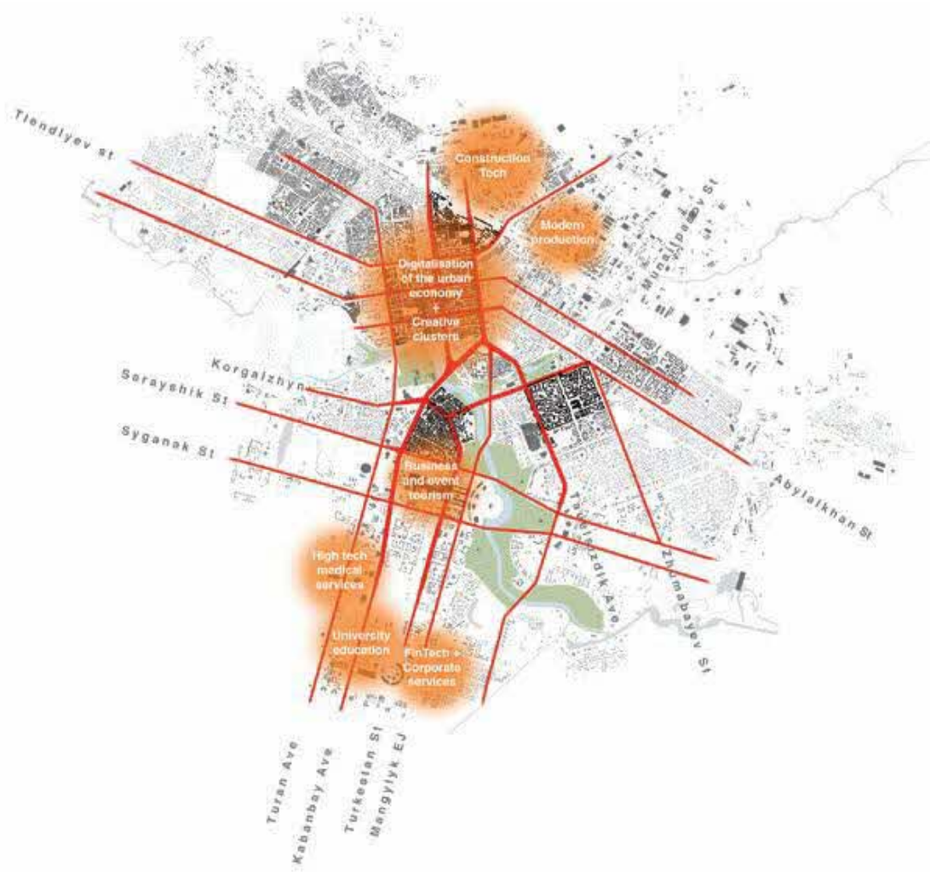
At a city-wide scale, this approach was used in Astana, Kazakhstan—where evaluation of spatial potentials informed a planning strategy covering land use, transport, utilities, street types and urban design. The ambition was to shift the city away from car dependence towards walking, cycling and public transport as genuine mobility options.

2. Treat Spatial Networks as Critical Infrastructure

The consistencies in the historic urban record identified by research suggest a natural order to the spatial shaping of cities that can be nurtured in new plans and applied to existing places where planners are seeking to move people away from car-dependence. In other words, historically evolved cities reveal this 'natural order'—recurring relationships between spatial connectivity, patterns of movement and the distribution of urban activity.

Spatial networks are indeed sufficiently powerful to make the difference between active travel and public transport investments either thriving or failing. They should therefore be considered as critical infrastructure, to be sensitively handled through careful appraisal, design and impact forecasting.

The Southbank Centre in London—a nationally significant collection of cultural buildings—demonstrates this principle in an existing urban environment. Spatial modelling was first used to diagnose how a fragmented and disconnected



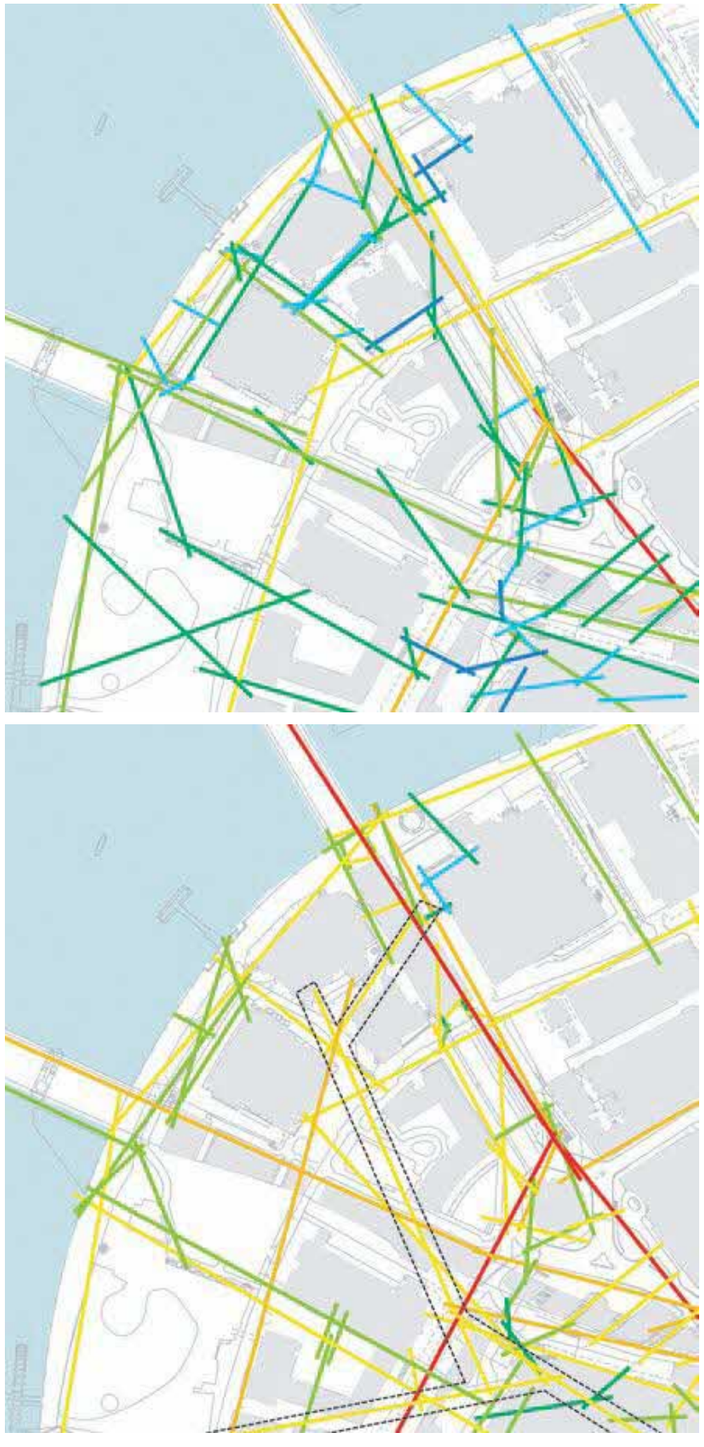
Spatial analysis of Astana showing the city-wide network and its spatial potentials. The analysis formed part of a wider planning strategy for the Kazakh capital.
Image: Space Syntax Limited

layout was suppressing pedestrian movement and limiting the use of its economic and cultural assets. The results of the diagnostic work led to the testing and refinement of plans to radically transform the Southbank Centre. A space-first approach was taken to simplify the internal layout of the entire estate and stitch it into its wider urban context in order to generate a 'movement economy' that is today characterised by vibrant public spaces lined with bars, cafés and restaurants.

3. Be Prepared to Think Differently

Spatial network research—in particular, the importance of mixing local and global movement to fuel the movement economy—has implications for contemporary planning and urban design. It challenges the mindsets of professionals who have often been educated to separate global and local movement networks. Consider the sterile residential streets of many new towns, encircled by fast roads but poorly connected to them, or bypasses that remove through traffic but also the passing movement that previously contributed to the local economy.

The lesson is not that all movement should be brought back into every street. Rather, the effects of changing movement at one scale need to be considered at other scales too. A spatial-networks-first approach challenges these long-held practices of partitioning, separation and isolation. It asks what should be connected, at what scale, and for whom—rather than assuming that separation will always produce better outcomes.



Spatial accessibility at the Southbank Centre before (top) and after (bottom) the redesign. The previously fragmented layout resulted in low levels of spatial accessibility (shown in green and blue). Simplifying the pedestrian network into fewer, more direct routes significantly increased accessibility.
Image: Space Syntax Limited

A spatial-networks-first approach challenges these long-held practices of partitioning, separation and isolation. It asks what should be connected, at what scale, and for whom—rather than assuming that separation will always produce better outcomes.

4. Accommodate the Slow Car

A further challenge concerns the urban design of Main Streets, where different scales of movement need to be accommodated.

First, the economic benefits of connected spatial networks will only occur if through traffic moves slowly enough for walking and cycling alongside it to remain comfortable. A maximum speed of 30 km/h is now typical in cities that have implemented such measures. Main Streets that accommodate the 'slow car'—with narrower kerb-to-kerb dimensions, narrower traffic lanes and landscaping—can create a 'visual friction' that helps to enforce lower speeds.

Second, public transport and private vehicles need opportunities to stop so that their occupants can convert from being global to local economic actors. There is no point implementing a slow-speed design strategy if the presence of through traffic cannot be harnessed. This means providing more accessible on-street transit stops rather than hard-to-reach transit hubs as well as on-street or near-street parking, carefully integrated within a pedestrian-first approach to urban design.

Conclusion

For cities looking to shift away from car-dominance, it is not enough simply to promote the benefits of doing so in terms of health, carbon emissions and economic advantage. Cities must also invest in the infrastructure to make walking, cycling and public transport a realistic possibility. This means good-quality footpaths, bike lanes, transit vehicles and transit stops, as well as attractive landscapes that shade their users. It also means architectural and planning codes that deliver mixed-use neighbourhoods and buildings that meet the ground with 'active' frontages onto Main Streets rather than blank walls onto highways.

However, these elements do not operate independently. Their effectiveness depends on the spatial networks in which they are embedded. Using modelling to identify spatial potentials, develop strategies and test their effectiveness can help cities unlock the natural, latent demand for people to walk, cycle and take public transport—and make better use of the streets, public spaces and urban assets they already have.

SHARED MICROMOBILITY GOVERNANCE

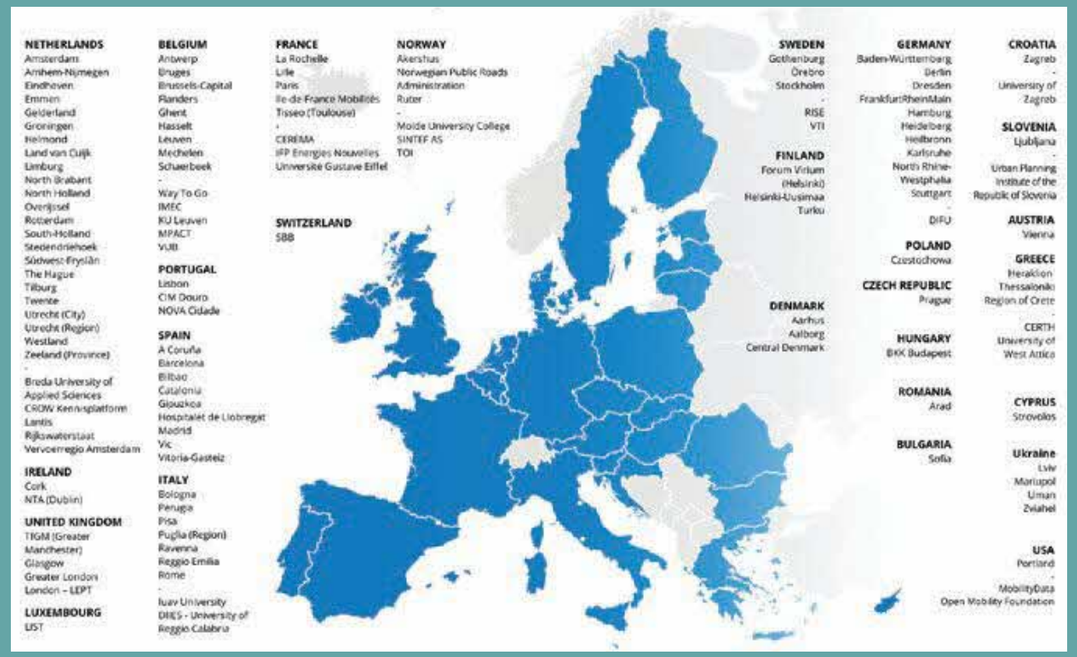


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How European Cities are Learning to Govern Shared Micromobility



Overview of POLIS members, September 2026.
Image: POLIS

In 2018, European cities witnessed the arrival of shared micromobility. In a matter of weeks, pavements were filled with a new type of vehicle whose success nobody had really anticipated. Faced with this phenomenon, many cities found themselves forced to act quickly. Their approaches ranged from prohibition to wholehearted adoption, and from open-door markets to highly competitive tenders. What has been learned so far?

For local and regional authorities, shared micromobility poses a governance challenge with many moving parts: it's about sustainability, but also about safety; about innovation, but also disruption; about the enforcement of rules, but also negotiation; about decisions, but also effective follow-through.

Eight years on, a consistent approach is increasingly emerging: cities are using regulations and licensing frameworks not only to manage shared micromobility, but also to make it work better for everyone—as part of a richer 'mobility menu'.

POLIS is a network of more than 120 European local and regional governments, transport authorities and research organisations, working to advance more sustainable, safe and equitable mobility through innovative policies, strategies, methods and tools.

The opportunities and challenges faced by local and regional authorities in this domain have been a major focus of the POLIS Governance and Integration Working Group.

Discussions within this working group—which facilitates systematic exchanges between POLIS members, operators and other relevant stakeholders—have provided several useful insights and prompted a more in-depth analysis through a series of working documents: "Macromanaging Micromobility: Taking the long view on short trips" (2019)[1], "Sharing Data for Shared Micromobility" (2021)[2], "Catch me if you can! How European Cities are regulating Shared Micromobility" (2023)[3] and "Careful what you wish for… Practical implications of rules & requirements for shared micromobility" (2025)[4].

The Long and Winding Road: Shared Micromobility Regulation Meets the Real World

It is easier to say what 'should' be regulated than to regulate properly. Additionally, rules that may seem 'obvious' can have unexpected—and undesirable—implications.

Take speed limits, for example. Hardly any rule sounds more intuitive: reducing the speed of scooters will make collisions less likely and their impacts less severe. However, putting this into practice is rarely straightforward. Geofencing, the technology used to enforce speed limits in specific zones, relies on the accuracy of GPS—which can vary by up to several metres in densely built-up urban areas. This can make vehicles decelerate abruptly in the wrong place, turning a safety measure into a source of confusion and, paradoxically, danger.

The issue of parking is also revealing. Incorrectly parked e-scooters and e-bikes have caused public frustration in many cities, and the push for regulation is understandable. The problem, however, is that there is no clear and universally accepted definition of what 'proper parking' actually means for shared micromobility vehicles. Furthermore, enforcing a regulation that mandates proper parking, when no appropriate infrastructure exists, imposes an unachievable standard on operators and users.

The situation is similar with regard to compulsory helmet use. While the requirement for operators to provide helmets sounds reasonable, storing helmets on the vehicles poses immediate technical and hygiene challenges—ranging from ensuring that helmets are available in the proper size, well cleaned and maintained, to them not getting stolen. These, in turn, can carry serious costs for the operators.



Shared bike users in Paris demonstrate how safe, dedicated cycling infrastructure can support shared micromobility and encourage wider adoption.
Image: Karen Vancluysen



Antwerp's bike-sharing scheme provides residents and visitors with an alternative to private motorised transport.
Image: Shutterstock, courtesy of POLIS

Fixing a Hole: Important Built Environment Considerations When Designing Regulations

> Any regulation that conflicts with the physical environment it is intended to regulate is bound to fail, however well-intentioned it may be.

What many regulations have in common is a fundamental flaw: they view written regulation as enough, while underestimating the critical role of the built environment. When it comes to urban mobility, space is the most important regulator. The ways in which cities design roads and allocate road space strongly shape behaviour—including how fast vehicles circulate, and where and how well they park.

This realisation has far-reaching implications. A city that calls for responsible parking but fails to provide parking spaces is setting itself up for failure. If compliance is impossible or very difficult, enforcement will suffer the same fate.

A city that reduces the speeds of e-scooters, while leaving car speeds unchanged, widens the speed differential between road users on the same road. This raises the risk for scooter users and forces them onto the sidewalks—which, in turn, increases the risk for pedestrians.

In short, any regulation that conflicts with the physical environment it is intended to regulate is bound to fail, however well-intentioned it may be. The most effective cities are those that have understood this and acted accordingly.

Measures that have created conditions under which written rules actually work include low-emission zones, lower speed limits and traffic calming measures, cycle path expansions, and the re-allocation of car parking spaces to infrastructure for shared mobility.



Shared e-scooters in Madrid highlight the importance of regulating micromobility to ensure safe and equitable use of public space.
Image: Karen Vancluysen

A Day in the Life: Antwerp's Case for Adaptive Regulation

Antwerp provides a good case study of what results-oriented urban policy looks like in practice. When shared micromobility was introduced in 2018, the city opted not for a ban or a delay, but for active engagement based on a 'learning by doing' approach.

Since then, regulations have been revised multiple times, guided by data and experience. An internally-developed monitoring dashboard provided city officials with a real-time overview of where vehicles were located—whether they were parked correctly, and where rules were being breached. When GPS inaccuracies led to discrepancies between reported and actual vehicle locations, the city identified this as a priority issue for the next round of negotiations with the operators.

To ensure compliance with the regulations without relying solely on fines, which had encountered legal obstacles, Antwerp introduced a points system. Operators accumulated points for specific breaches of the regulations, which were reviewed every three months; penalties ranged from fleet reductions to licence withdrawals. Crucially, the system was introduced gradually, with an initial transition period for operators to familiarise themselves with the requirements before enforcement was tightened. Most operators welcomed this arrangement—it provided clarity, a level playing field and a framework for genuine accountability.

Longer licence terms, typically five years, have been advocated as a means of encouraging investment in better vehicles, more stable local jobs, and more comprehensive data-sharing agreements.

Can't Buy Me Licences: How Cities are Shaping Shared Micromobility Markets

Early on, several cities adopted an 'open-door approach', where few or no conditions were imposed on market access. An operator could just start deploying. In some cases, this approach was adopted deliberately; in others, it was simply the result of the absence of an enabling law, a situation which was fixed slowly.

In larger cities, this open-door approach led to a 'tsunami' of vehicles, which harmed operators, users, and public spaces alike. These negative impacts left a deep mark in public perception, and shaped subsequent political debates.

Some level of order was needed, but how could it be pursued? Many opted for requiring a licence to operate, establishing a competitive process for the awarding of those licences, and a limited validity for them—which required a cyclic renewal of the competitive process.

The duration of the licence turned out to have important implications. Longer licence terms, typically five years, have been advocated as a means of encouraging investment in better vehicles, more stable local jobs, and more comprehensive data-sharing agreements. There is a simple logic behind this: if operators know they have a permanent presence in a city, they have an incentive to behave like long-term partners rather than short-term tenants of public space. However, longer contracts also require rigorous performance monitoring. Without this, there is a risk that established providers will be favoured over quality, and that cities will remain trapped in agreements that benefit operators more than the public.

Oslo's experience is worth noting here. Despite caps on fleet size—which one might have expected to restrict the market—the city achieved impressive passenger numbers. Scarcity, if well managed, can promote quality. A profitable and stable market attracts operators who are willing to invest; a race to the bottom drives out the better providers.

Paris provides a cautionary counter-example—the number of shared e-scooters fell from 15,000 in 2023 to zero by 2025, after a referendum decided to end shared e-scooter services. Other cities have since discussed, and some have adopted similar measures.

Whether this represented a democratic correction or a failure of regulation depends on one's point of view—yet it highlights the risk when the terms of the public debate are determined more by complaints than by facts. The attention that shared micromobility attracts in the media and in local politics is rarely proportionate to the extent of the risks it actually poses when compared to motorised transport. Salience bias[5] is a real phenomenon in regulatory decision-making, and its effects are not neutral.

> Effective regulation is more difficult than it appears. It requires a clear purpose, takes longer than expected, and depends on framework conditions that go far beyond the written rules.

Getting Better: How Proactive Regulation is Turning Shared Micromobility into an Asset

What sets the more effective regulatory approaches apart is not the specific rules they apply, but the mindset with which they tackle the challenge. The reactive 'damage-limitation' model treats shared micromobility as something that must be put up with. It focuses on containment, tackles symptoms rather than causes, and often leads to unintended consequences that require further reactive measures.

The proactive 'regulate to accelerate' model is based on a different premise. It asks what contribution shared micromobility can make to a broader agenda for sustainable mobility, and then drafts regulations to align private initiatives and capital with this public objective. It creates a stable regulatory framework, invests in infrastructure, aligns written regulations with the physical environment, and uses data and pilot projects to refine its approach over time.

Norway's National Action Plan for Micromobility—which covers e-scooters, e-bikes and new technologies such as small delivery robots—illustrates elements of this approach. It is revised every two to three years to keep pace with technological change and is guided by clear societal objectives. It recognises that effective regulation is a process rather than the result of a single decision. For example, new prohibition signs on the road surface and adjusted age limits have been introduced gradually and on the basis of scientific evidence, while national level guidelines help to reduce the fragmentation resulting from smaller local authorities lacking the resources or expertise to implement effective regulation.



Micromobility users navigate a busy street in Paris, illustrating the challenges of accommodating and regulating different modes of transport.
Image: Shutterstock, courtesy of POLIS

Come Together: Lessons Learned from Eight Years of Shared Micromobility Governance

The clearest lesson learnt from eight years of regulation of micromobility by European local governments is this: effective regulation is more difficult than it appears. It requires a clear purpose, takes longer than expected, and depends on framework conditions that go far beyond the written rules.

What is the regulation actually intended to achieve, and for whom? Does the infrastructure foster the desired behaviours? Is shared data being used for effective monitoring and decision-making? Are operators being treated as partners in a joint process, or as adversaries who need to be controlled? Finally, and most importantly: what should the mobility of tomorrow look like?

[1] POLIS Discussion Paper. November 2019. https://www.polisnetwork.eu/wp-content/uploads/2019/11/Polis-Paper-Macromanaging-MicroMobility.pdf

[2] POLIS Survey Report. January 2021. https://www.polisnetwork.eu/wp-content/uploads/2021/01/SHARING-DATA-FROM-SHARED-MICROMOBILITY_FINAL.pdf

[3] POLIS Research Report. November 2023. https://www.polisnetwork.eu/wp-content/uploads/2023/11/SHARED-MICROMOBILITY-REPORT.pdf

[4] POLIS Research Report. March 2025. https://www.polisnetwork.eu/wp-content/uploads/2025/03/Shared-Micromobility-Regulations-Report.pdf

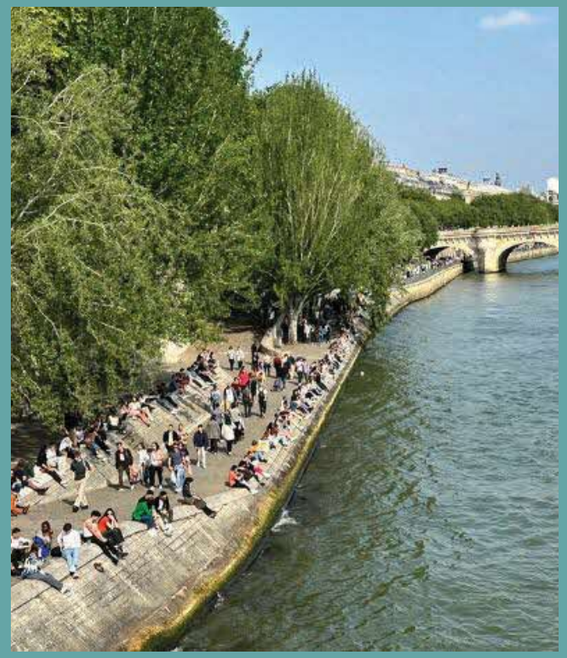
[5] Salience bias is a cognitive bias that leads people to focus on (and often overestimate the importance of) the most prominent information or traits, because they are new or different. More common traits, i.e. those less
'salient', are underestimated. Shared micromobility presents an interesting example – being new and different, its 'salience' has drawn disproportionate attention to its road safety risks, while cars and trucks remain, by far, the largest cause of road deaths and serious injuries.



15-MINUTE CITIES
CARLOS MORENO

Carlos Moreno is a researcher at IAE Paris-Sorbonne, internationally recognised for pioneering the 15-Minute City, which has shaped urban policy worldwide. Multi-award-winning, including the UN-Habitat Scroll of Honour and OBEL Award, his work advances human-centric transformation, proximity and quality of life.

Sustainable Proximity: Restoring Time, Trust and Quality of Life





Paris has redesigned its public spaces around proximity, making walking and cycling the natural way to move through the city.
Image: Carlos Moreno

The concept of the "15-Minute City", which I first proposed in October 2016 after COP21 and ahead of the Habitat III Conference in Quito, has gained worldwide momentum. In November 2019, Paris Mayor Anne Hidalgo embraced the concept and made it a cornerstone of her urban policy. Since then, mayors, organisations and institutions around the world have adopted and adapted it to their own local contexts.

Today, it appears under many different names. This idea of the "X-Minute City" or "X-Minute Territory" is being applied in large, medium-sized and small cities, as well as in rural areas. Increasingly, countries are also exploring how proximity can become part of national policy.

But the number of minutes does not matter. What matters is the paradigm shift. In the 20th century, we planned cities and organised activities in terms of kilometres and distance. Today, we need to think in terms of time—useful time, time that improves people's everyday lives.

The goal is to create places where people meet, talk, cross paths and interact: a more human city that builds trust and social inclusion, while strengthening the local economy. We need to move beyond neighbourhoods designed primarily as places to sleep, from which people commute long distances to work, always in a hurry, towards cities where everyday life can flourish—where proximity strengthens social ties and gives people back time, and with it, the joy of living close to one another.





Piazza Dergano, Milan: a former traffic junction reclaimed as pedestrian space, part of the city's push toward 15-Minute City planning.
Image: City of Milan

A New Urban Model for the 21st Century

The 15-Minute City is based on a simple but transformative idea: re-organising urban life so that people can meet most of their essential daily needs within a short distance of where they live, using low-carbon mobility—preferably on foot, by bicycle, or by public transport.
We want to develop a polycentric city in which every neighbourhood offers access to the essential functions of everyday life: housing, work, shops, healthcare, education, culture, green spaces and places for social interaction.

At its core, the 15-Minute City is a model of urban proximity. Its ambition is to give people back something that contemporary metropolitan life has increasingly taken away: time. For decades, urban development has separated the different functions of the city. We created residential districts in one place, business districts in another, shopping areas on the outskirts, and cultural and recreational facilities elsewhere. The result has been a fragmented city organised around distance and dependent on mobility.

The 15-Minute City proposes another urban grammar—one based on proximity, mixed uses, accessibility and quality of life.

The 15-Minute City proposes another urban grammar—one based on proximity, mixed uses, accessibility and quality of life.

Moving Beyond the Car-Centred City

This transformation inevitably challenges the dominant role that the private car has played in urban planning for almost a century.
In many dense urban areas, an extraordinary proportion of public space is devoted to cars, through roads and surface parking. Yet private cars are often occupied by only one person and remain stationary for the overwhelming majority of their existence. This raises a fundamental question: what is the best use of a scarce and collectively-financed resource such as public space?

A parking space can remain occupied by an inactive vehicle, or it can become a tree, a wider pavement, a playground, a café terrace, a bicycle lane or a place where people meet. The issue is therefore not simply whether one is “for” or “against” cars. It is a question of spatial justice.

Dense cities offer alternatives: walking, cycling and public transport. Where these alternatives exist, continuing to dedicate disproportionate amounts of public space to private vehicles has consequences for everyone else. These consequences are also environmental and health-related.

Internal combustion vehicles generate greenhouse-gas emissions and fine particles, including PM2.5, which pose serious risks to public health. Electric vehicles can reduce some emissions, but they do not solve the fundamental urban problem: a traffic jam remains a traffic jam whether the vehicles are electric- or petrol-powered. Electric cars also continue to produce particles through tyre, brake and road wear. The transition towards electric mobility is important, particularly in low- and medium-density territories. But electrifying the existing car-centred city is not enough. In dense urban environments, the deeper challenge is to reduce car dependency by making walking, cycling and public transport genuine everyday alternatives.

From Mobility to Accessibility

This distinction is central to the 15-Minute City. For much of the 20th century, urban policy sought to increase mobility—enabling people to travel farther and faster. The proximity city asks a different question: why should people be forced to travel long distances in the first place? Mobility is not necessarily synonymous with quality of life. A person travelling several hours every day to work, shop, study or access healthcare may be highly mobile but may have very poor access to the city.

The objective should therefore be accessibility rather than mobility for its own sake. A neighbourhood should not simply provide a roof under which to sleep while requiring its inhabitants to cross the metropolitan area for everything else. It should be a living ecosystem, with services, activities, public spaces and social relationships. Proximity allows people to recover time previously lost to compulsory travel. That time can be devoted to family, friends, culture, sport, community life or simply rest. This is why the 15-Minute City is ultimately less about distance and more about quality of life.

The 15-Minute City reframes the neighbourhood around everyday needs, including work, health, learning and community—all within reach on foot or by bike.
Image: Micaël

Social Infrastructure: The Power of Multiple Uses

Creating proximity does not necessarily mean building everything from scratch. One of its most powerful principles is transforming existing physical infrastructure into social infrastructure. A school can have another life outside teaching hours. A town hall can host cultural or community activities. A shop can also become a meeting place or training space. Public buildings can accommodate multiple uses at different times of the day and week.

This multi-use approach changes the economics of urban transformation. Instead of systematically asking what new infrastructure needs to be built, cities can first ask how existing buildings and spaces can be used differently and more intensively. Other transformations—such as wider pavements, protected bicycle lanes, redesigned streets, greener public spaces and high-quality public transport—require more resources. But they should be considered long-term investments in public health, accessibility, social cohesion and quality of life, rather than simply as expenditure on mobility.

The key is to move from infrastructure designed primarily for circulation towards infrastructure designed for life.

One Principle, Many Cities

The 15-Minute City is not a model that can simply be copied and pasted from one city to another. Every city has its own geography, history, density, culture, inequalities and patterns of mobility. A European capital, an Asian megacity, a North American metropolitan area and a small town cannot apply identical solutions. The principle of proximity must therefore be adapted to each territory. This adaptability explains why experiments inspired by proximity are appearing in very different places.

Paris has implemented a pioneering approach; Mexico City has developed the UTOPÍAS—territorial facilities that bring together cultural, educational, recreational and other services within neighbourhoods. Different cities in South Korea have integrated the 15-Minute City into their urban strategy, while Scotland has designed a powerful 20-Minute Territory programme. Pleszew, a small town in Poland with 15,000 inhabitants, and Trilport in France with 5,000 inhabitants have also deployed outstanding transformative roadmaps. Recently, Mongolia has created its own 20-Minute Path. This is the virtuous circle of this global proximity community.

Indeed, the principle is equally relevant to medium-sized and small cities. Proximity is not a question of density or metropolitan scale. It is about organising territorial resources so that everyday life becomes more accessible. Even highly car-dependent cities can evolve—cities built around the automobile do not have to remain organised around it forever.



From a car-dominated street to a shared, green public space: cities from Paris to Seoul are adapting the principle of proximity to their own context.
Image: Nicolas Bascop

A Long-Term Transformation

However, changing the urban model requires time, vision and commitment. For nearly 70 years, planning has reinforced long distances, functional separation and automobile dependency. Residential areas, office districts, commercial zones and industrial areas have often been deliberately separated from one another. Such a system cannot be reversed in a single political mandate. Transforming a city requires strategic continuity over decades. Streets must change, but so must land use, housing, services, public transport and the way buildings are used. New local centralities need to emerge. Existing neighbourhoods need to become more diverse and better equipped.

This is a way of building a strong urban regeneration policy. It also requires a cultural transformation. For generations, the car has represented freedom, autonomy, modernity and social status. Questioning its dominance can therefore be perceived as questioning individual freedom itself. But the proximity city does not seek to dictate how people should live—it seeks to expand their choices. Even if people have a bakery, school, doctor, park or cultural facility close to home, they remain free to travel elsewhere. The difference is that they are no longer forced to travel long distances simply to satisfy basic needs. In fact, proximity creates alternatives.

The Challenge of Spatial and Social Justice

This is also why the 15-Minute City cannot be reduced only to attractive cycle lanes, pedestrian streets or greener neighbourhoods. Its deeper challenge is social and territorial justice. Proximity must benefit all neighbourhoods, including peripheral areas and communities where essential services are currently lacking. Otherwise, improvements in quality of life risk becoming privileges concentrated in already prosperous districts. A proximity strategy therefore requires investment in underserved territories and the creation of new local centralities. Access to education, healthcare, shops, culture, public space, employment opportunities and public transport must become part of a broader commitment to urban equality. The question is not simply how close a service is geographically—we need to offer services that inhabitants can actually access and use.





Along the Seine in Paris: reclaimed riverbank space now used for walking and cycling, part of the city's 15-Minute City transformation.
Image: Carlos Moreno



A reclaimed green space in Paris, now used as a playground—part of the city's shift toward proximity-focused public space.
Image: Footage courtesy of the WRI Ross Center Prize for Cities

Towards Humanist Urbanism

The 15-Minute City ultimately represents a shift in the way we understand the purpose of urban planning. The 20th century city was largely organised around movement, specialised functions and infrastructure. The 21st century city must place people, time and quality of life at its centre. This means developing polycentric cities where ecology, economic activity and social interaction foster individual and collective trust, develop otherness, and reinforce one another rather than compete. It means seeing public space as a common resource rather than primarily as a corridor for vehicles. It means transforming buildings into places capable of supporting multiple uses. It means giving walking, cycling and public transport a central role while recognising that different territories require different mobility solutions. Above all, it means moving from an urbanism of distance to an urbanism of proximity.

The 15-Minute City is not a magic formula, nor is 15 minutes a rigid threshold. It is a framework for asking a fundamental question: how can we organise cities so that people can live better without being forced to travel farther? The answer lies in proximity, polycentrism, mixed uses and the regeneration of everyday urban life. The city of the future should not simply help us move faster. It should give us reasons to travel less, allow us to recover time, strengthen social ties and improve our quality of life.

That is the deeper promise of the 15-Minute City: a city of possibilities.



KNOWLEDGE EXCHANGE
CHRIS BRUNTLETT

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Bridging Bicycle Kingdoms: Dutch-Sino Collaboration in China's Cycling Resurgence



A cycle lane runs alongside a busy road in Beijing, where cycling is being reintegrated into the wider transport network.
Image: Chris Bruntlett

China's recent cycling resurgence represents one of the most significant urban mobility transformations of the 21st century. While domestic policy reforms, technological innovation and renewed political commitment have driven this revival, international collaboration has also played an important role. Among the most influential partnerships has been the long-standing exchange between Chinese and Dutch practitioners. Both countries were once bicycle kingdoms before the automobile reshaped their cities. Dutch experience has since helped inform China's cycling resurgence, with Chinese cities adapting those ideas to local conditions.

Beijing's Bicycle Comeback

Few cities illustrate the cyclical nature of urban transport better than Beijing. During the 1980s and 1990s, the city was internationally recognised as the "Bicycle Kingdom", with over 60% of daily trips undertaken by bike. Rapid motorisation, economic growth and road expansion subsequently reversed this trajectory. By 2012, cycling's mode share had fallen to just 12%, a direct outcome of its car-first policy. Traffic congestion, pollution and declining public space became defining features of the capital.

A turning point arrived in 2015 with the Asian Development Bank-commissioned policy document entitled "Beijing Bicycle Strategy and Policy: The Way Back to World Bicycle Capital". Developed jointly by two Dutch consultancies and Chinese partners, it reframed cycling as an essential component of a modern transport system rather than a legacy of the past. What it established was that cycling cities are not achieved through infrastructure alone—instead, cities that consistently increase their cycling rates combine high-quality hardware (physical infrastructure), software (policies and standards), and orgware (governance, institutions and implementation). Progress depends on these three elements reinforcing one another.

Within that framework, the strategy proposed applying the five CROW design principles—for ensuring the door-to-door experience is coherent, direct, safe, comfortable and attractive—to create cohesive networks, instead of isolated facilities.[1] Furthermore, it recommended safer intersections, stronger bicycle–public transport integration, cycling-priority streets, traffic-calming and -circulation measures, and embracing the extended range of the e-bike.

Local Adaptation Rather Than Replication

These recommendations quickly aligned with wider policy reforms. Beijing's Urban Master Plan (2016-2035) explicitly prioritised walking, cycling and public transport above private cars. In 2020, the city introduced an extensive package of policies, design standards and monitoring schemes that embedded cycling into the planning process. Since then, Beijing's network has exploded to 3,200 km, with protected bike lanes accompanying major roads, quieter streets becoming cycling-priority corridors, and intersections redesigned to improve safety. Bike infrastructure is connected with metro and bus stations, making it an integral part of Beijing's wider transport system.

However, Chinese cities did not simply copy-and-paste Dutch solutions. Instead, they selectively adapted ideas to local conditions. Tongzhou's flagship cycling corridor illustrates this process. When the master plan for this brand-new district on the eastern edge of Beijing was being developed, the directive from the mayor—who had just returned from an official visit to The Hague—was crystal clear: it must put cycling front and centre. At its spine would be a 3 km corridor connecting its commercial and residential hubs.

To fulfil his vision of a world-class sustainable infrastructure project, they went to the Dutch Cycling Embassy, where engineers at Haskoning were selected for their extensive experience with regional *doorfiets* (non-stop cycling) routes, to partner with a locally based consultant. Opened in May 2025, the route was designed using best practice and principles straight out of the CROW Manual. Key features included a five-metre width for safety, railway underpasses for directness, shade trees for comfort, and a bespoke light fixture for attractiveness.

Similarly, the new Shahe Metro Station (SMS) bicycle parking draws inspiration from the Netherlands while incorporating Chinese operational requirements. Located in Beijing's Changping District, the multi-storey facility—the first of its kind in China—provides a seamless connection to public transport for 8,000 bikes and e-bikes. During design, project leaders undertook an extensive review of international best practices for bike parking and transit-oriented development. At its heart was Utrecht Central Station (UCS), home to the world's largest bike parking and widely regarded as the global benchmark for bike-train integration.



Designed with Dutch cycling principles in mind, Tongzhou's cycle highway provides a direct, tree-lined route through the new district.
Image: Chris Bruntlett



Bike sharing has made cycling easier to access in Beijing, particularly for trips to and from public transport.
Image: Chris Bruntlett

Chinese cities did not simply copy-and-paste Dutch solutions. Instead, they selectively adapted ideas to local conditions.

Dutch examples were referenced, particularly in areas such as management, operation and user behaviour. The UCS was studied as a leading example of how large-scale cycling infrastructure supports public transport while maintaining a high-quality user experience. Officials noted striking similarities between UCS and SMS—the former serving a regional population of about 370,000 people, while the latter is home to 300,000 residents, across a combination of university campuses, technology parks, and dense residential neighbourhoods around a major transit hub.

The SMS facility adopts many principles that made UCS famous: direct connections, intuitive wayfinding, high-capacity parking, integrated services and digital management systems. Planners specifically highlighted the ability to manage flow with precision through smart monitoring and operation. By adapting Dutch lessons to Chinese conditions, SMS has combined bikes and trains into a seamless door-to-door mobility option. If it succeeds as a replicable national model as intended, UCS' influence will ultimately be measured not just in Europe, but across hundreds of rapidly growing Chinese cities.



A bicycle-priority sign marks a street where cyclists take precedence over cars.
Image: Chris Bruntlett

Dutch Influence Beyond Infrastructure

One of the most transformative ideas of Beijing's cycling renaissance, however, wasn't imported through a formal workshop or study visit. It came through a blog. After discovering Mark Wagenbuur's BicycleDutch, a popular blog about cycling in the Netherlands, a Tsinghua University professor became a passionate advocate for the *fietsstraat*: a street where cyclists are the main users and cars are guests.

Today, that idea has spread across the city at an astonishing rate. Hundreds of kilometres of cycling-priority streets now form the backbone of the city's bike network—creating safe, comfortable routes through neighbourhoods, commercial districts, and around metro stations. This is a remarkable example of informal policy transfer: a Dutch idea, shared online, embraced by a local champion, and transformed into citywide change for millions.

By rethinking the bike itself, not as a product to own but as a service to access, Chinese cities point towards urban cycling's next evolution.

Transformative Role of Bike Sharing

The most notable difference between the Dutch and Chinese cycling stories lies in bicycle ownership. Dutch cycling remains overwhelmingly based on privately-owned bicycles, while Beijing instead pioneered the global expansion of dockless bicycle sharing.

By removing barriers associated with ownership, maintenance and storage, shared bicycles have dramatically lowered the threshold for cycling. Today approximately one million shared bikes support around one billion annual trips in Beijing, with the majority functioning as first- and last-mile links to public transport. This innovation fundamentally changed assumptions about how a cycling city can function.

By rethinking the bike itself, not as a product to own but as a service to access, Chinese cities point towards urban cycling's next evolution: where riding a bike is not just safe and convenient, but where having one of your own is no longer a pre-requisite for enjoying the many benefits it has to offer.

Scaling the National Bicycle Revival

Long regarded as China's policy laboratory, Beijing's leadership and experience now serve as a reference for other Chinese cities.

Guangzhou has rapidly expanded protected infrastructure and re-allocated road space from private vehicles. More than 500 intersections have been planned for safety upgrades, while dedicated non-motorised lanes now span nearly 2,966 km across the city. The city has also invested heavily in expanding its greenway network, with plans to grow the network to 6,000 km as part of broader efforts to support active mobility.

Similarly, Shenzhen has taken an ambitious approach, linking its cycling infrastructure with wider urban and recreational networks, building on a greenway system that now spans more than 3,400 km. Chengdu's Tianfu Greenway demonstrates how ecological planning and everyday mobility can reinforce one another: its 109 km loop forms a three-tiered, spoke-and-hub network that will ultimately span around 17,000 km, while its metropolitan Park City—featuring green and active mobility infrastructure—acts as the primary support framework.

Although each city is defined by distinct geographic, institutional and political circumstances, they share an emerging philosophy that views cycling as an essential component of liveable, inclusive and sustainable development, rather than a residual transport mode.

The Benefits of Reciprocal Learning Between Countries

The relationship between the Netherlands and China has evolved considerably over the past decade. While Dutch expertise has contributed valuable planning frameworks, institutional approaches and design principles during a critical period of policy change, China has also become a laboratory for innovations, operating at scales rarely seen elsewhere.

Dockless bike sharing, app-based mobility platforms, integrated digital management and multimodal bicycle ecosystems have demonstrated possibilities many Dutch cities are only beginning to explore. Even as the Netherlands continues to lead in infrastructure and culture, China has shown that shared mobility can dramatically reduce the need for private bicycle ownership while enhancing access to and utilisation of scarce urban space.

Furthermore, China's rapid adoption of the e-bike—with a national fleet exceeding 350 million—offers valuable lessons in regulating and designing for light electric mobility. As Dutch cities grapple with the growing prevalence of e-bikes and fatbikes, this shared policy challenge presents a promising avenue for comparative research and bilateral knowledge exchange. Instead of a one-way transfer of expertise, future collaboration could offer opportunities for both countries to co-develop evidence-based approaches to infrastructure design, vehicle regulation and the safe integration of emerging micromobility technologies.



Bicycle parking at Shahe Metro Station connects cycling with public transport, adapting lessons from Dutch bike–train facilities to Beijing's needs.
Image: Chris Bruntlett

As Chinese cities continue refining shared-bike systems, digital mobility services and seamless public transport integration, they offer lessons that are increasingly relevant for Europe.

The Limits of Direct Knowledge Transfer

The limits of direct knowledge transfer became particularly apparent when Dutch principles encountered China's very different urban scale, density, and mobility patterns. The Netherlands' emphasis on relatively fine-grained cycling networks, cycling-priority streets and integration with public transportation provided a useful starting point, but these ideas often required substantial adaptation to accommodate much larger travel volumes, higher-density development, and the widespread use of shared bikes and e-bikes.

At SMS, Dutch-style bike–train integration was not simply reproduced: principles of directness, wayfinding and high-capacity parking were combined with smart monitoring and digital management suited to Chinese operational conditions. Likewise, Tongzhou proved Dutch design principles could guide the project, but needed to be translated into a new-build district with different spatial dimensions and expectations.

The lesson, therefore, was not to reproduce Dutch infrastructure literally, but to understand the principles behind it and reinterpret them in ways that respond to local needs, institutions, and patterns of travel.

No Longer a Simple Export

The revival of cycling in China should not be understood as the simple export of a Dutch model. Rather, it reflects an evolving partnership in which international experience has been successfully translated through many factors—including strong political leadership and governance, local champions who can drive change, sufficient institutional capacity to translate knowledge into action, a willingness to adapt proven approaches to local contexts, and integrating cycling within the wider transport system and mobility strategy.

Critically, the knowledge flow is no longer one way. As Chinese cities continue refining shared-bike systems, digital mobility services and seamless public transport integration, they offer lessons that are increasingly relevant for Europe. Dutch cities—despite their world-leading cycling rates—face growing challenges around parking, ownership saturation, growing e-bike usage and station capacity. Adapting elements of China's model could help address these pressures while complementing, rather than replacing, existing culture.

The future of sustainable mobility therefore lies not in one country copying from another, but in continued collaboration between two bicycle kingdoms that now have much to teach each other.

[1] Published by non-profit agency CROW in the Netherlands, the CROW Design Manual for Bicycle Traffic is the most influential bicycle transportation planning guide—outlining strategies and best practices for assessing, implementing and managing bicycle infrastructure.

CROSS-DOMAIN PLANNING



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Beyond Movement: Rethinking Mobility Through a Cross-Domain Lens



Walking and cycling influence more than how people move through a city. They can support healthier lifestyles, strengthen social connections and contribute to more vibrant public spaces.
Image: National Parks Board

Mobility interventions can shape outcomes far beyond transport, from health and environmental quality to public life and economic vitality. A cross-domain approach can help cities make these wider effects, co-benefits and trade-offs more visible—and use them to inform more integrated planning and decision-making.

Urban challenges are increasingly interconnected, with their causes and consequences spanning multiple domains. Climate change intersects with public health; ageing populations with accessibility and mobility; environmental quality with housing, economic activity and neighbourhood liveability. Decisions taken in one part of the urban system can have consequences—intended or otherwise—across several others.

This makes many of today's urban challenges difficult to address through a single-sector lens. Understanding these interactions is becoming increasingly important for cities seeking to improve liveability as a whole, rather than address individual outcomes in isolation. Mobility provides a particularly useful starting point for examining this shift.

Mobility has always been fundamental to how cities work. It connects people to jobs, schools, services and one another, and enables people and goods to move efficiently through urban areas. But its role is increasingly understood to extend well beyond movement.

A street is not simply a corridor for movement: it is also public space, environmental infrastructure, a setting for social interaction and part of a neighbourhood economy. Walking, cycling and public transport contribute not only to mobility objectives, but also to cleaner air, healthier communities, more inclusive public spaces and more vibrant neighbourhoods.

As the role of mobility expands beyond movement, how can cities better understand and communicate the wider value of sustainable mobility interventions?

This was the starting point for *Creating Liveable Cities: A Cross-Domain Approach to Sustainable Mobility*—CLC's research collaboration with Barcelona-based Center for Innovation in Transport (CENIT), a unit specialising in urban transport and mobility solutions, under the International Centre for Numerical Methods in Engineering (CIMNE). The cross-domain framework developed as part of the research starts from a simple premise: interventions in one area can generate co-benefits, trade-offs and ripple effects across social, economic, environmental and health domains.

Its value is not in resolving every relationship or calculating a single score but in structuring complexity: making connections, gaps, assumptions and potential tensions sufficiently visible for practitioners to examine them more deliberately.

Seeing the Whole Picture

Cities already measure many aspects of mobility and urban performance—including travel time, congestion, accessibility, emissions, air quality, safety, public space use and economic activity—which can provide valuable evidence about how a place or intervention is performing. The challenge is not an absence of evidence, but its fragmentation: cities often measure these impacts individually, but struggle to understand what they mean together for the people and places affected.

Consider a relatively simple intervention to reduce through traffic on a neighbourhood street. Fewer vehicles may improve road safety and reduce noise and air pollution. A calmer street may encourage walking and cycling. If road space is subsequently reallocated, it may make room for seating, play or greenery—giving people more reason to spend time outside, which can, in turn, support local businesses.

Each effect tells us something about how the street is performing, but considered together, they show how the interventions can influence neighbourhood liveability beyond transport performance. However, the effects may not all be beneficial—improvements in one dimension of liveability can create pressures in another, underscoring the need to consider co-benefits and trade-offs together.

This is why simply measuring more indicators is not enough. The challenge is to bring evidence from different domains together and connect it to the outcomes a city has set out to achieve.

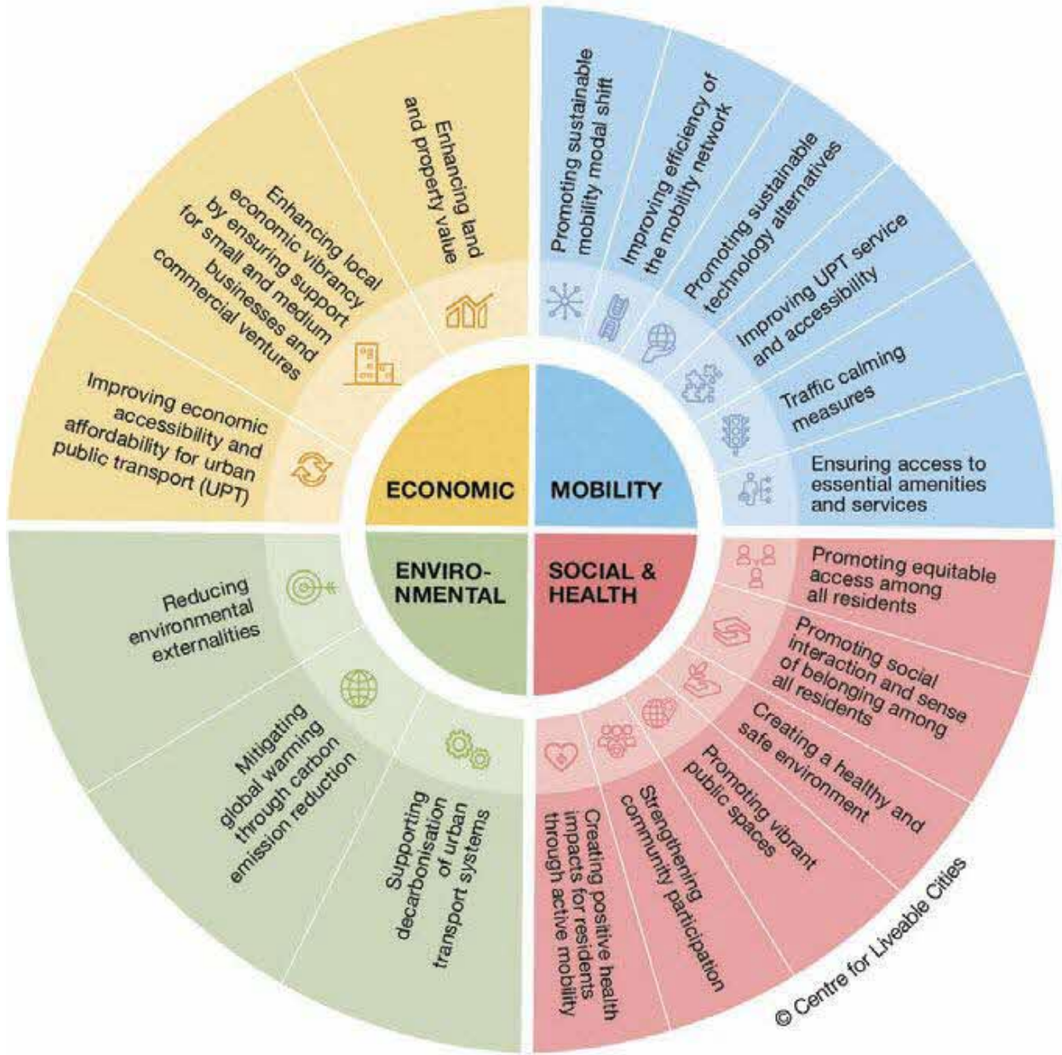
A Cross-Domain Lens

The cross-domain framework offers a way to bring different dimensions into a common view. It examines how sustainable mobility initiatives can affect liveability across four interconnected domains: mobility, environmental, social and health, and economic. Each domain encompasses more specific outcomes, indicators and metrics that can be adapted to an intervention's scale, context, priorities and available evidence.

The aim is not to measure everything or reduce different dimensions of liveability to a single score, but to provide a structured way to retain a multidimensional view of performance. Rather than viewing an intervention primarily through the sector that delivers it, the framework encourages cities to consider:

- What does the intervention aim to achieve?
- How do the intervention outcomes extend across different dimensions of liveability?
- How can evidence and priorities be brought together to inform planning and decision-making?

Its value is not in resolving every relationship or calculating a single score, but in structuring complexity: making connections, gaps, assumptions and potential tensions sufficiently visible for practitioners to examine them more deliberately.



The cross-domain framework representing potential desired outcomes from sustainable mobility initiatives across the four pillars.
Image: Centre for Liveable Cities

Interpreting Superblocks Through a Cross-Domain Lens

As part of CLC's research collaboration with CENIT, the framework was applied to Barcelona's Superblocks to explore what a cross-domain approach could reveal in practice.

The Superblocks rethink the role of neighbourhood streets by reducing through traffic and reclaiming road space for walking, cycling, greenery and public life. They combine interventions ranging from traffic management and access restrictions to street space reallocation, public space activation, greening and active mobility infrastructure.

Viewed through the cross-domain framework, these interventions can be mapped against the wider outcomes they may influence beyond mobility.

Considering these interventions together reveals several insights that can inform planning and decision-making.

1. One Intervention Can Support Multiple Outcomes
An intervention introduced for one purpose can generate multiple outcomes across several dimensions of liveability. For example, reallocating road space to walking and cycling can improve mobility and safety while also reducing traffic-related emissions and noise, supporting physical activity and creating opportunities for more vibrant public spaces.

Seeing these connections broadens how cities understand the value of an intervention. The same measure may be relevant to mobility, environment, health and planning objectives, even where those outcomes sit beyond the immediate scope of the agency delivering it. Bringing them into a common view can support a more integrated conversation about what success looks like.



A cross-domain view of Barcelona's Superblocks shows benefits reaching well beyond mobility—into health, social connection and public life.
Image: Ajuntament de Barcelona

Interventions	Mobility			Environmental		Social & Health		Economic	
	Reduced vehicular traffic	Sustainable mobility modal shift	Improved road safety	Improved air quality	Reduced noise pollution	Vibrant public spaces	Improved public health outcomes	Local economic vibrancy	Neighbourhood affordability
BASIC **Traffic management & access restrictions** Modal filters, one-way systems, speed limits, signage, bollards	●	●	●	●	●	●	●	?	?
BASIC / STRUCTURAL **Street space reallocation** Parking removal, footpath widening, raised platforms, public space	●	●	●	●	●	●	●	●	●
TACTICAL **Public space activation** Furniture, seating, play equipment, street paint, planters, programming	—	?	●	—	●	●	●	●	●
STRUCTURAL **Street tree planting / greening** Tree canopy, green corridors, planted medians	—	●	—	?	—	●	●	—	?
STRUCTURAL **Active mobility infrastructure** Protected cycling lanes, pedestrian footpath upgrades, crossings	●	●	●	●	●	●	●	●	?

LEGEND ● Strong positive ● Positive — No material impact ● Negative ● Strong negative ? Uncertain / insufficient evidence

How different interventions within Barcelona's Superblocks may influence outcomes across the four domains, based on published evidence.
Image: Centre for Liveable Cities

> Looking across domains also draws attention to effects that might be missed when an intervention is assessed only against its domain objectives.

The aim is not for every intervention to perform equally across every domain, but to understand its wider contribution in relation to the outcomes a city has prioritised.

2. Cross-Domain Thinking Can Reveal Tensions and Trade-offs
Looking across domains also draws attention to effects that might be missed when an intervention is assessed only against its domain objectives.

A street transformation may make a neighbourhood safer and more attractive, and encourage more walking, cycling and social interaction, but also contribute to greater demand for the area, placing pressure on housing or commercial affordability.

Making these interactions visible prompts a different set of questions: Who benefits? Who may bear unintended costs? What complementary measures may be needed to balance trade-offs, and what should be monitored as the intervention evolves?

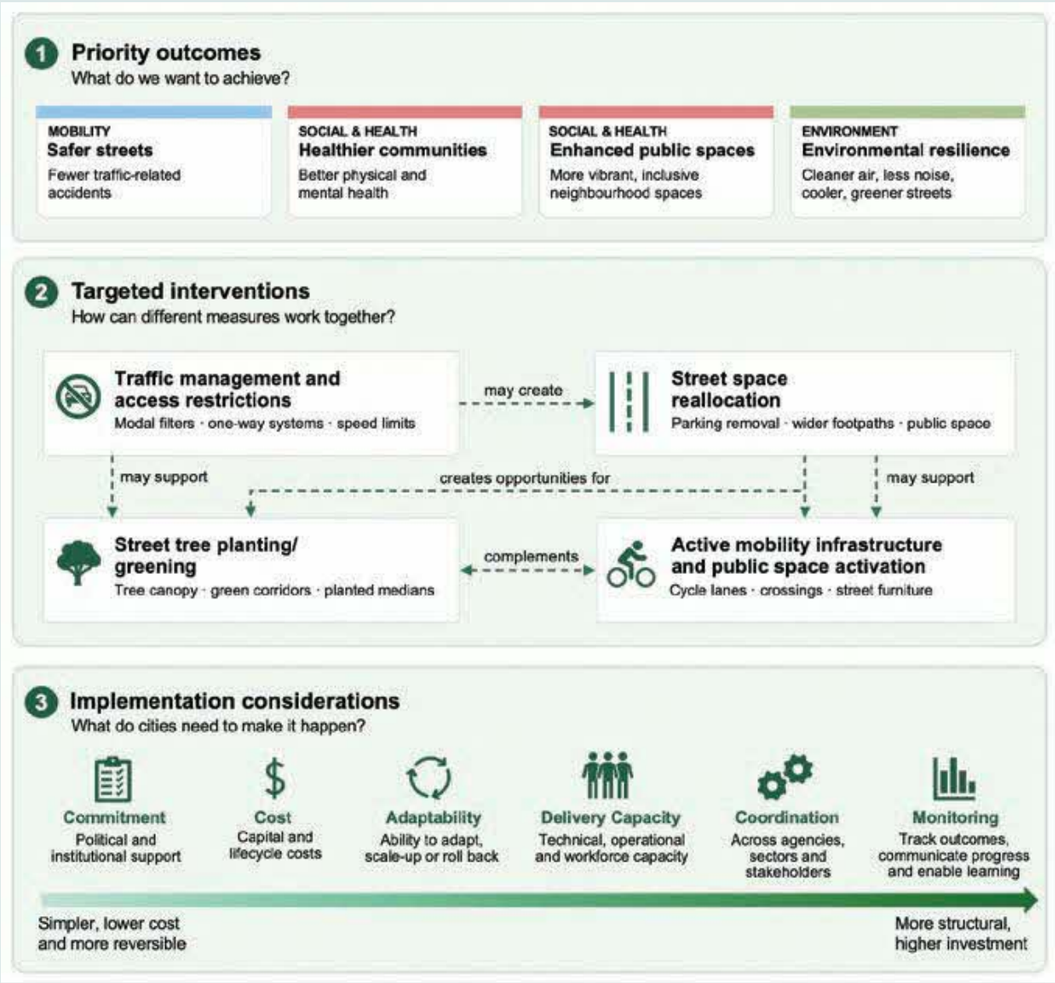
These questions can also bring housing, equity and other considerations into a decision that might otherwise be framed primarily around mobility.

3. Some Interventions Work Better Together

A cross-domain view can help cities consider interventions not only as individual measures, but as parts of a wider strategy. Different interventions may play different roles: one may create the conditions for change, while another builds on those conditions to extend the benefits across other dimensions of liveability.

For example, traffic management can reduce through traffic and create opportunities for street space to be used differently. Reallocating that space for active mobility infrastructure and public spaces gives people more reason to walk or cycle and spend time outside—supporting sustainable mobility as well as everyday social interaction.

Individually, these interventions serve different purposes. But together, they can achieve multiple outcomes.



Starting from priority outcomes, cities can identify interventions that work together as a strategy, then weigh the commitment, cost, adaptability, delivery capacity, coordination and monitoring involved.
Image: Centre for Liveable Cities

Looking across these relationships can help planners identify how different measures might work together, where they may be complementary and where gaps remain in the wider strategy.

4. Outcomes Need to Be Tracked Over Time

The outcomes of an intervention may not all be immediately visible. Travel behaviour may change gradually, people and businesses may adapt to new street conditions, and wider social or economic effects may emerge only over time.

Longitudinal monitoring can help cities understand these changing relationships rather than relying on a single before-and-after assessment. By revisiting outcomes as evidence accumulates, cities can identify emerging co-benefits or trade-offs and adjust interventions where needed.

From Cross-Domain Insights to Implementation

Considering interventions as part of a wider strategy also raises a practical question: cities may see value in several complementary measures, but may have limited resources or implementation capacity. Given these constraints, how should cities decide what to implement, and at what level of commitment?

Interventions vary not only in the outcomes they may influence, but also in the funding, delivery capacity and coordination required to implement them. They can range from simpler, lower-cost and more readily reversible measures, through tactical interventions involving greater physical change and delivery effort, to more structural interventions requiring substantial investment and coordination.

Considering implementation levels alongside cross-domain outcomes can help cities structure discussions about where to begin, which measures may need to be considered together and where more substantial intervention is warranted. These choices will also depend on enabling conditions such as institutional coordination, stakeholder support, delivery capacity and ongoing monitoring.

Towards Outcomes-Based Planning

Making cross-domain relationships clearer does not remove the complexity of decision-making or prescribe a universal answer, but helps make enough of that complexity visible to support better decision-making.

Instead of beginning only with which interventions should be implemented, cities can ask questions such as:

- What outcomes are we trying to achieve?
- Which interventions need to be considered together to support them?
- What do we know so far?
- What should we monitor?

Used early and iteratively, the framework offers a shared language for revisiting these questions as evidence, priorities and conditions change. By bringing cross-domain outcomes into the same conversation, it can broaden how the value of an intervention is understood and what counts as success.

As urban challenges become increasingly interconnected, this represents a shift from viewing interventions primarily through individual projects or sectors towards considering how they contribute to the wider outcomes cities seek to achieve.

That means asking not only how well an intervention performs, but how it contributes to making the city more liveable—and for whom.

For more details on the cross-domain framework and its application, visit the CLC Knowledge Hub or *https://go.gov.sg/clcbook-sustainablemobility*.

LEE KUAN YEW WORLD CITY PRIZE Network
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Beyond Leadership: Vienna's Approach to Lasting Mobility Reform

Vienna's interconnected reforms in public transport, parking and street design have helped shift everyday mobility away from private cars while reclaiming streets for public life. The city's experience shows how public engagement, community action and institutional support can help mobility reforms endure and scale.





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Mariahilfer Strasse was transformed from a car-dominated shopping street into a pedestrian-friendly corridor with space for walking, greenery and outdoor life.
Image: © Mobilitaetsagentur/Fuerthner

The Vision: A City of Liveable, Connected Neighbourhoods

It takes vision and leadership to embark on the long, and at times turbulent journey towards transforming urban mobility at scale. Yet getting started does not necessarily lead to successful, lasting change. Transitions often go hand in hand with controversy, and projects may fail or backfire. Drawing from Vienna's experience with three iconic projects, this article examines the factors that allow ambitious reforms to endure.

Facing and benefiting from rapid population growth, Vienna adopted a polycentric development approach aimed at creating a thriving, liveable centre in every neighbourhood and connecting these centres by public transport, cycling networks and shaded pedestrian walkways.

Defining a liveable city as one that is good for children—and taking child- and family-friendly urban design as a starting point—inevitably leads to rethinking the street as a place for community life. This means understanding urban space as a limited resource and reallocating space occupied by parked cars to placemaking, outdoor activities, children's play and urban greenery.

A city of connected neighbourhoods calls for a people-centred approach to urban mobility: identifying public transport as the city's backbone and key enabler, while putting walking at the heart of its mobility strategy as both a means and an end, and a powerful indicator of lasting success.

The three projects discussed here form interrelated parts of the same strategy: to shift everyday mobility away from private car use towards public transport and walking, while reclaiming scarce street space for neighbourhood life. Expanding parking space management to the outer districts, combined with a significant reduction in the price of the annual public transport pass, provided incentives for commuters to switch from private cars to public transport—thus freeing street space formerly occupied by parked cars. Redesigning Mariahilfer Strasse as a pedestrian zone demonstrated how reclaimed space could enhance urban life.

Three Reforms, One Strategy

1. **Redesigning Mariahilfer Strasse**
Mariahilfer Strasse, one of central Europe's longest and most emblematic shopping streets, was transformed between 2012 and 2014 into one of Vienna's most beloved boulevards for strolling and enjoying outdoor life. Previously, 45,000 pedestrians crowded the pavements daily, while up to 12,000 cars occupied three-quarters of the entire space.

A central stretch of approximately 500 m was pedestrianised, with two equally long stretches at either end transformed into shared spaces. Together, they created a 1.5 km green, shaded and walkable corridor connecting the outer districts with the city centre and improving quality of life in the adjoining high-density districts of Neubau and Mariahilf.

Although initially highly contested, the redesign was acknowledged as a success, attracting well over 60,000 users daily. It became a reference project for street transformation, leading to numerous street redesign and placemaking projects throughout Vienna and beyond Austria.

2. **The €365 Annual Public Transport Pass**
Vienna's decision to reduce the annual public transport pass to €365, allowing unlimited travel for the equivalent of €1 a day, proved to be more than a pricing measure. Introduced in early 2012, it was associated with a major shift in Vienna's modal split: public transport's share of daily journeys rose to 39%, alongside increased walking and cycling, while private car use fell by 6% to 27% that year.

In subsequent years, sales exceeded 900,000 annual passes, with students and young people eligible for even lower fares. More than half of Vienna's population used the annual pass for everyday travel. The measure contributed to improved air quality and lower carbon emissions, while boosting ridership and fostering a sense of pride in public transport.

Originally contested by the public transport company and experts who feared significant losses in ticket revenue and argued that ridership depended more on convenience than price, the €365 annual ticket broke expectations and records. Within three years, the original gap in sales revenue was refinanced through additional ticket sales, particularly in the suburban and sub-rural parts of the metropolitan area.



Vienna's €365 annual public transport pass complemented wider reforms in parking management and street redesign, helping create conditions for more sustainable everyday travel.
Image: Jorge Láscar / Wikimedia Commons

> One swallow does not make a summer. Lasting transformation requires an entire portfolio of interconnected actions that reinforce one another and deliver visible progress.

The fare remained in place for 14 years, until it was raised in January 2026. Dramatic increases in ridership also led to an ambitious but costly infrastructure development plan, including extensions and a new metro line.

3. **Parking Management Reform**
The most unpopular of all measures in Vienna's mobility strategy was undoubtedly the parking space management reform. Although it had been in place in downtown Vienna since the 1990s, proposals to extend operating hours, raise prices slightly and expand regulated parking to the outer districts drew strong opposition from residents, the chamber of commerce and opposition parties.

By 2010, daily congestion along major transport corridors, combined with overparked streets particularly in the outer districts—much of it caused by commuter cars from neighbouring countries—made additional steering measures unavoidable. After congestion pricing was rejected in a city-wide referendum, Vienna turned to an established and tested alternative: parking space management.

Implemented in 2011, the reforms had an immediate effect. They freed the streets from commuter parking, making space available for placemaking and traffic-calming projects, and reduced congestion along major corridors. Public opinion subsequently shifted after implementation, and calls to expand further into unmanaged areas resulted in positive local referenda several years later. As revenue from parking space management is legally required to be spent on mobility-related measures, it also indirectly cross-subsidised the €365 annual public transport pass.

Takeaways from Vienna's Mobility Reforms

One swallow does not make a summer. Lasting transformation requires an entire portfolio of interconnected actions that reinforce one another and deliver visible progress. All three projects served the same purpose: making limited street space available for quality-of-life improvements by boosting walking and public transport, while reducing private car use and parking.

The interaction between the €365 pass and parking management reforms illustrates this approach. Parking regulation both discouraged private car use and generated revenue that could support lower public transport fares. More broadly, Vienna's experience suggests that steering measures which both reduce car dependence and generate revenue can reinforce the wider sustainable mobility strategy.

Takeaway 1: Listening, Responding and Designing Around Tangible Needs
Throughout the planning and design of Mariahilfer Strasse, opponents claimed that the project would create a barrier and draw traffic congestion into adjoining residential areas. In response, traffic management plans were developed to ensure wide-scale traffic-calming across surrounding neighbourhoods, and relevant information was shared regularly with the public.

The design focused on identifying and maintaining all user groups, uses and functions the street already served, while adding new possibilities and attractions. A Functional Social Spatial Analysis (FSSA) combined intensive on-site observation, interviews with different user groups, data collection and the mapping of uses,



Through the Grätzl-Oase programme, residents can reclaim parking spaces for neighbourhood uses, such as seating, play and social activities.
Image: © MA 18/ Christian Fürthner

conflicts and opportunities to inform the planning process. Citizen engagement conducted on site over several weeks informed the design competition brief, while a representative citizens' jury helped select the final scheme. The resulting design introduced seating, daybeds, play facilities and water tables, giving the reclaimed space tangible new uses.

Takeaway 2: Focusing on Alliances
Stakeholder management around Mariahilfer Strasse originally focused on handling active opposition, which consumed resources without meaningfully reducing controversy. Refocusing efforts towards forging alliances and actively engaging supporters—most notably major retailers, real estate interests and young resident families—initiated a significant shift in public opinion.

The efforts were collaborative: visibly designed, but also communicated, promoted and defended together. Engagement with the real estate sector became the starting point for a long-term collaboration that resulted in numerous jointly planned and co-financed shared-space projects in downtown Vienna.

Takeaway 3: Convincing by Experiencing
Allowing local communities to experience the benefits of change requires the willingness to withstand initial opposition, but it can lead to a later shift in public opinion. Using available space as soon as possible after measures free streets from parked cars is essential: empty urban space is not in itself experienced as a benefit. Benefits arise from placemaking, children's play, outdoor seating, greening and other uses that foster a different sense of public space ownership.

Mariahilfer Strasse Neu became a recognisable brand and reference project, demonstrating the benefits of well-designed street transformation. Over the following decade, transformation spread to adjoining streets and inspired projects throughout the city, increasingly as bottom-up requests from local communities rather than top-down decisions by the administration.

Takeaway 4: Supporting Community-Driven Action
Controversial public discourse also prompted local communities to initiate small-scale transformation projects, which at times encountered legal barriers or administrative resistance. Recognising locally active groups as agents of change, the city introduced mechanisms to enable and support community-driven action.

This led to the development of a prototype contract for the use of public space, enabling initiatives such as parklets in parking spaces, as well as a small community grants scheme. Since 2015, Grätzl-Oase has supported more than 1,000 community-driven projects across Vienna's neighbourhoods—helping to shape a lasting "1,000 needles" strategy, inspiring the heat mitigation Cool Streets programme, and other municipal initiatives. Crucial to its success was the scheme's institutionalisation: the scheme is managed by the non-government organisation, Local Agenda 21, with regular submission periods, transparent rules and a jury for project selection.

Takeaway 5: Designing Fare Reform for the Long Term
Prices matter, but Vienna's experience with the €365 annual pass shows that fare reductions work best where public transport is already well developed, dense and convenient. Low fares alone are unlikely to deliver the expected results where service intervals exceed a maximum of around 15 minutes.

Cities must also account for the real costs which may include not only the direct costs of reducing fares, but also the additional infrastructure investment required to accommodate higher ridership and the difference between actual revenue and what would have been generated had fares been regularly indexed. Transparent accounting can support the measure's long-term viability and help prevent financial backlash.

Creating and branding an iconic fare also requires planning for the exit: how long fares will remain stable, when and why prices may eventually be raised, and how that change will be communicated. Otherwise, abandoning a highly popular brand may prove almost impossible.

Behind the Scenes: Institutionalising and Scaling Change

Several overarching principles have proved essential in the institutionalisation, acceleration and upscaling of successful projects and measures.

Policy Meets Tactics and Operations. Creating street typologies based on the suitability of different traffic-calming, walkability or placemaking interventions, and categorising Viennese streets to produce ready-to-use guidelines, allowed most maintenance projects to become opportunities for transformation.

Cross-Disciplinary Governance Structures. Cross-disciplinary teams within the administration, Urban Renewal Offices operating as city-funded non-profit organisations, and Local Agenda 21's support for community-driven action created the institutional foundation needed to sustain and scale change.

Sharing Visibility and Success. Sharing visibility and success with city staff, local stakeholders and community representatives reinforced shared ownership of successful projects and encouraged support for future projects.

Successful transitions from private car use to walking, cycling and public transport are ultimately about durability and acceleration from pilots to scale.

Nothing is more powerful or "contagious" than community-driven action. No argument on behalf of an administration will prove more convincing than what is discussed and agreed within local communities. Contested measures become the accepted urban baseline when they are visibly planned, communicated and, at times, defended together.

Lasting change extends beyond the administrations and individuals that set it in motion. It results from engaging the entire ecosystem and organising efforts that build shared commitment, which leads to perhaps the most important transition: from individual to collective leadership.

BOGOTÁ | CARE-CENTRED MOBILITY

Learning to Care: The Legacy of Bogotá's District Care System

Bogotá's District Care System reframes urban mobility around the everyday journeys of caregivers. By bringing essential services closer to neighbourhoods and linking Care Blocks with public transport, the city seeks to reduce time poverty and expand access to education, employment and care.





Claudia López became Bogotá's first female and openly LGBTQ+ Mayor in 2019, after four years as a Colombian Senator. She holds a master's degree from Columbia University in public administration and urban policy, and a PhD in Political Science from Northwestern University. A 2009 Yale World Fellow and 2004 Harvard ALI fellow, she is a board member of the WRI's Ross Center for Cities and an international consultant.

> Women devote 7.5 hours to unpaid care and domestic labour. This is a monumental contribution representing no less than 19.7% of the city's GDP and 21.4% nationally.

For generations, Latin American cities were planned with a deep blindness toward the invisible hand of care. Avenues were mapped out, buildings rose, and public policies were designed around the productive economy—all while taking for granted the silent engine that sustained life itself. That engine has had a name and a face: women.

In Bogotá, a metropolis of eight million people where over half the population is female, 1.2 million adult women—30% of all females—dedicate their entire days to washing, cooking, cleaning and caring for children, older adults or family members with disabilities. They do so without pause, without rest, and, above all, without pay.

The National Time Use Survey demonstrates that the disparity of care work is overwhelming. While men spend a daily average of 3 hours 14 minutes on household duties, women devote 7.5 hours to unpaid care and domestic labour. This is a monumental contribution representing no less than 19.7% of the city's GDP and 21.4% nationally. This disparity translates into inequality in women's lives: 70% of caregivers had completed, at most, high school education; a third did not have a single minute of free time to see a doctor or work for a wage; one in five suffered from diagnosed chronic illnesses; and, 90% belonged to the most socio-economically vulnerable strata. The burden of care has not only crushed women's life goals, it has also impoverished and drained the productivity of society as a whole.

Designing a Radical System for Eradicating Inequality

When I assumed the honour of serving as the first elected female Mayor in Bogotá's history, we understood that we had to settle this historic debt. Traditionally, the state only looked at those who required care—children, older adults, and people with disabilities. We decided to shift our gaze and introduce a radically new perspective: placing caregivers—76% of whom are women—at the very centre of our agenda. Thus was born the *Sistema Distrital del Cuidado* (SDC) or "District Care System".

The first experience of its kind in the region, the SDC was designed not as an isolated welfare programme, but a true urban revolution driven by three fundamental imperatives: to recognise, reduce and redistribute care work from the shoulders of women to all family members, and the public and the private sectors.

The power of the SDC lies in breaking down old bureaucratic silos and connecting proximate, simultaneous and intergenerational services.

To deliver local solutions effectively, SDC operates three flexible, adaptive modalities:

1. **Care Blocks:** At the structural core of the system are defined urban zones where municipal social infrastructure and public services are concentrated within a 20-minute walk of caregivers' homes. Each block features an anchor facility—such as a public school or community centre—which coordinates services across the Secretariats of Social Integration, Education, Health, Culture, Economic Inclusion and Women's Affairs. This comprehensive, simultaneous service offering has replaced facilities that once operated in silos under multiple roofs.
2. **Care Buses:** To serve remote rural areas like Sumapaz and urban neighbourhoods facing infrastructure deficits, we engineered mobile adaptations of classrooms and clinics to bring municipal services directly to caregivers. Women boarded the transformed bus to complete their education or receive legal and psychological support, while their care dependents engaged in supervised extra school education, sports, games and cultural activities in adjacent mobile units.
3. **Home Assistance:** Tailored for caregivers of home-bound individuals with severe physical or cognitive dependencies, professional care providers deliver direct, home-based assistance—including essential respite, health services, distance learning opportunities, and legal or social guidance.

> The power of the SDC lies in breaking down old bureaucratic silos and connecting proximate, simultaneous and intergenerational services.

The location and rollout of these Care Blocks were never left to chance or political improvisation. To identify the risk level of unpaid care work burdens across neighbourhoods, the Secretariat for Women created the *Índice de Priorización de Manzanas del Cuidado* (IPMC) or Care Block Prioritisation Index in 2020. This considered four crucial dimensions that were equally weighted: care demand (for children under 5 and adults over 80), caregiver density (women dedicated exclusively to domestic work and female single-parent households), multidimensional poverty levels in female-headed households, and the community's voice expressed through participatory budgeting.

The District Secretariat for Women then created a territorial ranking guided by five technical criteria: the IPMC results, public facility deficits, mobility megaprojects in Multimodal Integration Areas, projects in the Land Use Master Plan, and land availability. The data and territorial evidence gathered helped determine with rigour where the doors of each Care Block should open.

A Foundation of Care for Dignified Caregiving

Before the Care Blocks, the daily scene was heartbreaking: women caregivers would take their dependent children or relatives to a sports or medical appointment and spend two or three hours sitting on cold concrete bleachers, passively waiting for the activity to end. With SDC, we managed to get these women off those bleachers!

Now, while professional educators and sports instructors care for their loved ones, those very hours belong to the women. In the same place and at the same time, regardless of age, the women have the opportunity to finish high school, undertake technical training with Colombia's *Servicio Nacional de Aprendizaje* (SENA) or Technical Apprenticeship Service, learn entrepreneurship, or connect with formal employment. They can access healthcare, receive legal or psychological counselling if they are victims of violence, or simply swim, ride a bike or practice yoga. Some even do laundry in our free community laundromats—freeing themselves from the exhaustion of washing by hand.

Added to this physical and social transformation was a fundamental conviction: there is no dignified caregiving without mobility and urbanism designed to care.

Traditionally, urban engineering conceived public transport solely for commuter trips back and forth between periphery and formal employment. However, Bogotá's Region Mobility Survey 2023 became the first to include explicitly an analysis on care trips and gender perspective, demonstrating that the "mobility of care" operates under an entirely different logic.

Trip chaining—a complex, interconnected network of linked trips—is undertaken by caregivers to take children to daycare, accompany older adults to medical appointments, shop, and attend their own educational spaces. While women do 8% more trips than men, of which 72% are on foot or by public transportation, men use more cars and motorcycles. In an Andean metropolis like Bogotá, where poverty often settles on steep, hard-to-access slopes, topography imposes another barrier of isolation and physical exhaustion.

Therefore, linking mass transit with social infrastructure became an essential pillar. An iconic testament to this vision is the **San Cristóbal Cable Car**. Envisioned not merely as an aerial transit system but a direct artery for territorial equity, this project was designed to seamlessly connect the highest and most vulnerable neighbourhoods of the San Cristóbal locality with



From community laundries and childcare to digital training, cycling and cooking classes, Bogotá's SDC offers practical opportunities and support for caregivers and residents.
Image: Bogotá's Care System, Mayor's Office

both the Care Blocks and the mass transit trunk network, under an integrated fare.

This COP 799,000 million (USD 180 million) project allocated 53% of funds to the aerial cable, 47% for the surrounding urban and care infrastructure. The cable features three stations—which also house a Care Block, and a cultural and recreation centre—complemented by six neighbouring parks and three pedestrian circuits. Serving approximately 400,000 people, it reduces air pollution, congestion, and transit times from approximately 35 minutes to 10 minutes, a reduction of 72%.

By overcoming the mountain barrier, the San Cristóbal Cable Car drastically reduced not only travel times but also the "time poverty" of thousands of women—as hard-to-reach terrain is turned into a corridor of opportunity, safety and comprehensive well-being.

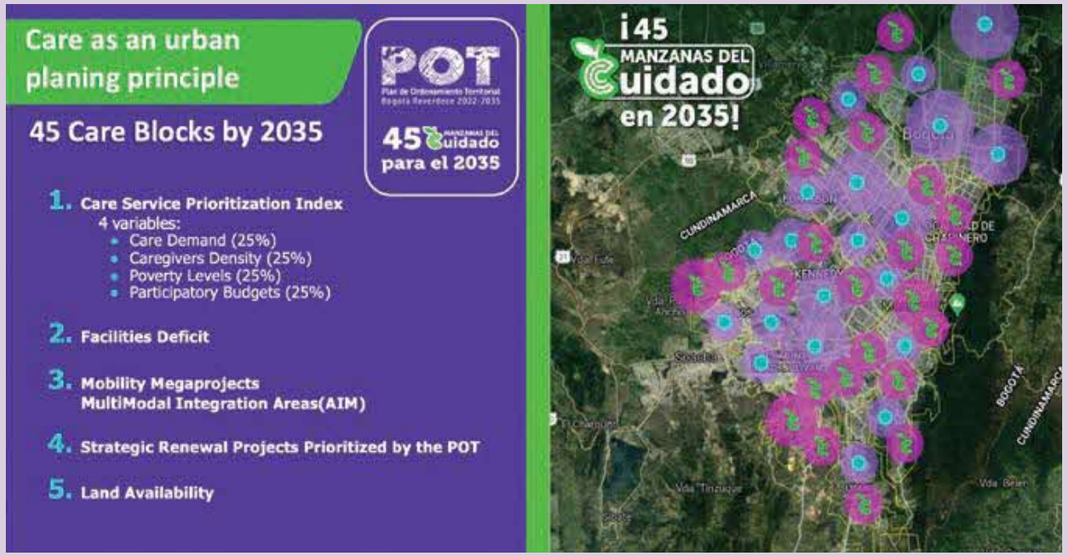
Ensuring True Sustainability

We knew that all our efforts to integrate care and mobility infrastructure and to set aside time would not be enough if we did not dismantle the cultural roots of inequality. That is why we incorporated the Learning to Care strategy, which is based on a mantra that is as simple as it is transformative: men can also learn to care.

Care, like mathematics or science, is something to be learned. We designed workshops to teach men how to cook, clean, iron, and share the co-responsibility of caring for their children and parents. It is equity's true contemporary trinity—liberty, equality and fraternity—woven into daily life.

Finally, the true sustainability of a transformative care system does not depend solely on the political will of a passing administration, but on its ability to anchor itself deeply within the city's institutions, laws, and urban planning. To guarantee that SDC endures over time and transcends future governments, we designed and implemented a three-level institutional shielding strategy:

1. **District Legal Framework:** Through District Agreement 837 of 2021, which was passed unanimously by Bogotá's City Council and championed alongside the Women's Advisory Council, we institutionalised the SDC as a legal obligation—this secures its ongoing maintenance, strengthening, and funding across the District's future administrations.
2. **Long-Term Territorial Planning:** We embedded care into the backbone of the Land Use Master Plan—for the first time in Latin American urban planning history, care was included as a structural category of spatial organisation. This guarantees that the location and construction of future public facilities respond to the needs of caregivers and care recipients, in support of the goal of implementing 45 Care Blocks—one in every Local Planning Unit—by 2035.
3. **Governance and Intersectorality:** We established the Intersectoral Commission of the SDC—led by the District Secretariat for Women and composed of 13 district-level entities. This is critical to ensuring coordinated management, cross-cutting funding and a unified service portfolio that will help address administrative fragmentation.



Bogotá's plan for 45 Care Blocks by 2035 integrates care needs, gaps in public facilities, mobility investments and land availability into long-term spatial planning.
Image: Bogotá's Care System, Mayor's Office



Manitas station, part of Bogotá's Ciudad Bolívar TransMiCable system, connects hillside communities to the wider transport network and care services within the station.
Image: Bogotá's Care System, Mayor's Office

A Collective Triumph

Not too long ago, the COVID-19 pandemic highlighted to the world the fragility of human life and the unfair distribution of domestic and care labour. In a century defined by climate, demographic and technological transitions, care policy must serve as the central bridge between socio-economic and urban agendas.

The SDC is a collective triumph of women's social movements and feminist collectives. During our administration, we put into operation more than 20 Care Blocks and 2 Care Buses—these reached over 600,000 women and their families, presenting them with new opportunities to break out of the cycle of poverty. We transformed Bogotá into a caring city—an initiative supported by UN Women and recognised in 2023 with the Guangzhou International Award for Urban Innovation.

Today, we are building a city transformed from segregation to connection—a human metropolis where caregiving is no longer a silent sentence but the very pillar upon which society thrives, leaving none behind.

SACRAMENTO | REGENERATIVE INFRASTRUCTURE

How Sacramento Valley Station Realises Its Ambition for a Regenerative Urban District

Sacramento is setting a global standard for urban development in the face of climate change, population growth, funding challenges, and constrained water and energy resources.





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> For city leaders, the question was never simply how to modernise a transit facility, but how to leverage that investment to create broader environmental, economic and social value.

Cities around the world are setting ambitious climate goals. And some are rethinking the infrastructure systems needed to deliver them. Sacramento Valley Station (SVS) demonstrates how transportation investment can become a platform for resource stewardship, community development and climate resilience. As the first ever municipality-led project to achieve the Living Community Challenge (LCC) Vision Plan certification by the International Living Future Institute, the City of Sacramento's SVS offers a practical example of how regenerative design can be embedded into the planning, engineering, funding and governance of a new urban district.

Constructed in 1926, SVS sits at the intersection of Northern California's transportation network, building upon Sacramento's historic role as the western gateway of the nation's first transcontinental railroad. The historic train station now serves as the region's primary rail gateway—connecting intercity rail, regional transit, local buses, cyclists, pedestrians and visitors arriving in California's capital city.

Located within downtown Sacramento adjacent to the rapidly transforming Railyards development district, the station area occupies one of the most strategically important pieces of urban land in the region. For city leaders, the question was never simply how to modernise a transit facility, but how to leverage that investment to create broader environmental, economic and social value.

The answer emerged through the Sacramento Valley Station Area Plan: a long-term vision that combines mobility investments, mixed-use development, public open space, ecological restoration, renewable energy and water reuse, within a single comprehensive framework. What makes the project notable is not just the City's scale of ambition, but its commitment to treating the district as a living system—where transportation, utilities, buildings and public spaces work together to generate positive outcomes, rather than merely reducing impacts.



The SVS plan's biophilic design will increase community connection to the natural environment.
Image: Steelblue for City of Sacramento / Perkins&Will

The Challenge

Across North America, transportation infrastructure has traditionally been designed around movement and capacity. Water and energy systems, housing and public spaces are typically planned independently, often managed by different agencies with occasionally opposing goals.

Although the SVS site was already functioning as a critical transportation hub connecting local residents and visitors to state and regional hubs, its operations were fragmented. Rail infrastructure historically created barriers between neighbourhoods, limiting connections between downtown Sacramento and adjacent districts.

Additionally, City officials face growing pressure to address housing demand, climate adaptation, greenhouse gas emissions and limited water resources. Like many communities, Sacramento also faces increasing environmental uncertainty. Drought conditions, rising temperatures, ageing infrastructure and state decarbonisation mandates are reshaping how cities across California think about growth and public investment.

As conventional development plans often focus on minimising environmental impacts, the City wanted to explore whether infrastructure could do more than that. Could a transportation district improve environmental conditions beyond simply reducing impacts? Could water, energy, mobility and new development be organised to support a broader regenerative system?

The project team recognised that achieving meaningful outcomes would require looking beyond individual buildings or isolated infrastructure. Instead, they would need to rethink how the entire district functions in a holistic way. Systems would need to complement one another—through multi-purpose function—to fully realise their potential to regenerate.

That ambition created a significant challenge—regenerative urbanism sounds great on paper but presents significant challenges to deliver. Public agencies must navigate funding limitations, regulatory requirements, changing political priorities and complex stakeholder relationships. Any vision would need to survive decades of implementation challenges while remaining flexible enough to adapt to evolving conditions.

The Response

To guide the project, the City of Sacramento adopted the LCC – one of the world's most ambitious community-scale sustainability frameworks.

Unlike building certification programmes that focus on individual structures, LCC evaluates entire districts based on their performance across seven categories—including place, water, energy, health and happiness, materials, equity, and beauty. The framework encourages participants to move beyond sustainability toward regeneration—a concept that seeks to restore ecological function, while strengthening social and economic outcomes.

For Sacramento, the certification process was not pursued as a sustainability accolade, but rather a framework for organising the project. Working together with planning and urban design firm Perkins&Will, Grimshaw Architects, and global built environment consulting firm Arup, the City developed a bespoke set of regenerative principles for transportation planning, utility systems, public space and ecological function. The resulting plan envisioned a district powered by renewable energy and supported by innovative water infrastructure capable of dramatically reducing dependence on conventional utility systems.

In 2021, these efforts culminated in SVS earning LCC Vision Plan certification as the first ever municipality-led project, establishing a pioneering benchmark for public agencies. This milestone established the project as an international precedent for regenerative urban planning and provides a common set of performance objectives for guiding future implementation phases. The certification also helps to align stakeholders around a vision that will take 10 to 20 years to implement. As infrastructure projects often span political cycles, funding programmes and economic downturns, a shared framework provides continuity even as individual projects evolve.

In Sacramento, the LCC framework highlighted a critical question—if the district is intended to provide ecological regeneration, how would its utility systems work? The answer became one of the project's defining innovations.



The station area will be transformed with plazas, retail, dining, office spaces, affordable housing, a hotel and community park.
Image: Steelblue for City of Sacramento / Perkins&Will

The Solution

At the heart of the SVS Area Plan is the proposed Regenerative Utility Center (RUC)—a concept that demonstrates how the project will turn regenerative theory into physical infrastructure and challenges the traditional function of municipal utility systems.

Most cities operate utility resources in a linear way—water is imported, used and discharged. Wastewater is exported elsewhere for treatment. Energy is generated offsite and delivered through large networks. Stormwater is managed as a burden to be removed as quickly as possible.

The RUC proposes something altogether different. The facility is envisioned as an integrated district-scale resource hub—housing wastewater treatment, water recycling, onsite renewables paired with high-efficiency energy management. Rather than viewing resource streams separately, the approach seeks to capture synergies among them—enabling water and energy to circulate within the development and maximising their usage.

Under the Vision Plan, wastewater generated by the buildings will be treated for non-potable reuse. Stormwater systems will support broader hydrologic and ecological functions rather than simply conveying runoff away from the site. District energy systems will support renewable energy management, enhance efficiencies and strengthen resilience from grid disruption. Collectively, these strategies are designed to help the district move toward net-positive outcomes.

What makes the concept particularly compelling is that it addresses multiple urban challenges simultaneously. For Sacramento, water resilience is increasingly important in a changing climate. Energy systems must support long-term decarbonisation objectives. New development must reduce environmental impacts while accommodating population growth. By integrating these issues into a single infrastructure strategy, the RUC creates opportunities that might not be possible through conventional utility planning.

The RUC is also intended to be visible as many of its technical functions will be showcased to residents and visitors passing through the district. Organising its compact wastewater treatment systems, recycled water storage tanks, heat exchange units and battery storage infrastructure in a transparent way will help the community understand where water and energy come from, how resources are reused, and how infrastructure can contribute to environmental stewardship.

This approach transforms infrastructure from something hidden below ground or on top of buildings into a visible expression of community values.

Perhaps the most impressive aspect of the SVS Area Plan is not the concept itself, but the strategy for delivering it. The City recognised early on that a regenerative district could not be built in a single phase.

The transformation of SVS has unfolded in three distinct phases over nearly two decades. Phase 1 included acquisition of the station property and historic building from Union Pacific and relocating the historic industrial rail infrastructure into its current configuration to support passenger rail. Phase 2 then rehabilitated the historic station and established the initial planning framework for broader district redevelopment. Work in Phase 3 includes improvements to its light rail transit system, utility infrastructure, roadway and cycle track, and the construction of a new station concourse to serve as the nexus of the SVS Area.



The Regenerative Utility Center will distribute both thermal energy and recycled water back to the development.
Image: Steelblue for City of Sacramento / Perkins&Will

For cities confronting climate change, resource constraints, ageing infrastructure and continued growth, Sacramento offers a compelling lesson. Transformative outcomes are built through sustained commitment, coordinated governance and infrastructure systems designed to work together.

All of these improvements serve to increase land value surrounding the station, making development opportunities attractive to investors.

This incremental delivery model is a defining characteristic of the project. Rather than waiting for complete funding of the entire vision, Sacramento has pursued a sequence of interconnected investments that will gradually move the district forward. Funding has, and will continue to come from multiple sources—including regional transportation measures, state funding programmes such as the Transit and Intercity Rail Capital Program, City transit initiatives, infrastructure grants, and private investment.

District-scale water systems require regulatory coordination and substantial upfront investment. The team coordinated closely with the Sacramento Utilities department to understand how the RUC will reduce reliance on the sewer conveyance network and regional wastewater plant. The RUC plan also proposes to capture and reuse heat from a major sewer main passing through the site. While supportive, the City is still learning how to permit onsite water reuse within its jurisdiction, relying upon progressive statewide standards.

Implementation of the RUC is likely to occur through a shared-use agreement between the facility operator and the new buildings it serves. The RUC's owner-operator will construct the facility based on expected wastewater, recycled water, electrical and heating demands. The building owner-operators will anticipate lower-than-conventional utility costs while realising highly efficient water and energy usage.

Utility infrastructure must remain flexible enough to accommodate uncertain future development schedules. Development of the RUC and the buildings it serves will need to be aligned in scope and schedule as they both rely on one another to realise economic viability. To help manage disparity in market conditions, the RUC systems are designed to start small and scale up as development occurs over time.

A Model for Future Cities

SVS' greatest contribution may be showing how ambitious environmental goals can be woven into the practical realities of public sector delivery. The project demonstrates the value of establishing regenerative principles early enough that they shape implementation decisions, rather than becoming aspirations layered onto projects after the fact.

For cities confronting climate change, resource constraints, ageing infrastructure and continued growth, Sacramento offers a compelling lesson. Transformative outcomes rarely emerge from a single project or funding source. They are built through sustained commitment, coordinated governance and infrastructure systems designed to work together.

The RUC remains the clearest symbol of that vision. More than a utility facility, it represents a new way of thinking about urban infrastructure—one in which energy, water, transportation, ecology and community development are treated not as separate challenges but as interconnected opportunities.

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