CREATING LIVEABLE CITIES

PRACTITIONER'S GUIDE: A CROSS-DOMAIN APPROACH TO SUSTAINABLE MOBILITY

CENTRE for LiveableCities SINGAPORE

cenit Science for Transport
An Innovation Unit of CIMNE

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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) has as its mission "to distil, create and share knowledge on liveable and sustainable cities". The CLC's work spans four main areas—Research, Capability Development, Knowledge Platforms, and Advisory. Through these activities, the CLC hopes to provide urban leaders and practitioners with the knowledge and support needed to make our cities better. For more information, please visit www.clc.gov.sg.

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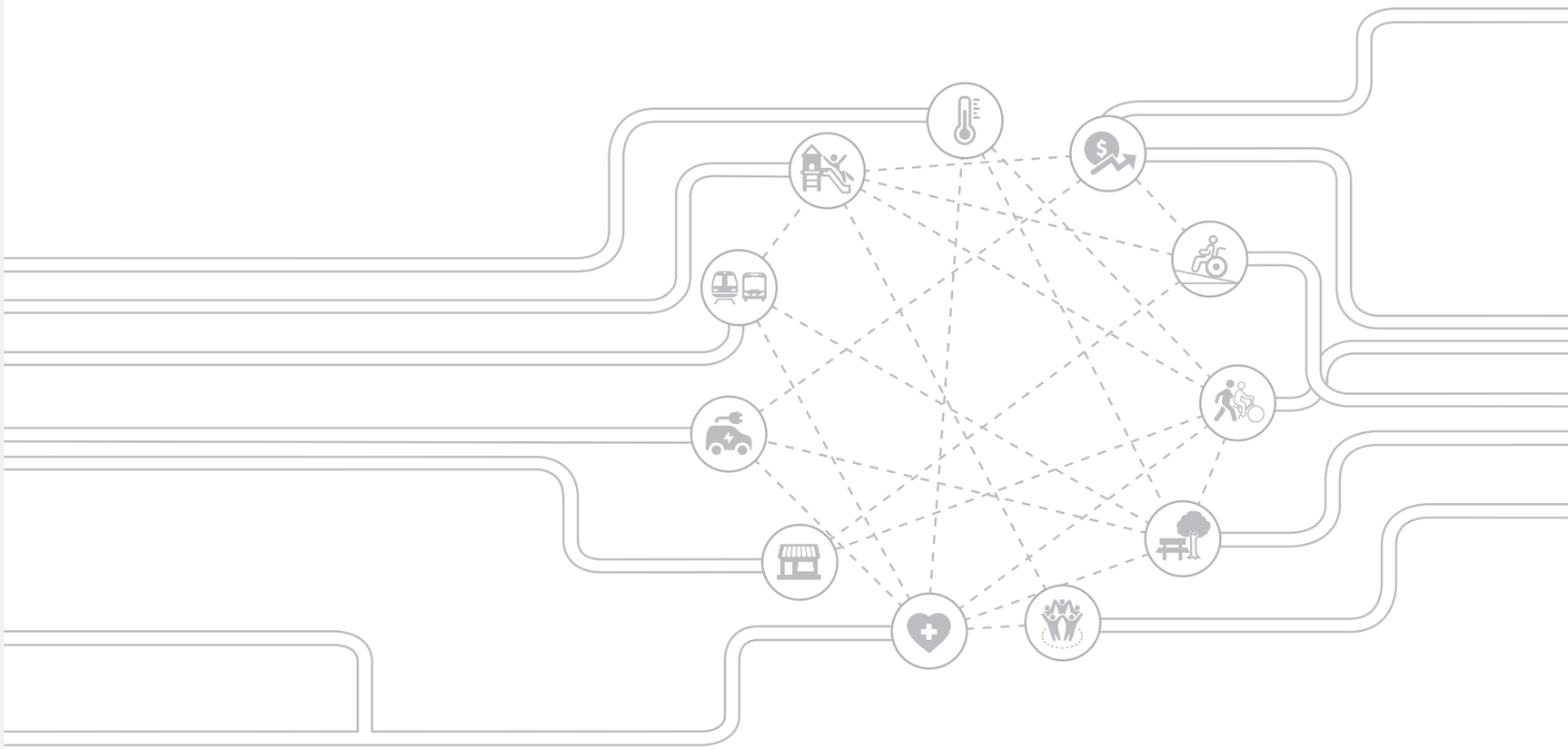


Purpose

This Practitioner's Guide accompanies the Centre for Liveable Cities (CLC) publication, ***Creating Liveable Cities: A Cross-Domain Approach to Sustainable Mobility***.

While the publication establishes the conceptual foundation for a cross-domain framework for sustainable mobility, this guide outlines its methodology and components, offering a step-by-step approach to its application. It is a practical resource intended for policymakers, planners and practitioners to:

- understand and evaluate the cross-domain impacts of mobility interventions,
- recognise how different outcomes are prioritised, and
- interpret results to inform planning and decision-making processes.

The framework can be applied across a range of policy and planning contexts where urban interventions have wider impacts on liveability—particularly in situations where decisions involve multiple objectives, such as balancing mobility performance with environmental, social and economic outcomes. Cities are encouraged to adapt the framework to their own contexts, and to refine it over time as new evidence emerges.

When to Use the Framework

The framework can be applied iteratively at different stages of the policy and project cycle, depending on the purpose of the assessment:

- **Early-stage planning** to define scope, priorities, outcomes and success criteria
- **Pre-implementation stage** to measure current performance across identified framework criteria
- **Implementation stage** to understand how an intervention is performing and identify areas for refinement
- **Post-implementation review** to evaluate outcomes, including trade-offs and co-benefits, and inform future scaling or replication

Overview of the Framework

The cross-domain framework provides a structured approach to assess how mobility interventions influence a range of cross-domain outcomes. It is organised as a hierarchical structure that links broad domain objectives to measurable outcomes by breaking them down into the following criteria:

- **pillars** that define the four core domains of impact—*mobility*, *environmental*, *social and health*, and *economic*;
- **sub-pillars** that represent key goals or intended outcomes within each pillar;
- **indicators** that are qualitative or quantitative measures used to assess progress towards these outcomes; and
- **metrics** that define how each indicator is assessed, providing specific units of measurement.

The framework organises the assessment of sustainable mobility interventions across four interconnected domains of impact, or pillars: mobility, environmental, social and health, and economic. These reflect key areas through which mobility systems shape urban liveability. The pillars are further broken down into sub-pillars which map out the desired outcomes of sustainable mobility interventions, and a set of indicators that represent the key aspects to be measured.

Indicators can be used to establish a baseline, assess expected or observed changes, and track outcomes over time. Indicators and metrics are intended to capture both outcomes (e.g., improvements in safety, emissions or economic activity) and progress towards outcomes (e.g., implementation of infrastructure or behavioural changes).

The framework does not prescribe a fixed set of indicators. Instead, practitioners are encouraged to select a context-appropriate set based on:

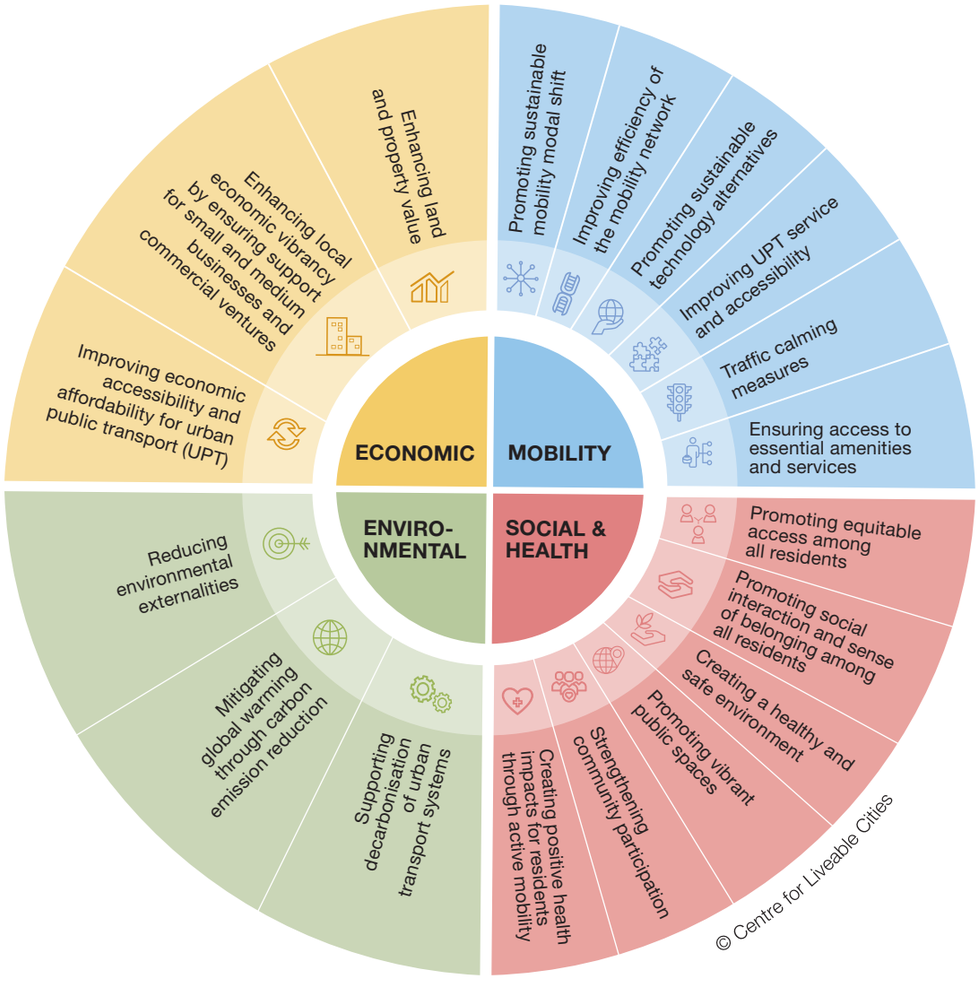
- the type and scale of intervention,
- policy objectives and priorities, and
- data availability and institutional capacity.

MOBILITY	At their foundation, sustainable mobility interventions should enhance how people and goods move through the city. This means improving accessibility, safety, travel efficiency, modal share and connectivity—with a strong emphasis on shifting towards more sustainable, active and shared modes of transport.
ENVIRONMENTAL	Transport systems have major environmental impacts, contributing significantly to greenhouse gas emissions, air pollution and noise. Sustainable mobility interventions that prioritise modes such as walking, cycling or using public transport can reduce emissions, improve air quality and support the city's broader climate goals.
SOCIAL & HEALTH	Beyond moving people, mobility shapes daily life. A cross-domain approach prioritises physical and mental health, inclusivity and community cohesion. Sustainable mobility interventions that encourage walking and cycling can increase everyday physical activity, in turn improving health. Public spaces with inclusive street design also improve accessibility for children, older adults and persons with disabilities, strengthening community interaction and quality of life.
ECONOMIC	Mobility systems influence urban productivity, commercial activity and access to employment. Sustainable mobility interventions can support vibrant street life, boost footfall to neighbourhood businesses, enhance local job access and improve vibrancy of neighbourhoods, beyond improving transport efficiency alone.

The four pillars are at the heart of what makes a city liveable, aligning with the Liveability Framework developed by the CLC.

In practice, this may involve selecting a subset of indicators across all pillars rather than attempting to assess every single metric. A combination of quantitative and qualitative indicators often provides a more complete understanding of impacts. Each indicator is supported by one or more metrics, which define how performance is measured or assessed in practice. Together, the selected indicators and metrics form the basis for assessing performance.

The results generated could be presented in the form of visual tools such as spider diagrams, charts or tables to support interpretation and communication. Over time, repeated application of the framework can help in tracking how outcomes evolve, enabling cities to monitor progress and refine interventions where needed. Instead of reducing outcomes to a single composite score, the framework captures a multi-dimensional view of impacts.



Pillars and sub-pillars representing potential desired outcomes from sustainable mobility initiatives across the four pillars.

The Role of MCA in the Framework

To reflect the multi-dimensional nature of sustainable mobility initiatives, the framework adopts a Multi-Criteria Analysis (MCA) approach—a structured methodology designed to evaluate multiple, competing objectives against a set of defined criteria.

MCA provides a systematic way to bring diverse dimensions into a common evaluative structure, enabling the assessment of an intervention across the framework's pillars, sub-pillars and indicators. This makes it particularly suited to complex policy and planning contexts where impacts cross domains and are not easily comparable, complementing existing assessment tools such as cost-benefit analysis.

As policy challenges have become increasingly cross-disciplinary, decision-making processes have evolved to incorporate a wider range of perspectives beyond technical analysis alone. This shift reflects the growing recognition that urban outcomes are shaped by diverse stakeholder priorities, local contexts and value systems.

MCA is particularly well suited to such contexts. By structuring evaluation around clearly defined pillars, sub-pillars and indicators, it provides a common framework through which different outcomes can be assessed in a consistent and transparent manner.

In practice, the framework is applied by practitioners, with flexibility in how stakeholder input is incorporated. MCA can be used in practitioner-led assessments, where priorities and weights are determined internally based on policy objectives, available evidence and professional judgement.[1] In such cases, the approach supports the systematic organisation of complex information and making underlying assumptions explicit.

Where stakeholder perspectives are included, the same structure provides a clear basis for engagement—allowing different priorities to be articulated, compared and discussed. This helps to surface areas of alignment, divergence and uncertainty, and supports more informed dialogue across sectors and disciplines.

Taken together, MCA can be understood as operating along a spectrum—from practitioner-led applications to more participatory approaches. While participation can strengthen the legitimacy and inclusiveness of decision making, the core value of MCA lies in its ability to structure complexity, organise evidence and make priorities explicit across all contexts.[2]

[1] Marco Dean, "Including multiple perspectives in participatory multi-criteria analysis: A framework for investigation", *Evaluation* 28.4 (2022): 505–539, https://doi.org/10.1177/13563890221123822.

[2] Ibid.

How to Use the Framework

The framework combines quantitative and qualitative evidence to support a more holistic understanding of how mobility interventions perform across domains. In practice, it works through the following steps:

- establishing priorities,
- assessing performance and
- interpreting results.

First, practitioners establish priorities across the framework's pillars and sub-pillars, using structured comparison methods to produce a set of weightings that reflect the objectives of the intervention. These weightings are then applied to assess performance across selected indicators and metrics. Finally, results are interpreted against established priorities helping to surface trade-offs, co-benefits and areas for refinement.

Each step is supported by a dedicated tool, described below.

TOOLS SUPPORTING THE FRAMEWORK

The framework is supported by a set of tools that help structure assessment, prioritisation and interpretation of results. These tools can be adapted to suit different intervention types, scales and contexts.

Prioritisation Tool: The Prioritisation Tool establishes the relative importance of outcomes across the framework's pillars and sub-pillars in relation to the objectives of the intervention. It uses structured comparison methods, such as pairwise comparison, where stakeholders assess the relative importance of one criterion against another.

Through this process, decision makers compare two criteria at a time, starting with the pillars and then the sub-pillars. For example, they consider whether pillar A is more or less important than pillar B, and by how much. The process is then repeated across the sub-pillars, producing a set of weightings that reflect the priorities of the specific context.

This pairwise comparison allows relative priorities to be established in a consistent and transparent manner. While this process may involve trade-offs, it helps to make them explicit and can reveal how prioritising certain outcomes may deliver broader cross-domain benefits that are often under-recognised by existing assessment tools.

PILLARS		Which of the two pillars is more aligned with the goals of the project?	How much more important is it? (1-9)
A	B		
Economic	Environmental	B	7
	Social and Health	B	8
	Mobility	B	7

Example of a pairwise comparison of pillars using the Prioritisation Tool.

The output is a set of weightings that reflect the priorities of the intervention. These weightings are then applied in the assessment process to ensure that results are aligned with stakeholder values and policy objectives.

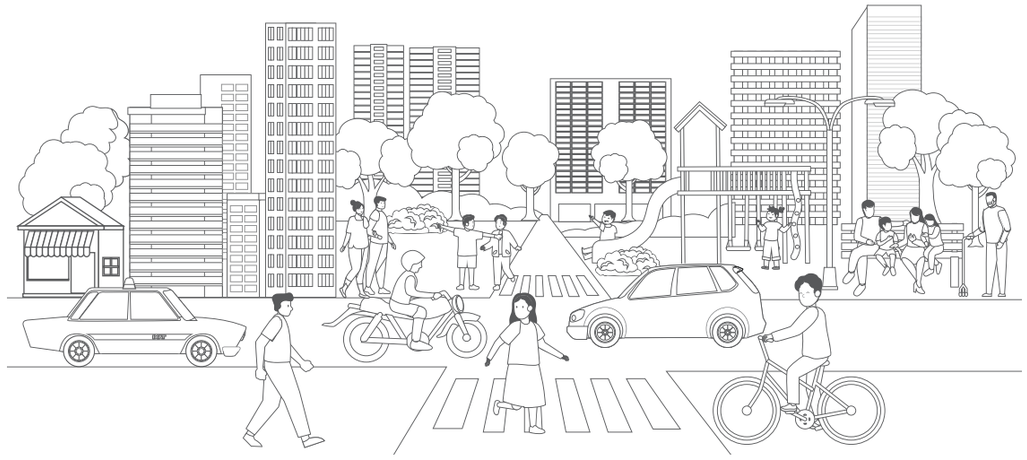
Self-Assessment Tool: The Self-Assessment Tool evaluates performance across selected indicators. It brings together quantitative and qualitative inputs to assess how the intervention performs against defined metrics and benchmarks. It generates a set of scores across metrics, which can be aggregated to show relative strengths and weaknesses across pillars.

Reference Manual: The Reference Manual provides detailed definitions, benchmarks and measurement approaches for each indicator and metric. The list is non-exhaustive and serves as a reference for key outcomes to be measured. The scoring benchmarks are derived from a mix of local, regional and international standards, and should be assessed to ensure they are appropriate for your project's context and local conditions. It supports consistent application of the framework by ensuring that indicators are clearly defined and assessed in a comparable way.

Refer to the Annex for the Reference Manual.

Indicators, Metrics and Cross-Domain Mapping

The indicators and metrics are distilled to support the cross-domain evaluation of sustainable mobility initiatives by mapping them across the pillars.



MOBILITY

Indicator	Metric	Outcome	Mapping		
		●	●	●	●
Walkability	Proportion of pedestrian zones that are barrier- and obstacle-free	●	●		●
	Proportion of pedestrian lanes over total road network		●	●	●
	Proportion of covered sidewalks (tree canopies or overhanging roofs)		●	●	●
	Average width of sidewalk		●		●
	Ease of crossing (presence of safe and direct crossing or pedestrian right-of-way)		●		●
Modal share of active mobility modes and shared transport	Active mobility modal share	●	●	●	●
	Shared transport modal share		●	●	
Modal share of public transport	Public transport modal share	●	●	●	●
	Number of private motorised vehicles per 1,000 residents registered within the area	●	●	●	
Provision of mobility hubs	Number of transport modes within a mobility hub	●	●	●	●
	Number of transport-related amenities and services within a transport hub	●	●	●	●
	Number of non-transport related amenities and services within a transport hub	●	●	●	●
Ease of intermodal integration	Average transfer time between modes	●	●		●
Bicycle priority	Proportion of bicycle lanes within the total road network		●	●	●
Bus priority	Proportion of bus priority lanes within the total road network		●	●	
Efficiency of PT buses	Average speed of urban buses		●		
Level of congestion	Average congestion hours on/near the area per day	●	●	●	●
Public charging points for electric vehicles (EVs)	Ratio of public charging points (PCPs) per EV		●	●	
	Proportion of residential areas with access to EV recharging points within a radius of 700 m (15-min walk)		●	●	
Urban public transport (UPT) accessibility/ level of service	Population living within a 500-m distance of a 5-minute headway to a UPT stop or station		●		●
	Average waiting time at UPT stops or stations		●		
	Average walking distance to the closest UPT stop or station		●		
Speed regulation	Average maximum vehicle speed allowed in the area		●		●
Parking regulation and policy	Area dedicated to parking spaces of private motorised vehicles		●	●	●
	Number of bicycle parking spots per resident		●		●

ENVIRONMENTAL

Indicator	Metric	Outcome Mapping
Urban heat island (UHI) effect	Total area covered by permeable surfaces	● ●
	UHI values	● ●
Green space	Total area covered by green space	● ●
Blue space	Total area covered by blue space	● ●
Air pollution	Annual average air quality index (combination of pollutants)	● ●
Noise pollution	Annual average level of noise per day	● ●
Share of renewable energy in transport	PT buses on clean energy	● ●
	Taxis on clean energy	● ●
	EVs in total vehicle fleet	●

SOCIAL & HEALTH

Indicator	Metric	Outcome Mapping
Spaces that promote outdoor usage and active lifestyle	Average dwell time in the area	●
	Provision of sufficient public seating infrastructure	● ●
	Proportion of public space dedicated to play areas	●
User profile mix	Diversity of genders and ages of users in the area	●
	Diversity of household incomes in the area	● ●
	Diversity of household types in the area	● ●
Accessibility to urban public space	Area of urban public space per resident within a radius of 700 m (15-min walk) of their residence	● ●
Placemaking/vibrancy of public spaces	Diversity of users observed in public spaces	●
	Diversity of uses in public spaces	● ●
	Average number of cultural, social and recreational events in public spaces per month	● ●
Community engagement/ participatory planning	Number of public consultations for feedback sessions	●
Public perception of sustainable mobility initiatives	Level of participation	●
Commuter satisfaction scores	Efficiency and comfort of public transport	● ●
Perceived safety of streets	Perceived safety of streets by pedestrians	● ●

ECONOMIC

Indicator	Metric	Outcome Mapping
Economic activity generated	Number of events in the area that require purchase of an entry ticket	●
	Change in revenue generated by retail/commercial activity in the area	●
	Change in number of small and medium-sized enterprises (SMEs)	●
	Change in commercial space vacancy rates relative to city median	●
Property value	Average purchasing value of property in the area	● ●
Public transport (PT) affordability	Proportion of household income spent on public transport	● ● ●

STEPS FOR APPLYING THE FRAMEWORK

STEP	ACTION	HOW TO APPROACH IT	TOOL TO USE
ADAPT	1. Define the scope, scale and intended outcomes of the intervention.	• Clarify whether the intervention is being assessed at the street, neighbourhood or city level, and whether the assessment is ex ante, interim or retrospective (refer to Note A). • Define what the intervention is intended to achieve, and establish the boundaries and time horizon of the assessment.	Reference Manual
	2. Identify stakeholders, user groups and engagement approaches.	• Consider which agencies, partners and decision makers need to be involved, as well as which user groups are most affected. • Where appropriate, plan workshops, interviews or other forms of engagement to capture lived experience and contextual insight.	
	3. Identify relevant sub-pillars, indicators and metrics. Review definitions, benchmarks and scoring approaches for the selected context.	• Select the outcomes that are most relevant to the intervention, then identify appropriate indicators and metrics under each. A balanced assessment should ideally include measures across multiple domains, even where some evidence is qualitative or proxy based (refer to Note D).	
	4. Establish data collection approaches.	• Determine the types of evidence to be collected. This may include quantitative and qualitative data (refer to Note C).	
APPLY	5. Establish priorities and assign weightings.	• Establish how different outcomes are prioritised or weighted using the pairwise comparison method (refer to Note B). Weightings can be assigned through surveys, focus group discussions or workshops.	Prioritisation Tool
	6. Compile quantitative and qualitative evidence.	• Draw on existing datasets, administrative records, observational data, public surveys and interviews where available. Use mixed methods to understand how the intervention is experienced by different groups.	Self-Assessment Tool
	7. Score performance across selected metrics.	• Apply the relevant benchmarks, thresholds or scoring criteria for each metric.	
	8. Combine scores and weightings to generate pillar-level and overall performance profiles.	• Aggregate results to show relative strengths and weaknesses across domains to create a performance profile that can support comparison, discussion and decision making.	
ANALYSE	9. Visualise results and review performance across pillars.	• Review the results across pillars to identify broad patterns of performance and areas that warrant closer attention.	Self-Assessment Tool
	10. Interpret cross-domain outcomes to identify strengths, gaps, synergies and trade-offs.	• Understand where co-benefits and trade-offs emerge, and what the pattern of results means for policy and practice.	
	11. Test assumptions and examine how priorities influence results, where relevant.	• Consider how different weightings, scoring choices or evidence limitations may affect the outcomes. This can help reveal how sensitive the results are to underlying assumptions (refer to Note B).	
	12. Validate findings with stakeholders where necessary.	• Use stakeholder discussions or follow-up engagements to test whether the findings reflect experience on the ground, whether important contextual factors have been missed, and whether the interpretation is credible. This helps strengthen legitimacy and reduce the risk of overly technical or incomplete conclusions.	Reference Manual
	13. Use insights to inform decision making, refine interventions and guide future applications.	• The framework should support learning as well as evaluation. • Results can be used to refine the intervention itself, revisit priorities, strengthen monitoring, or improve how the framework is applied in future assessments.	

NOTES:

The application of the framework will vary depending on context, data availability and the objectives of the intervention. The following considerations may support more effective and consistent use.

A Applying Across Scales

The framework can be used for interventions ranging from street or corridor improvements to neighbourhood programmes and city-wide strategies. In practice, smaller-scale or place-based interventions can provide a useful entry point because these contexts allow for clearer definition of scope and outcomes. They also make it easier to observe changes across domains and link interventions to measurable results. Practitioners may adapt indicators and levels of detail to suit the scale, objectives and available resources, with insights from smaller applications informing broader strategies over time.

B Addressing Subjectivity

While the selection of pillars, sub-pillars, indicators and weightings inevitably involves judgement, the framework does not seek to eliminate subjectivity. Instead, it makes assumptions explicit and embeds them within a clear methodological structure. To manage subjectivity, standardised indicator and metric definitions, along with clear measurement scales, should be established at the outset to provide a consistent basis for assessment. Structured discussions or consultations then help clarify the relative importance of each criterion, creating a common foundation for comparison. This ensures that when stakeholders undertake the pairwise comparison process, they do so with a shared understanding of the criteria, helping to reduce bias in the assignment of weightings.

Where appropriate, sensitivity testing can be conducted to explore how results change under different assumptions—for example, by adjusting weightings or revisiting scoring decisions. This helps to assess the robustness of the findings and to understand how different priorities may influence outcomes, particularly in complex decision-making contexts. If results remain broadly consistent, this suggests that the findings are robust. Where results vary significantly, this may indicate areas that require further analysis, refinement or stakeholder discussion.

C Using Qualitative Data

The framework draws on multiple forms of evidence, including quantitative, spatial and qualitative inputs.

In addition to measured data, qualitative and experiential inputs should inform assessment and scoring, particularly where outcomes require contextual interpretation rather than purely numerical judgement. These forms of evidence can help explain patterns observed in quantitative data, surface differences across user groups, and provide insight into how interventions are perceived and experienced on the ground. Types of qualitative data may include:

- **Perception-based**, regarding safety, comfort, inclusivity and sense of belonging
- **Behavioural or observational**, regarding who uses the space, when and how
- **Participatory or co-created**, derived from workshops, community mapping and co-design sessions
- **Narrative or lived experience**, recorded through interviews, journey mapping and diaries

When analysed concurrently with quantitative data, these forms of evidence support a more grounded and nuanced understanding of cross-domain impacts.

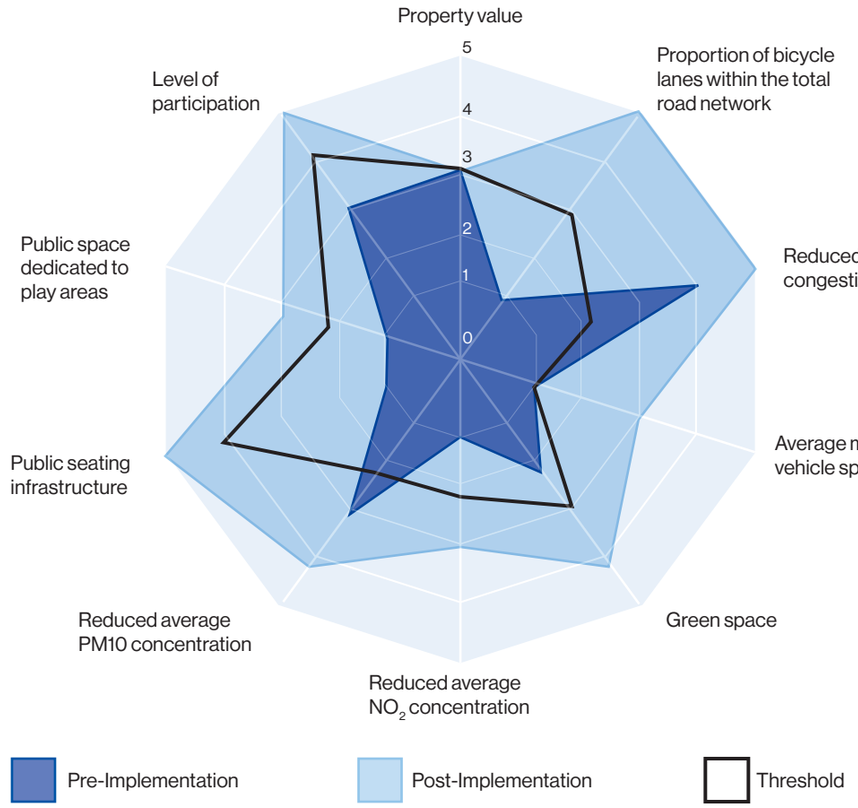
D Working With Available Data

The quality and reliability of data used for assessment will depend on available data, technical capacity and the extent to which data is coordinated, shared and maintained across agencies and other stakeholders. In many contexts, data may not only be limited, but also uneven in quality, narrow in scope, and/or focused primarily on transport-related metrics. To address this, cities can apply the framework progressively, using available data and clearly stated assumptions, supported by simpler methods of data collection. Where gaps do exist, proxy indicators or qualitative assessments can be used to provide indicative insights. Over time, the level of detail can be expanded as data quality, availability and capacity improve.

INTERPRETING RESULTS IN CONTEXT

The framework generates a multi-dimensional view of how mobility interventions perform across different domains. These results are intended to support a more nuanced understanding of impacts, rather than to produce a single definitive score. Results should therefore be interpreted in relation to both performance and priorities. They are not designed to provide universally comparable outcomes, but to reflect context-specific insights based on selected indicators, available data and assigned weightings.

INTERPRETING RESULTS	WHAT THIS MEANS
Look Across Pillars Review performance across all domains.	Variation is expected across pillars, particularly for interventions that are designed to achieve specific policy objectives. Strong outcomes in some areas, alongside more moderate results in others, often reflect intentional priorities (e.g., safety over vehicle flow) rather than shortcomings. This applies to sub-pillars, indicators and metrics as well.
Understand Priorities Interpret results in relation to how outcomes are prioritised and weightings assigned.	Weightings reflect the relative importance assigned to different outcomes. As such, results do not simply indicate whether an intervention performs "well" or "poorly", but rather how it performs relative to the priorities of the decision context. Differences in results may therefore reflect intentional choices about which outcomes to prioritise. Results show how performance aligns with priorities and not just how an intervention performs in isolation.
Identify Co-Benefits and Trade-Offs Look for outcomes that improve together or present tensions or trade-offs with others.	Interventions may deliver multiple benefits across domains (e.g., measures that reduce traffic volumes may improve road safety, air quality and public space usage while reducing speed). They may also create tensions or force trade-offs (e.g., neighbourhood improvements could result in gentrification or the rise of property value). Recognising patterns of co-benefits and trade-offs can help to balance objectives and highlight where complementary measures or further refinement may be needed.



Visualising results through a spider diagram provides a quick snapshot of performance across selected cross-domain indicators, enabling easy comparison over time and clear communication of impacts to stakeholders.

The results can be visualised using charts, spider diagrams and/or cross-impact matrices. They can also be viewed through a cross-impact matrix to map the relationship between specific criteria across domains. The matrix can be applied to different sets of criteria—pillars vs outcomes, interventions vs metrics or indicators—for different depths of analysis.

	Modal shift & active mobility uptake	Traffic reduction & network efficiency	Air quality & noise	Climate resilience & decarbonisation	Public health outcomes	Social equity & inclusion	Local economic vitality	Property value & affordability
BASIC **Traffic management & access restriction** Modal filters, one-way systems, speed limits, signage, bollards	3	5	4	3	3	3	2	2
BASIC/ STRUCTURAL **Street space reallocation** Parking removal, footpath widening, raised platforms, public space creation	4	3	3	2	4	4	3	4
TACTICAL **Public space activation** Furniture, seating, play equipment, street paint, planters, programming	2	1	1	1	4	4	3	2
STRUCTURAL **Street tree planting** Tree canopy, green corridors, planted medians	3	1	3	5	5	3	4	5
STRUCTURAL **Active mobility infrastructure** Protected cycling lanes, pedestrian upgrades, crossing improvements, wayfinding	5	3	3	4	4	3	3	3

Score: 1 = little to no influence, 5 = very strong influence

Example of a cross-impact matrix for Barcelona's Superblock programme, with scores intended for illustrative purposes only.[3,4] The matrix illustrates the influence of different intervention levels under Barcelona's Superblocks across cross-domain outcomes.

Cross-impact matrices can help to illustrate how different intervention components may influence outcomes across domains. In such matrices, higher scores do not imply that a single intervention is universally "better" but highlight which interventions may be more effective for achieving certain objectives or generating wider cross-domain effects.

Reading across a row reveals not just what an intervention delivers, but where it falls short and what complementary measures might be needed. Reading down a column shows which interventions are most relevant for a given outcome, and whether that outcome requires structural investment or can be addressed at a lower implementation level. This can help planners compare intervention options, clarify priorities and understand how different strategies may shape outcomes in different ways.

[3] Mark Nieuwenhuijsen et al., "The Superblock model: A review of an innovative urban model for sustainability, liveability, health and well-being", *Environmental Research* 251.1 (2024): 118550, https://doi.org/10.1016/j.envres.2024.118550.

[4] Natalie Mueller et al., "Changing the urban design of cities for health: The superblock model", *Environment International* (2020): 105132, 10.1016/j.envint.2019.105132.

For such analyses, interventions can be organised by implementation level:[5]

- **Basic**: Low cost, quickly implementable, reversible; primarily regulatory or signage based
- **Tactical**: Moderate cost, visible change, semi-reversible; physical but not permanent
- **Structural**: Capital investment, permanent works, requiring long-term planning and procurement timelines

Some interventions may evolve across levels over time. For example, street space reallocation may begin with temporary changes and progress towards more permanent redesign as interventions are refined and institutionalised.

Cross-Domain Insights

The matrix highlights how interventions may differ in the depth and distribution of the outcomes they generate:

A Some interventions generate broad cross-domain effects. For instance, street greening and tree planting, can score highly across climate resilience, public health and property value—three different pillars from a single investment. Such patterns can help planners identify opportunities for cross-agency collaboration and funding, where mobility outcomes align with the mandates of environment, health and economic agencies too.

B Some interventions reveal tensions. For instance, street space reallocation and green axes both score highly on property value, but more moderately on social equity and inclusion. This highlights that liveability improvements may also drive affordability pressures and displace the communities the intervention was meant to serve. Addressing this requires pairing these interventions with housing affordability safeguards, community benefit agreements and deliberate equity monitoring from the outset. It also requires strong governance—evidence suggests that equity outcomes are shaped as much by the quality of civic participation and decision making as by the design itself.

C Some interventions work better together. For instance, traffic management and street space reallocation are most effective when implemented together. Traffic management alone scores well on traffic reduction and air quality, but more modestly on social, health and economic outcomes. Street space reallocation lifts those scores considerably.

[5] TuneOurBlock Consortium, Final Project Publication: *Final Results from TuneOurBlock and ULL Activities* (Berlin: TuneOurBlock, 2024).

Informing Outcomes-Based Decision-Making

The use of visualisation tools such as charts, spider diagrams or cross-impact matrices can help to identify questions for consideration, such as:

- Which intervention components have the potential to generate the broadest cross-domain effects?
- What outcomes are strengthened, overlooked or present trade-offs under different intervention strategies?
- What investment pathway best aligns with current priorities and desired outcomes?

It is also worth noting that scores reflect what interventions can deliver when the enabling conditions for implementation are in place. In practice, outcomes depend not only on the intervention itself, but also on how it is planned, governed and adapted over time. Factors such as institutional coordination, stakeholder support, delivery capacity and ongoing monitoring can substantially influence results. Without these enablers, even well-designed interventions may fall short of their potential.

Cities may not have all the resources to implement everything at once. The framework can help inform decision making and structure conversations about where to start and in what order—based on a city's specific priorities and constraints.

If social and health outcomes are the primary focus, visualisation tools can help indicate that meaningful returns are achievable without structural investment upfront. If the mandate is environmental, they can show that climate resilience may require longer planning horizons and stronger capital commitments, but with cross-domain reach extending well into public health and economic outcomes. Where economic recovery is a concern, these tools may help prompt questions about whether investment gains are likely to be distributed equitably, and what complementary measures need to be built in from the outset.

These insights can work alongside the Prioritisation Tool, which allows cities to apply explicit weightings to each pillar based on local context and policy objectives. Together, they support a more structured and outcomes-based approach to investment decisions across departments and scales.

Conclusion

The cross-domain framework is most useful when introduced early—before investment decisions are fixed and before budgets are committed. Applied iteratively, with results informing subsequent rounds of assessment as new data, stakeholder inputs or policy considerations emerge, an intervention assessed through the framework becomes a more accurate and useful planning tool over time.

The framework is not prescriptive. It is intended as a starting point that can be tested, adapted and refined across different priorities, constraints and contexts. Its value lies in structuring discussion, clarifying priorities and providing a shared language across stakeholders for understanding and communicating impacts. Over time, its application across different projects and scales can help build a more grounded understanding of cross-domain impacts and support more outcomes-based decision making.

ANNEX:

REFERENCE MANUAL

How to Use the Reference Manual

This reference manual supports the application of the cross-domain framework by providing indicator definitions, scoring guidance, references and supporting notes. The indicators and metrics included in this manual are intended as evidence-informed reference points rather than an exhaustive list, and may be adapted or supplemented to reflect local context, intervention type and assessment needs.

Each entry follows a consistent structure, comprising of:

- an indicator, or the broader outcome being assessed;
- metric(s), or the specific, measurable expression(s) of that indicator;
- rationale, explaining why the metric matters and how it should be interpreted;
- a scoring scale of 1–5, where 5 generally represents the most desirable outcome; and
- source(s), which are the references, standards or evidence used to inform the benchmarks and scoring.

For most metrics, a higher score reflects a more desirable outcome. However, some metrics may have a more complex relationship with liveability, and higher values do not automatically represent better results. These cases are flagged in the relevant entries and should be interpreted alongside the accompanying rationale rather than read as simple rankings. Some entries also explain how to interpret metrics alongside related indicators or contextual considerations, helping users understand how broader trends or cross-domain relationships may affect results.

The scoring benchmarks in this manual draw on a mix of local, regional and international standards, informed by cities across different urban contexts.

Cities differ significantly in climate, density, development stage, infrastructure provision and policy context. As a result, benchmarks that represent best practice in one setting may be less appropriate or less achievable in another. Users are encouraged to assess the suitability of benchmarks for their local conditions and adapt thresholds where local standards, policy targets or evidence provide a more relevant basis for comparison.

This manual is intended to evolve through ongoing application and learning. Benchmarks, indicators and guidance will need to be revised as new evidence emerges, standards change, and the framework is applied across more diverse urban contexts—including cities in Asia, the Global South, and other regions underrepresented in current international benchmarking literature. Feedback from practitioners applying the framework is encouraged and will contribute to the continued refinement of the manual.

MOBILITY

1 Walkability

This indicator reflects how well the urban environment supports walking as a safe, convenient, and attractive mode of travel. It encompasses factors such as accessibility, connectivity, safety, comfort and the quality of the public realm. A higher score indicates that streets are continuous and barrier-free, crossings are safe, sidewalks are wide and shaded, and destinations are easily accessible.

A walkable environment not only encourages people to choose walking over short car trips but also supports healthier lifestyles, reduces emissions, and enhances the vibrancy of neighbourhoods. Well-designed pedestrian infrastructure ensures that people of all ages and abilities can move easily and independently, while also contributing to economic vitality through increased footfall for local businesses.

A. Proportion of pedestrian zones that are barrier- and obstacle-free

Barriers and obstacles such as parked vehicles, street vendors, construction, poorly maintained sidewalks and steep road gradients impede walking. Having a higher percentage of pedestrian zones that are barrier- and obstacle-free ensures that they are safe and accessible to all.

SCORING:

1: <50%
2: 50–70%
3: >70–85%
4: >85–95%
5: >95%

SOURCES:

Daniel Rhoads, Albert Solé-Ribalta and Javier Borge-Holthoefer, "The Inclusive 15-minute city: Walkability analysis with sidewalk networks," *Cities* 139 (2023): 104278, https://doi.org/10.1016/j.compenvurbsys.2022.101936.

Gloria Serra-Coch et al., "Graphical approach to assess urban quality: Mapping walkability based on the TOD-standard", *Cities* 76 (2018): 58–71, https://doi.org/10.1016/j.cities.2018.01.007.

Institute for Transportation and Development Policy (ITDP), *TOD Standard* (New York: ITDP, 2017), https://itdp.org/wp-content/uploads/2017/06/TOD_Standard_EN.pdf.

B. Proportion of pedestrian lanes over total road network

The proportion of pedestrian lanes over the total road network within the area reflects how much a city prioritises walkability by ensuring safe, accessible and continuous pedestrian pathways. A higher percentage reflects better connectivity and ease of movement, reducing reliance on cars and promoting healthier, more sustainable urban mobility.

SCORING:

1: <60%
2: 60–70%
3: >70–80%
4: >80–90%
5: >90%

SOURCES:

A. Bartzokas-Tsiompras and Y.N. Photis. "Global indicators for pedestrian streets by city", *Mendeley Data*, 14 January 2021, https://data.mendeley.com/datasets/fs9xxhh5yh/2.

Institute for Transportation and Development Policy (ITDP), *Pedestrians First: Tools for a Walkable City* (New York: ITDP, 2018), https://itdp.org/wp-content/uploads/2024/09/pedestrians_FINAL.pdf.

C. Proportion of covered sidewalks (tree canopies or overhanging roofs)

Covered sidewalks improve accessibility and inclusivity while enhancing pedestrian comfort and safety. While beneficial to all, a higher percentage of sidewalks that are covered is particularly helpful for older adults, children and people with disabilities, who may be more sensitive to environmental conditions. Covered sidewalks also contribute to environmental sustainability, with tree-lined streets improving air quality, reducing stormwater runoff and supporting urban biodiversity.

SCORING:

1: <10%
2: 10–20%
3: >20–30%
4: >30–40%
5: >40%

SOURCES:

Institute for Transportation and Development Policy (ITDP), TOD Standard (New York: ITDP, 2017), https://itdp.org/wp-content/uploads/2017/06/TOD_Standard_EN.pdf.

Scott E. Maco and E. Gregory McPherson, "Assessing canopy cover over streets and sidewalks in street tree populations," *Journal of Arboriculture* 28.6 (2002): 270–276, https://auf.isa-arbor.com/content/isa/28/6/270.full.pdf.

Voronoi, "Ranked: Urban Tree Cover of European Capital Cities", 20 July 2024, https://www.voronoiapp.com/climate/Ranked-Urban-Tree-Cover-of-European-Capital-Cities-1770.

D. Average width of sidewalk

Sidewalk width is a key determinant of pedestrian comfort, safety, and accessibility. Wider sidewalks minimise crowding, allowing people to walk side by side and accommodating those using mobility aids or strollers. Adequate width supports universal design by ensuring inclusive access for people of all ages and abilities.

Wider sidewalks also provide space for street furniture, greenery, and other amenities, improving the overall quality of the public realm. Providing adequate sidewalk width contributes to local economic vitality by supporting higher footfall and encouraging street-level activity.

SOURCE:

Institute for Transport and Development Policy (ITDP), *Street Design: Components and Guidelines* (ITDP, 2014), http://itdp.in/wp-content/uploads/2014/12/03-Design-components-and-Guidelines-140915.pdf.

SCORING:

1: <1.5 m

3: 1.5–3 m

5: >3 m

E. Ease of crossing (presence of safe and direct crossing or pedestrian right-of-way)

Accessibility is a crucial factor in assessing ease of crossing. Existence of features such as curb ramps and tactile paving for visually impaired individuals ensures that everyone has a safe experience navigating through the urban environment. Well-marked, frequent and accessible crossings can also avert conflicts between pedestrians and vehicles.

SOURCES:

Christopher Kost et al., *Streets for walking & cycling: Designing for safety, accessibility, and comfort in African cities* (UN-Habitat and Institute for Transportation & Development Policy, July 2018), http://unhabitat.org/sites/default/files/2020/06/streets-for-walking-and-cycling.pdf.

Presto, "Give Cycling a Push: Implementation Fact Sheet", n.d., https://www.polisnetwork.eu/wp-content/uploads/2019/06/presto_cycling-policy-guide-general-framework_english.pdf.

SCORING:

1: No pedestrian right-of-way (no marked pedestrian crossings or designated crossing points exist)

2: Poor pedestrian crossing condition (some informal crossing points, like curb cuts or faded markings, exist; no pedestrian signals or traffic-calming measures are in place)

3: Limited pedestrian right-of-way (marked pedestrian crossings exist but are infrequent; traffic signals do not include pedestrian phases)

4: Moderate pedestrian priority (well-marked and signalised pedestrian crossings are present at major intersections; crosswalks have countdown timers; some traffic calming features exist)

5: High pedestrian priority (clearly marked crosswalks; dedicated pedestrian signals and prominent traffic-calming measures are in place)

2 Modal share of active mobility modes and shared transport

This indicator measures the proportion of urban trips made using active mobility modes, including walking, cycling, and micromobility (e.g., e-scooters, e-bikes), as well as shared transport options such as ride-hailing and car-sharing, as alternatives to private vehicle ownership.

Cities with a high share of walk-cycle-ride modes typically experience lower congestion, better air quality and improved public health outcomes due to increased physical activity and enhanced liveability. Additionally, shared mobility solutions contribute to more efficient land use, reducing the need for extensive parking infrastructure and complementing public transport networks.

This indicator helps cities evaluate the success of policies promoting non-motorised and shared transport options, such as dedicated cycling lanes, pedestrian-friendly infrastructure and micromobility integration with public transport.

A. Active mobility modal share

A higher percentage of active mobility trips (walking, cycling, micromobility) indicates that pedestrian and cycling infrastructure are well-integrated into urban planning, and that policies supporting sustainable transport are effective.

It is important to interpret each mode distinctly, as they reflect different policy outcomes. Walking levels often reflect urban density and accessibility, while cycling and micromobility uptake are more directly tied to infrastructure, safety, and regulatory support. Micromobility adoption is still emerging, but where it scales successfully, it demonstrates strong policy support, infrastructure integration, and public acceptance.

SCORING:

Walking:

1: < 10%

2: 10–20%

3: >20–30%

4: >30–40%

5: > 40%

Cycling:

1: < 1%

2: 1–10%

3: >10–20%

4: >20–30%

5: > 30%

SOURCES:

Anna Fleck, "Which cities in the world are the most bicycle-friendly?", World Economic Forum, 15 August 2022, https://www.weforum.org/stories/2022/08/bicycle-mobility-transport-ranked-world/.

Enrico Pisoni, Panayotis Christidis and Elena Navajas Cawood, "Active mobility versus motorized transport? User choices and benefits for the society", *Science of The Total Environment* 806.2 (2022): 150627, https://doi.org/10.1016/j.scitotenv.2021.150627.

Ministère Chargé De L'Enseignement Supérieur Et De La Recherche and Horizon Europe, "Increasing walking and cycling: to reap health benefits, emission reductions and integrate active mobility and micro-mobility devices, with smart technologies and infrastructure", 2025, https://www.horizon-europe.gouv.fr/increasing-walking-and-cycling-reap-health-benefits-emission-reductions-and-integrate-active-40536.

Nikolaus Lang and Andreas Herrman, "Micromobility is clean and quiet—how can it be widely used?", World Economic Forum, 14 July 2022, https://www.weforum.org/stories/2022/07/micromobility-will-make-our-cities-clean-and-quiet-how-can-it-be-widely-used/.

The Economist, "What can the world's most walkable cities teach other places?" *The Economist*, 7 February 2025, https://www.economist.com/graphic-detail/2025/02/07/what-can-the-worlds-most-walkable-cities-teach-other-places.

Micromobility:

1: < 1%

3: 1–3%

5: >3–5%

B. Shared transport modal share

As an alternative to private vehicle ownership, shared transport (ride-hailing services or car-share) reduces urban congestion, lowers vehicle ownership rates and optimises the use of available transport resources, particularly when integrated with public transport, making cities less dependent on private cars.

The metric should be interpreted alongside private car and active mobility modal share to provide a fuller picture.

SCORING:

1: <2%

2: 2–5%

3: >5–10%

4: >10–20%

5: >20%

SOURCES:

Charlotte Brannigan et al., *The state of shared and zero-emission mobility in Europe: Final Technical Report* (Ricardo Energy & Environment, published for Clean Cities Campaign, June 2023), http://cleancitiescampaign.org/wp-content/uploads/2023/06/CCC-Thank-you-for-Sharing-Technical-Report.pdf.

International Association of Public Transport, "Shared vehicles," 2025, https://www.uitp.org/knowledge-research/shared-vehicles/.

3 Modal share of public transport

The modal share of public transport is the proportion of total trips taken using public transport modes such as buses, trains and trams.

A higher share of public transport usage signals an efficient, accessible and well-integrated urban transit system, which reduces reliance on private motorised vehicles. Cities that prioritise public transport benefit from lower congestion, reduced emissions, improved air quality and enhanced mobility equity for all residents.

A. Public transport modal share

An increase in public transport modal share (buses, metros, trains, trams) often reflects effective policies such as investment in transit infrastructure, fare subsidies, last-mile connectivity improvements and integration with active mobility modes.

Conversely, a low public transport share may indicate inadequate service coverage, affordability concerns or insufficient infrastructure, leading to continued dependence on private vehicles.

SCORING:

1: <20%

2: 20–40%

3: >40–50%

4: >50–60%

5: >60%

SOURCE:

European Commission, *Report on the Quality of Life in European Cities, 2023* (Luxembourg: Publications Office of the European Union, 2023), https://ec.europa.eu/regional_policy/sources/reports/qol2023/2023_quality_life_european_cities_en.pdf.

B. Number of private motorised vehicles per 1,000 residents registered within the area

A higher number of private vehicles per capita suggests greater reliance on personal cars, often due to limited public transport options or poor service quality. A lower number can reflect a shift towards sustainable transport alternatives and reduced congestion.

This metric should be interpreted alongside modal share of PT and active mobility because in some areas, a lower number may also signal transport poverty.

SCORING:

1: >600
2: >400–600
3: >200–400
4: 100–200
5: <100

SOURCES:

Eurostat, "Statistics Explained: Passenger cars in the EU," 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_cars_in_the_EU.

Eurostat, "Statistics Explained: Stock of vehicles at regional level," 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Stock_of_vehicles_at_regional_level#Stock_of_passenger_cars_at_regional_level.

Fernando Perez Diez, Magin Campos Cacheda and Julià Cabrerizo Sinca, "Stage of historical evolution of private vehicle ownership in the City of Barcelona", *Transportation Research Procedia* 18 (2016): 140–147, https://doi.org/10.1016/j.trpro.2016.12.020.

4 Provision of mobility hubs

A mobility hub is a designated location that integrates multiple transport modes and essential services, enabling seamless transfers and improving accessibility. These hubs are designed to enhance multimodal connectivity, reduce reliance on private vehicles and support sustainable urban mobility by combining public transport, active travel infrastructure and shared mobility services.

This indicator helps cities assess the availability, functionality and inclusivity of mobility hubs, ensuring that they support seamless mobility, reduce last-mile connectivity gaps and contribute to a car-lite urban environment.

Well-designed mobility hubs facilitate efficient, convenient and equitable transport choices, encouraging greater adoption of public transport, walking, cycling and shared mobility options while contributing to increased efficiency and connectivity in the wider transport network. In addition to transport integration, the presence of mixed-use amenities and services within or near the hub further enhances its utility.

A. Number of transport modes within a mobility hub

The presence of multiple transport modes within a hub enhances accessibility and travel flexibility, allowing users to shift easily between different mobility options. Hubs that integrate public transport with walking, cycling, micromobility and shared mobility services provide a stronger alternative to private car use.

SCORING:

1: 1 mode
2: 2 modes
3: 3-4 modes
4: 5 modes
5: > 5 modes

SOURCE:

International Association of Public Transport, "Mobility hubs: Steering the shift towards integrated sustainable mobility", April 2023, https://www.uitp.org/news/mobility-hubs-steering-the-shift-towards-integrated-sustainable-mobility/.

B. Number of transport-related amenities and services within a transport hub

The presence of supporting transport and amenities and services (e.g., charging infrastructure, parking facilities for bicycles, end of trip facilities, lockers) enhances the attractiveness, convenience and functionality of sustainable mobility modes and encourages their use. A higher score indicates a comprehensive hub offering diverse amenities, creating a vibrant, functional space.

SCORING:

1: 0 amenities
2: 1–2 amenities
3: 3–4 amenities
4: 5–6 amenities
5: >6 amenities

SOURCES:

Alta Planning + Design and Portland Bureau of Transportation (PBOT), *Mobility Hub Typology Study* (Alta Planning + Design and PBOT, 2020), https://altago.com/wp-content/uploads/PBOT-Mobility-Hub-Typology_June2020.pdf.

International Association of Public Transport, "Mobility hubs: Steering the shift towards integrated sustainable mobility", April 2023, https://www.uitp.org/news/mobility-hubs-steering-the-shift-towards-integrated-sustainable-mobility/.

C. Number of non-transport related amenities and services within a transport hub

Integration of non-transport amenities and services (e.g., supermarkets, convenience stores, day care centres, clinics, gyms, libraries, F&B options) ensures that essential daily needs can be met within a short distance of where people live, work or travel. By integrating them within transport hubs, the hubs function not only as points of interchange but also as mixed-use urban anchors that enhance convenience, reduce the need for long journeys, and strengthen local economic and social life.

SCORING:

1: 0–1 amenities
2: 2–3 amenities
3: 4–6 amenities
4: 7–9 amenities
5: >9 amenities

SOURCES:

Alta Planning + Design and Portland Bureau of Transportation (PBOT), *Mobility Hub Typology Study* (Alta Planning + Design and PBOT, 2020), https://altago.com/wp-content/uploads/PBOT-Mobility-Hub-Typology_June2020.pdf.

International Association of Public Transport, "Mobility hubs: Steering the shift towards integrated sustainable mobility", April 2023, https://cms.uitp.org/wp/wp-content/uploads/2023/06/Policy-Brief-Mobility-hubs-web.pdf .

5 Ease of intermodal integration

This indicator evaluates how seamlessly passengers can navigate between modes—whether transfers are fast, intuitive and user-friendly, or plagued by delays, confusion and inconvenience for users.

Seamless and efficient transfers, from reduced journey friction and clear wayfinding (e.g., good signage, digital support, infrastructure improvements), are critical for multimodal transport adoption and can determine whether users choose or abandon public, active and shared transport.

A. Average transfer time between modes

The ease of transfers between modes reflects how efficiently different transport modes are connected at transport hubs. Shorter average transfer times indicate greater ease and a well-designed and efficient transfer experience.

This metric should be considered together with qualitative aspects such as legibility of wayfinding signage, barrier-free access, integrated ticketing options and perceived safety. Cities may also adapt thresholds based on network design, recognising that the quality of the transfer experience often matters as much as speed.

SCORING:

1: >15 min
2: >10–15 min
3: >5–10 min
4: 3–5 min
5: <3 min

SOURCES:

Ankita Sil et al., "Exploring satisfaction for transfers at intermodal interchanges: A comparison of Germany and India", *Journal of Public Transportation* 24 (2022): 100005, https://doi.org/10.1016/j.jpubtr.2022.100005.

Biao Yin and Fabien Leurent, "Estimation of Transfer Time from Multimodal Transit Services in the Paris Region," *Future Transportation* 2.4 (2022): 886–901, https://doi.org/10.3390/futuretransp2040049.

6 Bicycle priority

Bicycle priority assesses the extent to which a city prioritises cycling as a transport mode, as well as the provision of dedicated infrastructure to ensure safe, connected and accessible cycling routes. A strong cycling network also promotes healthier commuting habits, thereby reducing rates of sedentary lifestyle-related diseases.

A. Proportion of bicycle lanes within the total road network

A higher percentage of bicycle lanes over the total road network within the area indicates greater coverage of dedicated cycling lanes and shared paths for active mobility, reflecting improved connectivity and accessibility, as well as a stronger commitment to bicycle priority.

SCORING:

1: <40%
2: 40–50%
3: >50–60%
4: >60–70%
5: >70%

SOURCE:

Simone Weikl and Patricia Mayer, "Data-driven quality assessment of cycling networks", *Frontiers in Future Transportation 4* (2023): 1127742, https://doi.org/10.3389/ffutr.2023.1127742.

7 Bus priority

Bus priority assesses the level of priority placed for buses, trams and high-occupancy vehicles. A higher bus priority can result in enhanced travel time reliability, making public transport more attractive and thereby increasing ridership while ensuring efficient and sustainable mobility. It can also reduce congestion, improve air quality, create quieter streets that are pedestrian-friendly, increase accessibility for all residents and support local economic activity.

A. Proportion of bus priority lanes within the total road network

Bus priority lanes reduce delays caused by mixed traffic, improve travel time consistency, and increase the overall capacity of the transit system. Higher coverage of bus priority lanes reflects a city's commitment to efficient and reliable public transportation. By ensuring faster and more predictable bus services, these lanes also enhance urban mobility, reduce congestion and lower emissions.

SCORING:

1: <5%
2: 5–10%
3: >10–15%
4: >15–20%
5: >20%

SOURCES:

Marija Burinskienė, Modesta Gusarovienė and Kristina Gabrulevičiūtė-Skebienė, "The Impact of Public Transport Lanes on the Operating Speed of Buses," published in conjunction with the 9th International Conference on Environmental Engineering (2014), https://www.researchgate.net/publication/269224712_The_Impact_of_Public_Transport_Lanes_on_the_Operating_Speed_of_Buses.

Thomas Schönhofer and Klaus Bogenberger, *A Comprehensive Review on Managed Lanes in Europe* (Technical University of Munich, 2021), https://mediatum.ub.tum.de/doc/1640100/d9y0se39q840q2o97meagntj3.pd.

8 Efficiency of PT buses

Efficient public buses are essential for reducing congestion, improving air quality and enhancing accessibility, all of which contribute to a more liveable city. When buses operate with minimal delays, frequent service and optimised routes, they encourage greater ridership, reducing dependence on private cars and lowering overall emissions. A well-functioning bus network also ensures affordability and accessibility for all residents, particularly those who rely on public transport for daily commutes.

A. Average speed of urban buses

Higher average speeds of buses in urban areas usually reflect reduced congestion, effective traffic management and the presence of bus priority measures, making buses more competitive with private cars. Faster and more reliable services shorten travel times, improve passenger satisfaction and encourage greater public transport use.

Benchmarks for this metric should be adjusted for routes that operate mainly in designated low-speed zones such as school areas or silver zones.

SCORING:

1: <15 km/hour

2: 15–20 km/hour

3: >20–25 km/hour

4: >25–30 km/hour

5: >30 km/hour

SOURCES:

Global BRT Data, "Systems Indicators: Operating Speed", 2025, https://brtdata.org/indicators/systems/operating_speed.

Transport Metropolitans de Barcelona (TMB), "Transport Figures," TMB, 1 January 2025, https://www.tmb.cat/en/get-to-know-tmb/corporate-information/transport-figures.

9 Level of congestion

The level of congestion indicates the extent of traffic delays and road network inefficiencies in an urban area, typically expressed as average travel delay per kilometre, congestion index or percentage of time lost in traffic. It reflects how efficiently vehicles move through the city and how much congestion impacts commuting times, fuel consumption and overall mobility.

Managing congestion is essential for creating a liveable city, as excessive traffic leads to longer commutes, higher emissions and reduced air quality, negatively impacting public health and urban sustainability. High congestion levels decrease productivity, increase stress levels and discourage active mobility by making streets less pedestrian- and cyclist-friendly.

A. Average congestion hours on/near the area per day

Higher congestion hours can indicate persistent bottlenecks, inefficient traffic flow and excessive demand on road infrastructure, leading to longer commutes, increased fuel consumption and higher emissions. Lower congestion hours can indicate better traffic management and enhanced urban accessibility due to efficient public transit and active mobility options.

Since lower congestion hours can also reflect traffic displacement to nearby roads, results should be checked both inside and outside the project boundary, and read alongside indicators like modal share and air quality.

SCORING:

1: >4 hours

2: >3–4 hours

3: >2–3 hours

4: 1–2 hours

5: <1 hours

SOURCE:

Panayotis Christidis and Juan Nicolás Ibáñez Rivas, *Measuring Road Congestion* (Luxembourg: Publications Office of the European Union, 2012), https://publications.jrc.ec.europa.eu/repository/bitstream/JRC69961/congestion%20report%20final.pdf.

10 Public charging points for electric vehicles (EVs)

This indicator looks at the availability and accessibility of EV charging infrastructure within a city, which is typically expressed as the number of charging stations per capita, per square kilometre, or per registered EV.

A well-distributed and easily accessible charging network ensures that EV users can recharge conveniently, reducing range concerns and supporting the widespread adoption of electric mobility. Expanding public EV charging infrastructure is essential for reducing reliance on fossil fuels, lowering emissions and promoting cleaner urban transport, all of which enhance air quality and public health.

A. Ratio of public charging points (PCPs) per EV

A higher ratio of PCPs per EV indicates better accessibility, reduced waiting times and greater convenience, supporting the widespread adoption of EVs. Well-balanced charging infrastructure prevents charging bottlenecks, encourages EV ownership for those without private chargers and promotes smoother integration of electric mobility into the urban transport network.

SCORING:

1: <2.5%
2: 2.5–5%
3: >5–10%
4: >10–20%
5: >20%

SOURCE:

Dale Hall and Nic Lutsey, *Charging infrastructure in cities: Metrics for evaluating future needs*, Working Paper 2020-17 (Washington D.C.: International Council on Clean Transportation, 2020), https://theicct.org/wp-content/uploads/2021/06/EV-charging-metrics-aug2020.pdf.

B. Proportion of residential areas with access to EV recharging points within a radius of 700 m (15-min walk)

A higher percentage of residential areas with access to EV recharging points indicates a well-distributed charging network, ensuring that EV owners can conveniently recharge their vehicles without long detours or extended wait times. Expanding access to EV chargers supports sustainable mobility, encourages the transition to cleaner transportation and reduces range anxiety, ultimately contributing to lower urban emissions and improved air quality.

SCORING:

1: <25%
2: 25–40%
3: >40–60%
4: >60–75%
5: >75%

SOURCES:

Giacomo Falchetta and Michel Noussan, "Electric vehicle charging network in Europe: An accessibility and deployment trends analysis," *Transport Research Part D* 94 (2021): 102813, https://doi.org/10.1016/j.trd.2021.102813.

Rick Wolbertus et al., "Charging infrastructure roll-out strategies for large scale introduction of electric vehicles in urban areas: An agent-based simulation study," *Transportation Research Part A* (2021): 262–285, https://doi.org/10.1016/j.tra.2021.04.010.

11 Urban public transport (UPT) accessibility/level of service

This indicator measures how easily and efficiently residents can reach and use public transportation services. They are typically assessed through factors like proximity to transit stops, service frequency, reliability and overall network coverage.

A higher score indicates that public transport is well-integrated, widely available and convenient, reducing reliance on private vehicles and improving urban mobility.

Well-designed public transport networks enhance social equity by providing affordable and reliable mobility options, making jobs, education and essential services more accessible. Where data is available, methods such as Public Transport Accessibility Levels (PTALs), used by cities like London, can be used to score this. Otherwise, a scoring based on walking distance, frequency and/or network coverage, like the ones below, can provide a practical proxy.

A. Population living within a 500-m distance of a 5-minute headway to a UPT stop or station

Measuring the amount of people near UPT stops or stations is crucial for ensuring equitable access to jobs, education and essential services, particularly for low-income and car-free households. A higher percentage indicates that more people can conveniently reach reliable and frequent transit services, reducing dependence on private vehicles and promoting sustainable urban mobility.

SCORING:

1: <80%
2: 80–85%
3: >85–90%
4: >90–95%
5: >95%

SOURCE:

European Commission, *How many people can you reach by public transport, bicycle or on foot in European Cities? Measuring urban accessibility for low-carbon modes* (Luxenbourg: Publications Office of the European Union, 2020), https://ec.europa.eu/regional_policy/information-sources/maps/low-carbon-urban-accessibility_en.

B. Average waiting time at UPT stops or stations

Shorter waiting times indicate frequent and well-coordinated services, making public transport a more attractive alternative to private vehicles. Excessive waiting times, on the other hand, discourage use, increase travel uncertainty and reduce accessibility, particularly for time-sensitive commuters. By optimising schedules, reducing delays and improving real-time information systems, cities can enhance transit reliability to directly impact passenger experience and overall ridership.

SCORING:

1: >15 min
2: >12–15 min
3: >8–12 min
4: 5–8 min
5: <5 min

SOURCE:

International Association of Public Transport (UITP) and Walk21 Foundation, *Urban Mobility Indicators for Walking and Public Transport* (UITP, Walk21 Foundation and VBK, published on behalf of the Urban Agenda for the EU, 2019), https://ec.europa.eu/futurium/en/system/files/ged/convenient-access-to-public-transport.pdf.

Moovit, *Moovit Global Public Transport Report 2024*, https://moovitapp.com/report#waiting-time.

C. Average walking distance to the closest UPT stop or station

A shorter walking distance to a UPT stop or station ensures greater convenience and encourages ridership. Excessively long walking distances, on the other hand, create barriers to accessibility, particularly for elderly individuals, people with disabilities, and those carrying goods or traveling with children.

SCORING:

1: >700 m
2: >600–700 m
3: >500–600 m
4: 400–500 m
5: < 400 m

SOURCES:

Dennis van Soest, Miles R. Tight and Christopher D. F. Rogers, "Exploring the distances people walk to access public transport", *Transport Reviews* 40 (2020): 160–182, https://doi.org/10.1080/01441647.2019.1575491.

Juan Carlos García-Palomares, Javier Gutiérrez and Osvaldo Daniel Cardozo, "Walking accessibility to public transport: An analysis based on microdata and GIS", *Environment and Planning B: Urban Analytics and City Science* 40.6 (2013): 1087–1102, https://doi.org/10.1068/b39008.

12 Speed regulation

Speed regulation refers to the policies, infrastructure and enforcement measures that control vehicle speeds in urban areas to improve road safety, pedestrian accessibility and overall traffic flow.

Effective speed regulation is essential for creating a liveable city, as lower, well-enforced speed limits reduce traffic fatalities, enhance pedestrian and cyclist safety, and promote walkable environments. Slower vehicle speeds improve street vibrancy and encourage active mobility.

Speed regulation also reduces noise pollution, lowers emissions and improves the overall quality of public spaces.

A. Average maximum vehicle speed allowed in the area

Lower speed limits, especially in pedestrian-heavy zones, reduce the risk and severity of accidents, making streets safer for walkers, cyclists and public transport users. Well-calibrated speed limits also contribute to quieter, more pleasant urban environments, supporting local businesses and public space usage.

Interpretation of this metric should reflect street function and context. A 30 km/hour environment is best practice in residential, school or commercial areas, while higher limits may be acceptable only on arterial roads with limited pedestrian or cycling activity. Results should be read together with road safety and active mobility indicators to assess whether limits support broader liveability goals.

SCORING:

1: >30 km/hour

3: 15–30 km/hour

5: <15 km/hour

SOURCE:

Institute for Transportation and Development Policy (ITDP), *TOD Standard* (New York: ITDP, 2017), https://itdp.org/wp-content/uploads/2017/06/TOD_Standard_EN.pdf.

13 Parking regulation and policy

This indicator looks at the rules and strategies governing parking within urban areas, including parking fees, zoning laws, permits and enforcement. It is aimed at managing parking demand and encouraging alternative transportation options.

This indicator is crucial for promoting sustainable mobility. Effective parking policies help decrease car dependency, free up public space for other uses and support more efficient land use, contributing to a more sustainable and equitable urban environment.

A. Area dedicated to parking spaces of private motorised vehicles

With this metric, a high percentage could indicate over-provision of parking relative to the overall area, with space used for vehicle storage taking away from public and green spaces. This may be a sign of inefficient land use and potentially contributes to congestion and reduced walkability as well. Reducing this percentage could free up space for sustainable urban development that prioritises space for people over cars, and promote alternative transport options.

SCORING:

1: >40%

2: >30–40%

3: >20–30%

4: 10–20%

5: <10%

SOURCE:

Institute for Transportation and Development Policy (ITDP), *TOD Standard* (New York: ITDP, 2017), https://itdp.org/wp-content/uploads/2017/06/TOD_Standard_EN.pdf.

B. Number of bicycle parking spots per resident

This metric measures the availability of designated spaces for bicycle parking relative to the population size. A higher ratio indicates a city's commitment to supporting cycling as a sustainable mode of transport, encouraging more people to cycle by providing convenient and secure parking options. It also reflects the city's infrastructure readiness for cyclists and to promote active transportation.

SCORING:

1: < 0.05

2: 0.05–0.2

3: >0.2–0.5

4: >0.5–1

5: >1

SOURCES:

European Cyclists' Federation (ECF), "Two bicycle parking spaces per apartment set to become new European norm," 15 December 2023, https://www.ecf.com/en/news/two-bicycle-parking-spaces-per-apartment-set-to-become-new-european-norm.

European Union, "Directive (EU) 2024/1275 of the European Parliament and of the Council of 24 April 2024 on the energy performance of buildings (recast)", *Official Journal of the European Union* L 1275 (2024), https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L_202401275.

ENVIRONMENTAL

1 Urban heat island (UHI) effect

This indicator looks at the difference in temperature between urban areas and their surrounding rural or natural environments. The UHI effect occurs when cities, with their dense buildings, concrete and asphalt, absorb and retain more heat than non-urban areas, leading to higher temperatures in comparison.

The UHI effect is a critical environmental concern as it contributes to increased energy consumption (due to higher cooling demands), worsens air quality and exacerbates health issues like heat stress. Addressing the UHI effect can improve urban liveability by promoting cooler, more sustainable cities. Mitigating this effect through strategies like increasing green spaces and using reflective materials can reduce energy costs, lower pollution and create healthier environments for residents.

A. Total area covered by permeable surfaces

Higher coverage of permeable surfaces such as grass and gravel, or permeable pavements that allow water to pass through, promotes better water infiltration, reduces surface runoff and mitigates the UHI effect through evaporative cooling. Permeable surfaces help manage stormwater, reduce flooding risks and cool the environment.

SCORING:

1: <80%

2: 80–85%

3: >85–90%

4: >90–95%

5: >95%

SOURCES:

Andrea Ferrari et al., "The use of permeable and reflective pavements as a potential strategy for urban heat island mitigation", *Urban Climate* 31 (2020): 100534, https://doi.org/10.1016/j.uclim.2019.100534.

European Environment Agency, "Imperviousness and imperviousness change in Europe", 20 November 2024, https://www.eea.europa.eu/en/analysis/indicators/imperviousness-and-imperviousness-change-in-europe?activeAccordion=546a7c35-9188-4d23-94ee-005d97c26f2b.

B. UHI values

Higher UHI values (i.e., larger temperature differences between urban areas and their surrounding rural or natural environments) indicate stronger heat retention in cities, leading to increased cooling demands, higher energy consumption and greater risks of heat-related health issues.

Monitoring UHI values helps in assessing the severity of the UHI effect and informs urban planning strategies, such as increasing vegetation, implementing reflective materials and improving building design to mitigate excessive heat buildup.

SCORING:

1: >2°C

2: 1.67–2°C

3: 1.34–1.66°C

4: 1–1.33°C

5: <1 °C

SOURCE:

Dirk Lauwaet et al., "High resolution modelling of the urban heat island of 100 European cities", *Urban Climate* 54 (2024): 101850, https://doi.org/10.1016/j.uclim.2024.101850.

2 Green space

This indicator focuses on the presence, distribution and accessibility of parks, forests and other vegetated areas within a city, assessing their role in enhancing the environment and social well-being.

A. Total area covered by green space

Adequate provision of green space supports biodiversity, mitigates the UHI effect, improves air quality, and provides residents with opportunities for recreation and physical activity. Access to greenery also enhances mental well-being and strengthens social cohesion by offering inclusive public spaces.

This metric should be assessed alongside the distribution of green space, ensuring that all residents live within a reasonable walking distance of a park or garden. This links directly to health outcomes and environmental resilience.

SCORING:

1: <15%

2: 15–20%

3: >20–30%

4: >30–50%

5: >50%

SOURCE:

Evelise Pereira Barboza et al., "Green space and mortality in European cities: A health impact assessment study," *Lancet Planet Health* 5 (2021): e718–e730, http://ecodes.org/images/que-hacemos/01.Cambio_Climatico/Incidencia_politicas/Clean_Cities_Campaign/Pereira_et_al_2021_Green_space_and_mortality_TLPlanet_Oct2021.pdf.

3 Blue space

This indicator looks at the presence, distribution and accessibility of water bodies such as rivers, lakes, ponds, wetlands and coastal areas within a city, assessing their contribution to environmental and social well-being.

Blue spaces play a crucial role in climate regulation, biodiversity support and water management, while also providing recreational, aesthetic and mental health benefits. Well-integrated blue spaces enhance urban resilience by mitigating flooding, cooling surrounding areas and improving overall environmental quality.

A. Total area covered by blue space

The extent to which blue spaces cover the total area reflects a city's commitment to preserving natural water resources and promoting sustainable water management. Higher coverage of blue spaces enhances ecological diversity, mitigates extreme temperature and contributes to healthier cities with stronger urban resilience.

As with green space, distribution and accessibility matter as much as overall coverage. Blue spaces can provide significant climate adaptation benefits, but care should be taken to ensure equitable access and balance ecological protection with recreational use.

SOURCE:

Clemens Deilmann et al., "A multifactorial GIS-based analytical method to determine the quality of urban green space and water bodies", *Urbani Izziv* 26, supplement (2015), https://www.researchgate.net/publication/306308729_A_Multifactorial_GIS-Based_Analytical_Method_to_Determine_the_Quality_of_Urban_Green_Space_and_Water_Bodies.

SCORING:

1: <4%

2: 4–8%

3: >8–12%

4: >12–16%

5: >16%

4 Air pollution

This indicator measures the concentration of harmful pollutants in the air, assessing the overall air quality and its impact on public health, the environment and urban liveability.

Air pollution is a major environmental and public health concern, contributing to respiratory diseases, cardiovascular issues and reduced life expectancy. Monitoring air pollution levels helps cities implement effective policies to reduce emissions, promote sustainable transportation and improve overall urban air quality for a healthier population.

A. Annual average air quality index (combination of pollutants)

This metric assesses the annual average air quality index (AQI), which aggregates multiple pollutants (e.g., NO_2, $PM_{2.5}$, PM_{10}, SO_3, ozone) into a single measure of air quality.

A higher AQI indicates worse pollution levels, affecting public health and quality of life. Monitoring this metric provides a comprehensive assessment of air pollution and helps guide policy decisions to improve urban air quality.

SOURCES:

European Environment Agency, "European Air Quality Index", https://airindex.eea.europa.eu/AQI/index.html.

World Health Organization (WHO), *WHO global air quality guidelines: Particulate Matter ($PM_{2.5}$ and PM_{10}), Ozone, Nitrogen Dioxide, Sulfur Dioxide and Carbon Monoxide* (Geneva: WHO, 2021), https://iris.who.int/bitstream/handle/10665/345329/9789240034228-eng.pdf.

SCORING:

1: Very or extremely poor ($PM_{2.5}$: ≥ 91; PM_{10}: ≥ 196; O_2: ≥ 161; NO_2: ≥ 101; SO_2: ≥ 191)

2: Poor ($PM_{2.5}$: 51–90; PM_{10}: 121–195; O_2: 121–160; NO`: 61–100; SO_2: 126–190)

3: Moderate ($PM_{2.5}$: 16–50; PM_{10}: 46–120; O_2: 101–120; NO_2: 26–60; SO_2: 41–125)

4: Fair ($PM_{2.5}$: 6–15; PM_{10}: 16–45; O_2: 61–100; NO_2: 11–25; SO_2: 21–40)

5: Good ($PM_{2.5}$: 0–5; PM_{10}: 0–15; O_2: 0–60; NO_2: 0–10; SO_2: 0–20)

* Measured in µg/m³

5 Noise pollution

Excessive noise exposure contributes to stress, sleep disturbances, cardiovascular diseases, and reduced well-being. Monitoring noise pollution helps cities implement mitigation measures such as traffic calming, sound barriers and urban planning strategies to create healthier and more liveable environments.

A. Annual average level of noise per day

By measuring the annual average day-evening-night-weighted noise level (Lden) that residents are exposed to over 24 hours, which is expressed in decibels (dB), cities can account for long-term noise exposure, with more weight given to evening and nighttime levels when noise can be more disruptive.

High Lden values indicate significant noise pollution, affecting residents' health and comfort. Tracking this metric helps guide noise reduction policies, zoning regulations and infrastructure planning to minimise harmful noise exposure in urban areas.

SCORING:

1: > 55 dB Lden

3: 50–55 dB Lden

5: < 50 dB Lden

SOURCE:

International Energy Agency, "Global EV Outlook 2024: Outlook for electric mobility", n.d., https://www.iea.org/reports/global-ev-outlook-2024/outlook-for-electric-mobility.

6 Share of renewable energy in transport

The share of renewable energy in transport looks at the extent to which a city's transportation system relies on clean, renewable energy sources, reducing dependence on fossil fuels and lowering emissions from mobility.

Transitioning to renewable energy in transport is crucial for reducing greenhouse gas emissions, improving air quality and promoting sustainability. A higher share of clean energy in public and private transport decreases urban pollution, enhances energy efficiency and supports climate resilience. By tracking the adoption of renewable energy-powered buses, taxis and private vehicles, cities can evaluate the effectiveness of their sustainable mobility policies and infrastructure investments, supporting cleaner urban air, public health improvement, greenhouse gas reduction and climate targets.

A. PT buses on clean energy

This metric measures the percentage of public bus fleet vehicles powered by clean energy—including those that are battery-electric (BEVs), plug-in hybrid (PHEVs), hydrogen fuel cell (FCEVs), and others that utilise low- or zero-emission technologies—out of the total number of buses operated by public or contracted transit agencies in a city.

High proportions of PT buses on clean energy in a fleet suggest significant progress in the transition to clean-energy bases, contingent upon the decarbonisation of the local energy grid.

SCORING:

1: <10%

2: 10–20%

3: >20–30%

4: >30–50%

5: >50%

SOURCE:

International Energy Agency, "Global EV Outlook 2024: Outlook for electric mobility", n.d., https://www.iea.org/reports/global-ev-outlook-2024.

B. Taxis on clean energy

This metric measures the percentage of registered taxis powered by clean energy—including BEVs, PHEVs and FCEVs—relative to the total number of taxis in a city and reflects the extent of the fleet transition. Smaller proportions could indicate cities in the early stages of transition, while larger shares could reflect major fleet transitions and strong policy backing for clean energy vehicles.

SCORING:

1: <5%

2: 5–20%

3: >20–35%

4: >35–50%

5: >50%

SOURCES:

International Energy Agency, "Global EV Outlook 2024: Outlook for electric mobility", n.d., https://www.iea.org/reports/global-ev-outlook-2024/outlook-for-electric-mobility.

Robin Whitlock, "UK Government to help more black cab drivers go green with further funding support," *Renewable Energy Magazine*, 21 February 2024, https://www.renewableenergymagazine.com/electric_hybrid_vehicles/uk-government-to-help-more-black-cab-20240221.

C. EVs in total vehicle fleet

This metric measures the percentage of EVs in the total registered vehicle fleet of a city or metropolitan area overall—including BEVs, PHEVs and FCEVs—and reflects the degree of electrification in private, commercial and institutional road transport.

A higher proportion of EVs suggests the mainstreaming of electric mobility, beyond public or professional fleets, and highlights policy effectiveness and market readiness, as well as shifts in consumer behaviour.

SCORING:

1: <5%

2: 5–10%

3: >10–20%

4: >20–30%

5: >30%

SOURCES:

International Council on Clean Transportation (ICCT), *Market Spotlight—European Market Monitor, Cars and Vans: May 2025* (ICCT, 2025), https://theicct.org/wp-content/uploads/2025/06/ID-409-—-high-EU-cars-May-Market-Spotlight-A4-70167-v4.pdf.

International Energy Agency, "Global EV Outlook 2024: Outlook for electric mobility", n.d., https://www.iea.org/reports/global-ev-outlook-2024/outlook-for-electric-mobility.

SOCIAL AND HEALTH

1 Spaces that promote outdoor usage and active lifestyle

This indicator measures the effectiveness of public spaces in promoting outdoor usage and active lifestyles through infrastructure provision.

Spending time outdoors can result in improved well-being and increased physical activity. How long people spend outdoors can be dependent on the attractiveness of public spaces, due to the key role they play in serving as vital hubs for community engagement, recreation and physical activities. When well-designed and integrated into neighbourhoods, public spaces can encourage more time spent outdoors, thereby enhancing health, community vibrancy and social cohesion.

A. Average dwell time in the area

This metric measures how long people dwell or stay in a public space on average, to assess a space's attractiveness, level of comfort, and ability to support social interaction and active lifestyles.

A higher dwell time suggests that the space is engaging, well designed and provides amenities that encourage people to linger, fostering community connections and promoting outdoor activity.

SCORING:

1: <2 min

2: 2–10 min

3: >10–20 min

4: >20–30 min

5: >30 min

SOURCES:

UN-Habitat, *Healthier Cities and Communities Through Public Spaces: A guidance paper* (Nairobi: UN-Habitat, 2025), https://unhabitat.org/sites/default/files/2025/01/final_public_space_and_urban_health.pdf.

Vikas Mehta, *A Toolkit for Performance Measures of Public Space* (published in conjunction with the 43rd ISOCARP Congress, 2007), https://www.isocarp.net/Data/case_studies/983.pdf.

B. Provision of sufficient public seating infrastructure

This metric measures the provision of and distance between public seating infrastructure. Regular seating, provided at shorter intervals, enhances accessibility by supporting the needs of diverse populations, including older adults and people with disabilities. This makes spaces more inclusive and encourages time spent outdoors.

SCORING:

1: >300 m of spacing

3: 150–300 m of spacing

5: 50–<150 m of spacing

SOURCES:

UN-Habitat, *Healthier Cities and Communities Through Public Spaces: A guidance paper* (Nairobi: UN-Habitat, 2025), https://unhabitat.org/sites/default/files/2025/01/final_public_space_and_urban_health.pdf.

United Nations, *Accessibility for the Disabled: A Design Manual for a Barrier-Free Environment* (prepared by the Ministry of Social Affairs National Committee for the Disabled, United Nations Economic and Social Commission for Western Asia, and SOLIDERE, 2003), https://www.un.org/esa/socdev/enable/designm/index.html.

C. Proportion of public space dedicated to play areas

This metric measures the percentage of public space dedicated to recreation in the form of play areas for different demographic groups—such as chess tables, table tennis tables and children's playgrounds.

Public spaces with a higher proportion of play areas that cater to diverse demographics enhance their attractiveness and encourage greater use.

SCORING:

1: <2%

2: 2–5%

3: >5–8%

4: >8–10%

5: >10%

SOURCE:

UN-Habitat, *Healthier Cities and Communities Through Public Spaces: A guidance paper* (Nairobi: UN-Habitat, 2025), https://unhabitat.org/sites/default/files/2025/01/final_public_space_and_urban_health.pdf.

2 User profile mix

This indicator reflects the demographic diversity of people living in or using an area, considering factors such as age, gender, household structure and income levels—as calculated using the Shannon Diversity Index (H'), which can be applied to quantify both the range of groups present and the balance among them. This helps to assess how inclusive and socially balanced a neighbourhood or public space is.

A diverse user profile indicates an inclusive and well-integrated urban environment where people of different backgrounds, ages and economic situations can coexist and thrive. High diversity fosters social cohesion, reduces segregation, and enhances the vibrancy and resilience of a community. By ensuring a balanced mix of users, cities can create spaces that cater to varied needs, promote equity and encourage a rich social and economic environment.

A. Diversity of genders and ages of users in the area

This metric assesses how balanced and varied the mix of age groups and genders is within a given space. It is calculated in terms of H', with a higher score indicating a more inclusive and representative user mix, suggesting that the space is accessible and welcoming to a wide spectrum of residents.

While the index provides a useful composite measure, cities should also monitor specific group participation (e.g., women, children, persons with disabilities) to ensure vulnerable users are adequately represented. Results should be interpreted alongside qualitative user feedback and accessibility audits.

SCORING:

1: 0–0.3 H'

2: >0.3–0.75 H'

3: >0.75–1.1 H'

4: >1.1–1.4 H'

5: >1.4–1.6 H'

SOURCES:

Richard Wright, Mark Ellis and Gemma Catney, "The age of diversity: The neighbourhood demographic structure of ethnic groups in England and Wales, 2001–2021", *Transactions of the Institute of British Geographers* Early View (2025): e70014, https://doi.org/10.1111/tran.70014.

Steven R. Holloway, Richard Wright and Mark Ellis, "The racially fragmented city? Neighbourhood racial segregation and diversity jointly considered", *The Professional Geographer* 64 (2012): 63–82, https://www.tandfonline.com/doi/epdf/10.1080/00330124.2011.585080.

B. Diversity of household incomes in the area

This metric measures the economic diversity of residents, reflecting whether an area includes a mix of low-, middle- and high-income households. It is calculated in terms of H', with a higher score indicating economic inclusivity, which reduces the risks of segregation and fosters a more integrated and socially cohesive environment. Ensuring a mix of income levels supports local businesses, prevents economic displacement and promotes equity in access to services, opportunities and public amenities.

SCORING:

1: 0–0.3 H'

2: >0.3–0.75 H'

3: >0.75–1.1 H'

4: >1.1–1.4 H'

5: >1.4–1.6 H'

SOURCES:

Richard Wright, Mark Ellis and Gemma Catney, "The age of diversity: The neighbourhood demographic structure of ethnic groups in England and Wales, 2001–2021", *Transactions of the Institute of British Geographers* Early View (2025): e70014, https://doi.org/10.1111/tran.70014.

Steven R. Holloway, Richard Wright and Mark Ellis, "The racially fragmented city? Neighbourhood racial segregation and diversity jointly considered", *The Professional Geographer* 64 (2012): 63–82, https://www.tandfonline.com/doi/epdf/10.1080/00330124.2011.585080.

C. Diversity of household types in the area

This metric measures the diversity of household structures, such as single-person households, families with children, multi-generational households and shared living arrangements. It is calculated in terms of H', with a higher score suggesting a well-balanced community that accommodates various lifestyles and needs. Promoting a mix of household types contributes to neighbourhood resilience, social stability and a richer local economy by ensuring services and infrastructure are designed to serve different population segments effectively.

SCORING:

1: 0–0.3 H'

2: >0.3–0.75 H'

3: >0.75–1.1 H'

4: >1.1–1.4 H'

5: >1.4–1.6 H'

SOURCES:

Richard Wright, Mark Ellis and Gemma Catney, "The age of diversity: The neighbourhood demographic structure of ethnic groups in England and Wales, 2001–2021, *Transactions of the Institute of British Geographers* Early View (2025): e70014, https://doi.org/10.1111/tran.70014.

Steven R. Holloway, Richard Wright and Mark Ellis, "The racially fragmented city? Neighbourhood racial segregation and diversity jointly considered", *The Professional Geographer* 64 (2012): 63–82, https://www.tandfonline.com/doi/epdf/10.1080/00330124.2011.585080.

3 Accessibility to urban public space

This indicator assesses the availability of, and ease of access to, public spaces such as parks, gardens, plazas and recreational areas. This ensures that residents can engage in social, cultural and leisure activities within close proximity to their neighbourhoods.

Access to well-distributed public spaces enhances social interaction, mental and physical well-being, and overall urban liveability. Equitable access to these spaces promotes inclusivity, reduces social disparities and supports environmental sustainability by providing green infrastructure that mitigates the UHI effect and improves air quality.

A. Area of urban public space per resident within a radius of 700 m (15-min walk) of their residence

A higher value of public space (e.g., parks, gardens, outdoor spaces, play areas) per capita indicates better spatial distribution of, and more equitable access to, urban public spaces. Such spaces strengthen social cohesion, enhance environmental benefits and support sustainable urban development by encouraging active lifestyles, fostering community connections and improving mental health.

SCORING:

1: <1 m^2 of urban public space/ capita

2: 1–4 m^2 of urban public space/ capita

3: >4–7 m^2 of urban public space/ capita

4: >7–10 m^2 of urban public space/ capita

5: >10 m^2 of urban public space/ capita

SOURCES:

Alexander Ståhle and CEO Spacescape, *Developing Public Space and Land Values in Cities and Neighbourhoods*, UN-Habitat Discussion Paper, 23 July 2018, https://unhabitat.org/sites/default/files/download-manager-files/Discussion%20Paper%20-%20Developing%20Public%20Space%20and%20Land%20Values%20in%20Cities%20and%20Neighbourhoods.pdf.

Hyunji Lee, "Quantifying public spaces for better quality of urban assets," *World Bank Blogs*, 24 October 2018, https://blogs.worldbank.org/en/sustainablecities/quantifying-public-spaces-better-quality-urban-assets#:~:text=To%20measure%20dynamic%20characteristics%20of,lacks%20empirical%20background%20or%20references.

World Health Organization (WHO), "Health indicators of sustainable cities in the context of the Rio+20 UN Conference on Sustainable Development", 17–18 May 2012, https://www.who.int/docs/default-source/environment-climate-change-and-health/sustainable-development-indicator-cities.pdf?sfvrsn=c005156b_2.

4 Placemaking/vibrancy of public spaces

This indicator assesses the quality, inclusivity and dynamic nature of public spaces by evaluating how diverse groups of people use them, the variety of activities they support, and how they reflect local identity and culture.

Vibrant public spaces enhance community interaction, social cohesion and urban liveability by being welcoming, functional and culturally meaningful. A well-designed public space fosters inclusivity by: attracting people of different ages, genders and abilities; offering diverse activities; hosting a variety of events that activate the space; and incorporating local materials and plants that strengthen cultural identity.

A. Diversity of users observed in public spaces

This metric measures the effectiveness of place-making by evaluating social mixing or the diversity of users, in terms of age, gender, ability and culture, in public spaces. This can be done through direct observation, surveys or other forms of urban data collection and analysis.

When spaces attract people across different user groups, and support a variety of activities, they demonstrate their effectiveness in meeting broader community needs. A high diversity of users within a public space can indicate that the space is inclusive, diverse and accessible, thereby promoting coexistence and active interaction between different user groups.

SOURCES:

Jackie De Burka, "Designing for diversity: How inclusive urban spaces shape societies", *Constructive Voices*, 18 November 2024, https://constructive-voices.com/designing-for-diversity-how-inclusive-urban-spaces-shape-societies/.

Linda R. Tropp and Liora Morhayim, *Designing, Implementing, and Evaluating the Impact of Social Mixing Programmes: A Toolkit for IOM and Its Partners* (Vienna: International Organization for Migration, 2022), https://publications.iom.int/system/files/pdf/pub2022-194-r-designing-implementing-and-evaluating-the-impact-of-social-mixing-programmes.pdf.

Monika Maria Cysek-Pawlak, "Mixed use and diversity as a New Urbanism principle guiding the renewal of post-industrial districts: Case studies of the Paris Rive Gauche and the New Centre of Lodz", *Urban Development Issues* 57: 53–62, https://www.researchgate.net/publication/325584704_Mixed_use_and_diversity_as_a_New_Urbanism_principle_guiding_the_renewal_of_post-industrial_districts.

SCORING:

1: Very low (dominance of a single group in terms of age, gender or culture, with minimal interaction between groups)
2: Low (presence of some diversity of groups, but strong segregation or lack of interaction between them)
3: Medium (moderate diversity of groups with some interaction, but visible social barriers)
4: High (high diversity in age, gender and culture, with meaningful interactions between groups)
5: Very high (space is inclusive and diverse, where people of different ages, genders and cultures coexist and interact actively)

B. Diversity of uses in public spaces

This metric evaluates the multifunctionality and dynamism of a given public space by counting the range of activities and uses they support. A greater diversity of uses, such as active frontages (shops, cafés), temporary pop-up installations, and community events, reflects the degree of vibrancy and adaptability of the space. Spaces with a higher variety of uses are more inclusive, engaging and resilient. This attracts varied users throughout the day, promotes local economic activity and fosters social interaction.

SOURCE:

UN-Habitat, *Healthier Cities and Communities Through Public Spaces: A guidance paper* (Nairobi: UN-Habitat, 2025), https://unhabitat.org/sites/default/files/2025/01/final_public_space_and_urban_health.pdf.

SCORING:

1: No variety in public space use
2: 1–2 uses of public space
3: 3–5 uses of public space
4: 6–7 uses of public space
5: >7 uses of public space

C. Average number of cultural, social and recreational events in public spaces per month

This metric measures how actively public spaces are used for cultural, social and recreational activities, through the total number of events conducted per month. Such activities contribute to community engagement and urban vibrancy.

A higher number of such events indicates that public spaces are well-utilised, which fosters social interaction, local economic activity and a sense of belonging. Events like car-free days also promote sustainable mobility and environmental awareness, reinforcing the role of public spaces as dynamic, inclusive and people-centred areas.

SOURCE:

Greg Richards, "Events and urban space: a challenging relationship", *International Journal of Tourism Cities* 10.3 (2024): 1067–1081, www.emerald.com/insight/content/doi/10.1108/ijtc-12-2023-0270/full/pdf?title=events-and-urban-space-a-challenging-relationship.

SCORING:

1: 0–2 events
2: 3–8 events
3: 9–12 events
4: 13–18 events
5: >18 events

5 Community engagement/participatory planning

This indicator assesses the engagement of the local community in the formulation of policies that promote sustainable mobility initiatives.

Communities and local residents understand the specific needs and challenges of their area. Early engagement of these stakeholders can increase the likelihood of buy-in, leading to the success of initiatives. It also ensures that the diverse voices of the community are represented, which can foster greater trust between the public and government.

A. Number of public consultations for feedback sessions

This metric is a quantitative measure of the number of sessions conducted to gather public feedback for mobility related projects. The quantity is measured per project. At the same time, having quality consultation sessions can result in more detailed discussion and feedback, and improved transparency in the planning process.

SCORING:

1: <2 consultations
2: 2 consultations
3: 3 consultations
4: 4 consultations
5: >4 consultations

SOURCES:

United Nations Human Settlements Programme (UN-Habitat), *Inclusive and Sustainable Urban Development Planning: A Guide for Municipalities*, Volume 3 (Nairobi: UN-Habitat, 2007), https://unhabitat.org/sites/default/files/download-manager-files/Inclusive%20and%20Sustainable%20Urban%20Development%20Planning%20A%20guide%20for%20Municipalities%20%2C%20Volume%203.pdf.

World Bank, *Stakeholder Engagement Plan: Tonga Climate Resilience Transport Project* (World Bank, 2018), https://documents1.worldbank.org/curated/en/488641537171658332/pdf/TCRTP-Stakeholder-Engagement-Plan-final.pdf.

6 Public perception of sustainable mobility initiatives

This indicator measures the extent of public involvement and support for sustainable mobility initiatives. Public perception is critical for building legitimacy, ensuring long-term behavioural change and strengthening the adoption of new mobility policies. A higher score reflects deeper levels of citizen engagement and empowerment in shaping mobility decisions.

A. Level of participation

This metric is measured in terms of the level of engagement by the city to encourage public participation in the policy formulation process. It considers not only whether citizens are informed or consulted, but also the degree to which their views influence outcomes.

Higher levels of participation indicate more collaborative and transparent governance, where residents play an active role in shaping sustainable mobility initiatives.

SOURCE:

International Association for Public Participation (IAP2), "IAP2 Spectrum of Public Participation", 2024, https://cdn.ymaws.com/www.iap2.org/resource/resmgr/pillars/iap2_spectrum_2024.pdf.

SCORING:

1: Providing the public with information
2: Consulting the public on issues (providing feedback based on acknowledged concerns)
3: Getting involved with public discussions to understand concerns while proposing solutions
4: Collaborating with the public to make a decision together, including shared development of alternatives and identification of preferred solutions
5: Empowering the public with decision-making authority

7 Commuter satisfaction scores

Commuter satisfaction scores provide a qualitative measurement of commuters' experience with the PT system and services, beyond technical performance.

Measuring commuter satisfaction through surveys provides insights into factors that directly shape commuter well-being and influence whether people continue using, or shift towards, more sustainable modes of travel.

A. Efficiency and comfort of public transport

This metric assesses key aspects of transport systems such as speed, comfort, safety, overall reliability and quality of transport journeys. The higher the score, the more satisfied a commuter is with their overall commuting experience.

Commuter satisfaction is typically assessed through recurring passenger surveys, structured focus groups, digital feedback tools or apps. In many cities, these datasets are complemented by regular customer service performance reports and longitudinal benchmark surveys, which allow changes in satisfaction to be tracked over time and across different commuter segments.

SCORING:

1: Very dissatisfied
2: Somewhat dissatisfied
3: Neutral
4: Satisfied
5: Very satisfied

SOURCES:

Observatori de la Mobilitat de Catalunya, "Customer Satisfaction Index (CSI) of TMB bus service", 2023, https://ce.atm.cat/en/web/observatori/w/eqp-bus-tmb?filterCategoryIds=undefined&operationType=AND.

Transport for London, *Customer service and operational performance report: Quarter 4* (Transport for London, 2023/2024), https://content.tfl.gov.uk/customer-service-and-operational-performance-report-quarter-4-2023-24-acc.pdf.

8 Perceived safety of streets

This indicator measures individuals' perceived safety of streets, which shapes the success of sustainable mobility initiatives by influencing both travel behaviour and societal outcomes. Safe streets can catalyse community interaction and economic activity by encouraging commuters to choose active mobility and public transport modes.

A. Perceived safety of streets by pedestrians

This metric assesses the perceived safety of streets by pedestrians. A higher score indicates that streets in their neighbourhood or precinct are perceived to be safer.

Perceptions of safety may be measured through resident or commuter surveys, using Likert-scale questions (e.g., "How safe do you feel walking in your neighbourhood?"). These could also be integrated into city quality-of-life surveys, transport user satisfaction studies, or stand-alone perception audits. This metric should be cross-checked with objective safety indicators such as accident rates, lighting and/or traffic speeds, for a fuller picture.

SCORING:

1: Pedestrians do not feel safe at all
2: Pedestrians feel safe to a small extent
3: Pedestrians feel safe to a moderate extent
4: Pedestrians feel safe to a large extent
5: Pedestrians feel very safe

SOURCES:

Eleonora Papadimitriou et al., "Road Safety Attitudes and Perceptions of Pedestrians in Europe," *Procedia – Social and Behavioral Sciences* 48 (2012): 2490–2500, https://discovery.ucl.ac.uk/id/eprint/10011936/1/Road_Safety_Attitudes_and_Perceptions_of_Pedestrians_in_Europe_2012.pdf.

European Commission, *Report on the Quality of Life in European Cities*, 2023 (Luxembourg: Publications Office of the European Union, 2023), https://ec.europa.eu/regional_policy/information-sources/maps/quality-of-life_en.

ECONOMIC

1 Economic activity generated

Sustainable mobility enhances urban economies by driving investment, increasing property values and supporting local businesses. Projects such as transit-oriented developments (TODs)—which integrate high-density, mixed-use development with efficient public transport—encourage walkability and reduce car dependency. This attracts businesses, boosts foot traffic and stimulates demand for commercial spaces, helping to create a vibrant local economy.

A. Number of events in the area that require purchase of an entry ticket

This metric measures the annual number of cultural, leisure and other events in areas influenced by sustainable mobility initiatives (e.g., around TOD nodes, business districts, pedestrianised districts, cycling corridors). Concerts, exhibitions and sporting events, for example, act as local economic multipliers, generating revenue through ticket sales, hospitality services and retail activity.

Areas with better accessibility to public transport and sustainable mobility modes make more attractive locations for events, as ease of access can increase attendance and reduce reliance on private cars.

In residential areas (e.g., superblocks, low traffic neighbourhoods), this is better reflected by the number of community and cultural events such as street markets, local festivals and temporary activations.

This metric should be interpreted alongside potential negative impacts such as rising local property values, noise or overtourism.

SCORING:

Non-residential Areas

1: <20

2: 20–40

3: 41–80

4: 81–100

5: >100

Residential Areas:

1: <5

2: 5–10

3: 11–20

4: 21–30

5: >30

This metric should be interpreted alongside transport accessibility measures to ensure events are inclusive and do not generate car-dependent travel. A high number of events reflects strong cultural and economic vitality, but must be balanced with equity and environmental goals.

SOURCES:

Future Place Leadership, *The effect of pedestrianisation and bicycles on local business: Case studies for the Tallin High Street Project* (Future Place Leadership AB, 2017), https://futureplaceleadership.com/wp-content/uploads/2017/05/Tallinn-High-Street-Case-studies-Future-Place-Leadership.pdf.

Rachel Aldred and Megan Sharkey, *Healthy Streets: A Business View* (University of Westminster, commissioned by Transport for London, 2017), https://tfl.gov.uk/cdn/static/cms/documents/healthy-streets-a-business-view.pdf.

Transport for London, *Small Change, Big Impact: A Practical Guide to Changing London's Public Spaces* (Transport for London, 2017), http://content.tfl.gov.uk/small-change-big-impact.pdf.

B. Change in revenue generated by retail/commercial activity in the area

Improved accessibility and walkability enhance customer footfall, with studies showing that people arriving on foot, by bicycle or by public transport often spend more per month in local shops than those travelling by car. Rising commercial revenues signal that sustainable mobility contributes to economic vitality, supporting both businesses and street vibrancy.

This metric should be interpreted alongside footfall data to ensure that revenue increases are not driven solely by price inflation.

SCORING:

1: No change

2: 1–5% increase

3: >5–10% increase

4: >10–15% increase

5: >15% increase

SOURCES:

New York City Department of Transportation, *The Economic Benefits of Sustainable Streets* (New York: Department of Transportation, 2013),https://ssti.us/wp-content/uploads/sites/1303/2014/01/dot-economic-benefits-of-sustainable-streets-1.pdf.

Rachel Aldred and Megan Sharkey, *Healthy Streets: A Business View* (University of Westminster, commissioned by Transport for London, 2017), https://tfl.gov.uk/cdn/static/cms/documents/healthy-streets-a-business-view.pdf.

C. Change in number of small and medium-sized enterprises (SMEs)

Measuring the growth of SMEs highlights whether sustainable mobility supports diverse local businesses, or whether smaller operators are displaced by large brands.

Rapid growth may signal vibrancy, but it can also mask higher business turnover if older businesses are being displaced.

SCORING:

1: >10% decrease
2: 0–10% decrease
3: >0–5% increase
4: >5–10% increase
5: >10% increase

SOURCE:

Rachel Aldred and Megan Sharkey, *Healthy Streets: A Business View* (University of Westminster, commissioned by Transport for London, 2017), https://tfl.gov.uk/cdn/static/cms/documents/healthy-streets-a-business-view.pdf.

D. Change in commercial space vacancy rates relative to city median

A decline in vacant commercial spaces, relative to the city median, suggests increased demand for business locations near transport hubs, signalling commercial vibrancy and a positive response to sustainable mobility investments.

Vacancy rates should be interpreted in relation to overall retail trends to avoid attributing unrelated market dynamics to mobility projects. Very low vacancy can also indicate affordability challenges for small businesses.

SCORING:

1: >5% increase
2: 0–5% increase
3: >0–5% decrease
4: >5–10% decrease
5: >10% decrease

SOURCE:

Savills, "Spotlight: European Office Development", 11 June 2024, https://en.savills.fr/research_articles/256178/362952-0.

2 Property value

This indicator measures the financial worth of real estate in a given area, reflecting factors such as demand, location desirability, infrastructure quality and economic conditions.

Property values serve as a key economic indicator as they influence investment decisions, housing affordability and urban development patterns. Higher property values often signal strong economic activity, desirable amenities and well-planned infrastructure, while rapid increases may indicate potential affordability challenges and gentrification risks. Monitoring property values helps policymakers balance economic growth with housing accessibility and equitable urban development.

A. Average purchasing value of property in the area

This metric provides insight into real estate market trends and affordability within a specific location. A rising average purchasing value may indicate increased demand, improved infrastructure or economic growth, while extremely high values can lead to affordability issues and social displacement.

Because this metric is benchmarked to the city median, it adjusts dynamically to local market conditions. A higher score does not necessarily mean a better outcome, but signals a relatively more stable housing market.

To understand whether this reflects healthy growth or affordability risks, results should be read together with complementary indicators such as price-to-income ratios or housing cost overburden rates. When interpreted in a cross-domain lens, property value trends can reveal important trade-offs between economic vitality and social equity, and should inform policies that integrate housing, mobility and urban development strategies.

SCORING:

1: >20% above median (signals strong economic growth, but could be a sign of a growing housing bubble) or below median (extremely weak demand; signals significant apparent economic decline)
2: >10–20% above median (unbalanced demand and vitality; potential gentrification and exclusion risk) or below median (signals disinvestment or weak demand; may suggest economic decline)
3: >7–10% above median (signals higher demand; growing risk of affordability) or below median (signals weaker demand)
4: 3–7% above median (signals strong desirability; may risk affordability pressures) or below median (slightly below market but relatively stable)
5: 0-3% above or below median (healthy, stable market aligned with wider city trends)

SOURCES:

Eurostat, "Housing price statistics–house price index", 2025, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Housing_price_statistics_-_house_price_index.

OECD, "OECD Affordable Housing Database", n.d., https://www.oecd.org/en/data/datasets/oecd-affordable-housing-database.html.

3 Public transport (PT) affordability

Public transport affordability is a key factor in ensuring equitable access to mobility for all socio-economic groups. An affordable transport system enables greater economic participation, social inclusion and improved quality of life. High transport costs relative to household income can disproportionately burden lower-income groups, limiting their mobility options. Sustainable transport policies should aim to keep public transport costs reasonable while maintaining financial sustainability for operators.

A. Proportion of household income spent on public transport

A lower percentage for this metric indicates greater affordability and accessibility, while a higher percentage indicates a higher cost burden.

This metric should be interpreted alongside modal share and vehicle ownership data to give a fuller picture of household transport costs. While a lower percentage may reflect stronger affordability and high PT coverage, it can also occur where PT usage is limited due to poor service or high-income households spending a lower % of household income on PT.

SCORING:

1: >4% (high-cost burden)

2: >3–4%

3: >2–3%

4: 1–2%

5: <1% (high affordability)

SOURCES:

European Environment Agency, "Are We Moving in the Right Direction? Indicators on transport and environmental integration in the EU: TERM 2000", 19 April 2016, https://www.eea.europa.eu/publications/ENVISSUENo12/page023.html.

International Association of Public Transport, "Keeping It Fare: How to Make Public Transport Fares Affordable", May 2025, https://www.uitp.org/wp-content/uploads/sites/7/2025/08/20250822_Fare-Affordability_Policy-Brief_WEB.pdf.

International Association of Public Transport (UITP) and Walk21 Foundation, *Urban Mobility Indicators for Walking and Public Transport* (UITP, Walk21 Foundation and VBK, published on behalf of the Urban Agenda for the EU, 2019), https://ec.europa.eu/futurium/en/system/files/ged/convenient-access-to-public-transport.pdf.