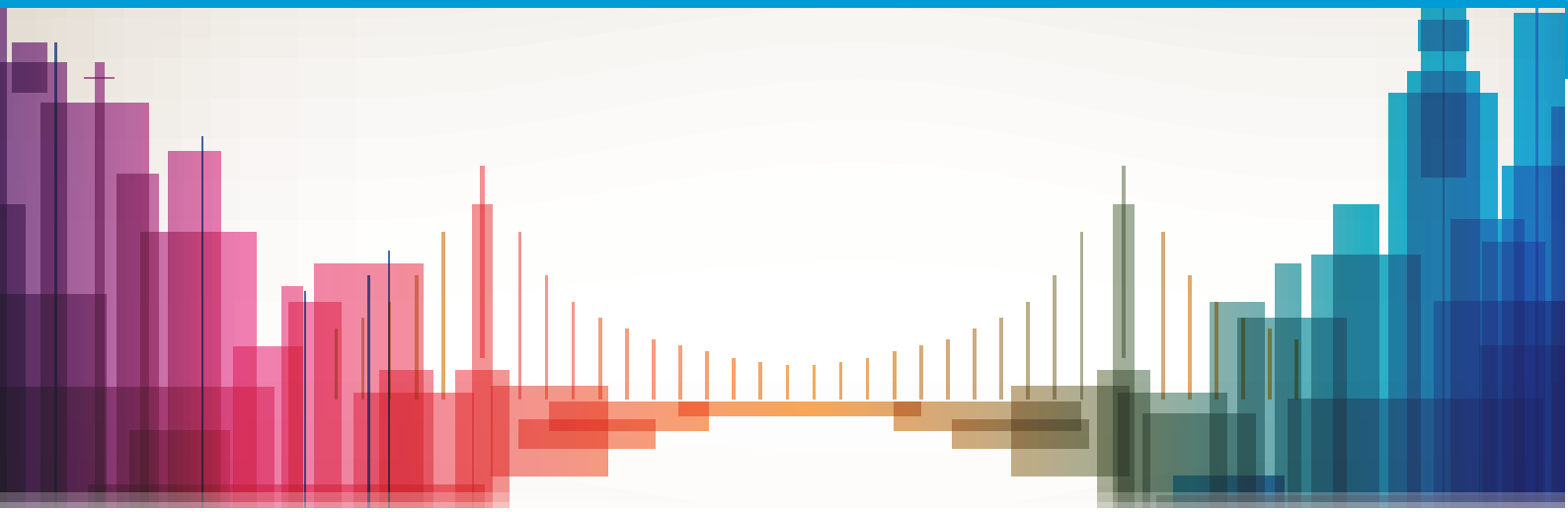
An Urban Foresight Framework for Anticipatory Governance

Exploring uncertainty. Anticipating change. Shaping better urban decisions.



Convention on Biological Diversity

United Nations ECLAC

Food and Agriculture Organization of the United Nations

ITU

UN-HABITAT

UNDP

United Nations Economic Commission for Africa

UNECE

UNIDO

unesco

UN environment programme

FINANCE UNEP INITIATIVE

United Nations Framework Convention on Climate Change

unitar United Nations Institute for Training and Research

UNFPA

United Nations | Department of Economic and Social Affairs

UNJSPF United Nations Joint Staff Pension Fund

UN OFFICE 4 PARTNERSHIPS

UNU EGOV

UN Tourism

WORLD METEOROLOGICAL ORGANIZATION



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Foreword

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Disclaimer

The opinions expressed in this publication are those of the authors and do not necessarily represent the views of their respective organizations or U4SSC members. In line with the U4SSC principles, this report does not promote the adoption and use of Smart City technology. It advocates for policies encouraging responsible use of information and communications technologies (ICTs) that contribute to the economic, environmental and social sustainability as well as the advancement of the 2030 Agenda for Sustainable Development and the Pact for the Future and its Global Digital Compact.

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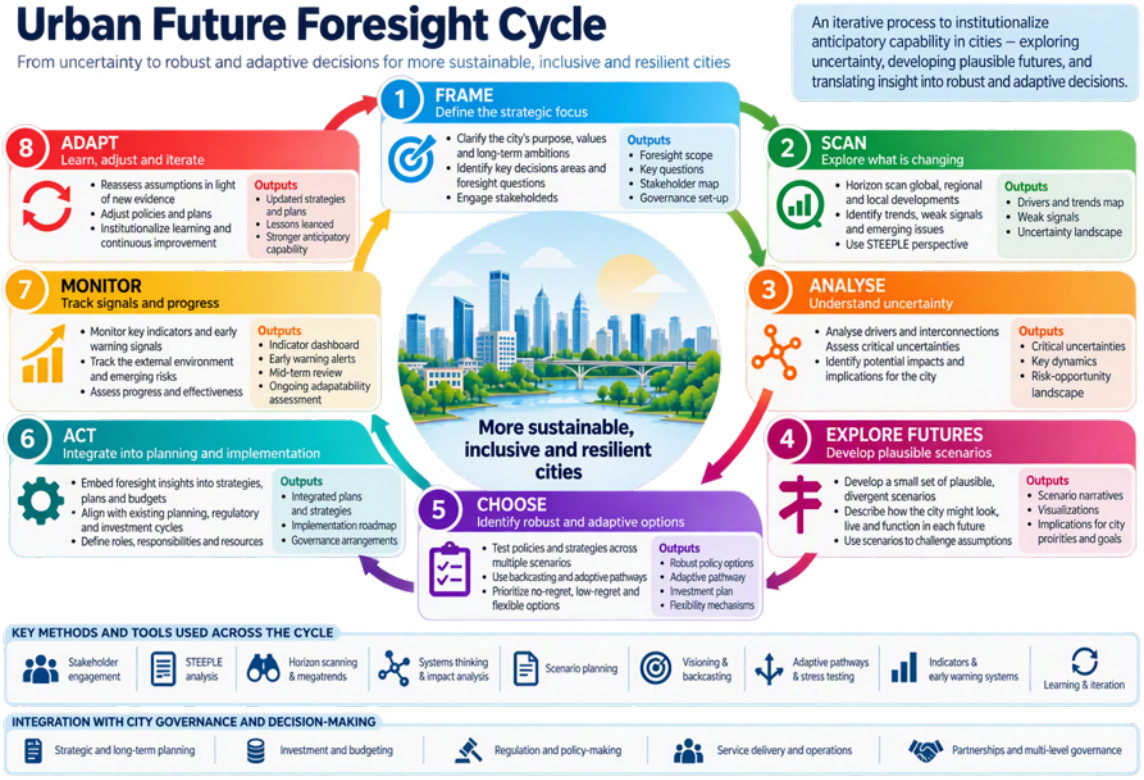
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Abbreviations and acronyms

Abbreviation	Full form
5G	Fifth-generation mobile network
6G	Sixth-generation mobile network
AI	Artificial intelligence
EPUB	Electronic publication
ICT	Information and communications technology
IoT	Internet of Things
ISBN	International Standard Book Number
KPI	Key performance indicator
MICMAC	Cross-impact matrix multiplication applied to classification
PESTLE	Political, Economic, Social, Technological, Legal and Environmental
PoC	Proof of concept
STEEPLE	Social, Technological, Economic, Environmental, Political, Legal and Ethical
U4SSC	United for Smart Sustainable Cities

Executive Summary

Figure 1: Urban Future Foresight Cycle: from uncertainty to robust and adaptive decisions



Cities cannot predict the future, but they can be ready for it.

Every city is being reshaped at once by faster technology, a changing climate, shifting populations, tighter budgets, new regulations and rising public expectations. These forces do not arrive one at a time; they collide. A decision that looks sound today, whether a transport line, a housing plan or a digital platform, may have to perform for decades in conditions that nobody can forecast with confidence. Traditional planning and forecasting remain essential, but they were built for a more stable world. The question for city leaders is no longer whether the future will surprise them. It will. The question is whether their institutions are prepared to notice change early, make sense of it and act before options narrow.

What urban future foresight is

Urban future foresight offers a disciplined answer to this question. It is not prediction, and it is not an academic exercise. It is a governance capability; a structured, repeatable way for a city to explore multiple plausible futures, understand the trade-offs and systemic risks they contain, and translate understanding into decisions that remain sound across a wide range of conditions. Cities that build

this capability gain something rare in public administration – the ability to act with confidence under uncertainty, and to adapt deliberately rather than react under pressure.

What cities gain

- **Fewer surprises.** Early warning of emerging risks and opportunities, linked to clear triggers for action.
- **Better long-term investments.** Major and hard-to-reverse decisions are tested against several plausible futures before public money is committed.
- **Policies that last.** Strategies are designed to work across a range of conditions and to be adjusted as the evidence changes.
- **Joined-up government.** Departments and agencies work from a shared picture of the futures the city must navigate.
- **Stronger public trust.** Residents, including young people, help to shape the future of their city, and trade-offs are discussed openly.

Key messages

- **Foresight is not prediction.** It is a disciplined way of preparing for several plausible futures instead of betting on one.
- **Robust beats optimal.** A strategy that performs acceptably in many futures is worth more than one that is perfect for a single future that may never arrive.
- **Foresight must lead to decisions.** Its value is realized only when it informs strategies, budgets, regulations and investments.
- **It has to be permanent.** One-off studies fade. Foresight delivers when it has a clear owner, a regular rhythm and a formal link to how the city plans and spends.
- **Every city can do it.** The framework is modular and scalable. Smaller municipalities can work through partnerships, shared services and regional networks, so that no city is left behind by an "anticipatory divide".
- **People come first.** Foresight should ask who benefits from change, who bears its costs and what the decisions of today mean for future generations.

What the framework offers

This report sets out a practical framework for building that capability. It moves from foundations, through analysis, to synthesis and decision, and finally to institutionalization because foresight that lives in a single report, a single unit or a single electoral cycle will not survive contact with the pressures it was designed to address. The ambition of the Thematic Group on Future Foresight for

Cities is that anticipatory thinking becomes a permanent, accountable function of urban governance, embedded in the machinery through which cities scan, plan, budget, regulate, invest and learn.

The framework is organized into four parts:

- Part I establishes core concepts and design principles.
- Part II provides an analysis playbook, including framing, drivers of change, horizon scanning, emerging technologies, and scenario development.
- Part III translates analysis into decision support through visioning, options and policy pathways under uncertainty, and integration into city strategies and plans.
- Part IV focuses on institutionalization, including organizational models, governance mechanisms, data and tools, capability building, stakeholder participation, monitoring and learning, and a phased roadmap for adoption. Appendix A provides a compendium of selected foresight methods.

This document is designed to be modular and applicable at multiple scales. It may be used for citywide foresight, district-level foresight, or domain foresight (for example: mobility, housing, digital services, public safety, health, climate resilience and economic development). Users may adopt the full operating model or implement components in phases.

Where city leaders can start

- **Give foresight an owner and a mandate.** Name a senior sponsor and a small team, in-house or through partners.
- **Start with one decision that matters.** Take a major investment, strategy or regulation and test it against several plausible futures.
- **Set a simple rhythm.** Review signals of change every month, brief leadership every quarter and refresh scenarios every year.
- **Connect foresight to strategy and budget cycles.** Make sure that findings reach the people who can act on them.
- **Bring residents in.** Involve young people and the communities most exposed to change from the outset.
- **Measure and learn.** Track whether foresight is changing decisions, and adjust.

No framework can remove uncertainty. What it can do is make uncertainty an explicit and manageable part of public decision-making rather than an unexamined source of vulnerability. Cities that build this capability will not simply react to the future; they will help to shape it.

How to use this document

This document is intended for use by city governments, metropolitan authorities, and urban-sector institutions. It supports leadership decision-making, as well as practitioner delivery. The framework is designed to be applied iteratively and to be integrated into existing strategy, planning, regulatory, and investment cycles.

- Senior leadership: Use the Executive Summary and Parts I and III to align on purpose, governance value, and decision implications.
- Foresight practitioners and analysts: Use Part II as a repeatable method playbook for scanning, synthesis, and scenario design.
- Sector owners: Use the framing guidance to tailor foresight to domain priorities and implementation pathways.
- Governance bodies: Use Part IV to institutionalize future foresight including cadence, accountability, repositories, and learning loops.
- External partners: Use the engagement and transparency guidance to coordinate participation and co-production.

A companion compendium of city case studies will be published separately. Short examples drawn from three of those case studies appear in this document as Boxes 1 to 3.

Definitions and core concepts

This section provides operational definitions to support consistent terminology across agencies and partners. Definitions are intended for use in governance documents, terms of reference, and reporting templates.

Term	Operational Definition
Urban future foresight	A structured capability enabling cities to explore multiple plausible futures, assess systemic implications, and inform robust and adaptive decision-making.
Anticipatory governance	Governance arrangements that institutionalize forward-looking intelligence, scenario-based deliberation, and adaptive policy tools to manage uncertainty over time.
Scenario	A plausible and internally consistent description of how the future might unfold under uncertainty. Scenarios are not forecasts.
Robustness	The extent to which a policy, strategy, or investment performs acceptably across multiple plausible futures, rather than being optimized for a single expected future.
Known unknowns	Uncertainties that can be specified today but whose direction, timing, or magnitude are not yet known.

Term	Operational Definition
Wild card	A low-probability but high-impact event capable of reshaping assumptions and outcomes.
Deep uncertainty	A condition in which the range of plausible futures is wide, the probabilities of specific outcomes cannot be reliably estimated, and structural change can invalidate the assumptions on which existing plans were built.
Driver of change	An underlying force that shapes how a city evolves over time.
Trend	A sustained directional pattern derived from clusters of verified signals.
Weak signal	An early indicator of emerging change that may be ambiguous, fragmented or localized.
Critical uncertainty	A high-impact factor whose future direction is uncertain and which can generate divergent futures.
Horizon scanning	The systematic detection and interpretation of signals, weak signals and emerging issues.
Backcasting	Working backward from a future scenario to identify the milestones and actions required to reach it.
No-regret action	An action that delivers value across all or most plausible futures and can therefore be taken with confidence under uncertainty.

Core concepts emphasized throughout the framework include systems thinking, multihorizon analysis, inclusive participation, evidence-informed imagination, ethical deliberation, and continuous learning.

PART I – FOUNDATIONS OF URBAN FUTURE FORESIGHT

Part I establishes the rationale, scope, and guiding principles for urban future foresight. It positions future foresight as an enabling governance function and institutional discipline.

1 Purpose and Scope of Urban Future Foresight

1.1 Why future foresight matters for cities

Urban governments operate today at the intersection of several simultaneous and interacting transformations and govern under conditions of deep uncertainty. Technological acceleration in artificial intelligence, connectivity, sensing, automation and digital platforms is changing how services are delivered, how infrastructure is operated and how citizens relate to government, at a pace that routinely outstrips regulatory and organizational adaptation. Climate volatility is converting what were once treated as exceptional events, such as heatwaves, floods, droughts and storms, into recurring operating conditions with direct consequences for infrastructure, public health, insurance and municipal finance. Demographic shifts, including ageing, migration, changing household structures and evolving labour markets, are reshaping the demand side of nearly every urban service. Fiscal constraints are narrowing the room for manoeuvre precisely when investment needs are growing, while regulatory change at national and supranational levels continuously redraws the boundaries of local action. Meanwhile, citizen expectations of responsive, transparent, digital and participatory government continue to rise.

None of these pressures is new in isolation. What is new is their simultaneity and their interaction. A change in energy prices alters mobility behaviour; a new digital platform reconfigures housing markets; a climate event triggers migration that reshapes school and health demand; a national regulation changes the economics of a municipal investment made a decade earlier. The result is an environment characterized by deep uncertainty: a condition in which the range of plausible futures is wide, the probabilities of specific outcomes cannot be reliably estimated, and structural change can invalidate the assumptions on which existing plans were built.

Cities are complex socio-technical systems where infrastructure, services, markets, and behaviours interact. Urban decisions shape long-lived outcomes. They create path dependencies that persist for decades. Consequently, uncertainty is not a peripheral consideration; it is central to good governance.

Future foresight improves decision quality by expanding the range of plausible futures considered in planning and policy. It reduces the risk of lock-in to a single assumed trajectory, strengthens preparedness and resilience, and enables proactive approaches to emerging risks (e.g., climate extremes, cyberthreats, disruptive innovation).

In addition to improving resilience, future foresight can enhance competitiveness and quality of life by identifying early opportunities for innovation, new economic models, and service redesign. The most effective applications link foresight directly to decision points such as regulatory reviews, capital investments, programme portfolios, and strategic initiatives.

1.2 From forecasting to anticipatory governance

The dominant planning instruments of most city administrations, such as demand forecasts, master plans and multi-year investment programmes, remain indispensable, but they were designed for environments of relative stability. Forecasting extrapolates from historical data and performs well when the underlying system behaves tomorrow broadly as it behaved yesterday. Under deep uncertainty, shocks and structural change, extrapolation systematically fails: it produces single-point predictions that create false confidence, concentrates attention on the most probable future at the expense of the most consequential ones, and leaves institutions unprepared for discontinuities that were visible, in retrospect, as weak signals long before they materialized.

Urban future foresight addresses this gap. Rather than asking "what will happen?" foresight asks "what could plausibly happen, what would it mean for us, and what should we do now so that we are robust and adaptive across that range?". It is, therefore, positioned in this report as four things at once: a structured governance function, with defined owners, cadences and decision rights; a decision-support capability, feeding strategies, plans, budgets, investments and regulation; a resilience and preparedness mechanism, linking anticipation to early warning and contingency; and a means of improving cross-agency coherence and long-term accountability, by giving the whole administration a shared picture of the futures it must navigate.

Anticipatory governance recognizes that uncertainty cannot be eliminated and therefore institutionalizes continuous sensing, scenario-based deliberation, and adaptive policy instruments. Under anticipatory governance, future foresight becomes a routine component of strategy and policy cycles, complementing monitoring and evaluation, risk management, and performance governance.

Future foresight is positioned as a bridge between intelligence and action: it converts signals and uncertainties through structured analysis into robust policy pathways, supported by monitoring indicators and learning loops.

1.3 Urban complexity and uncertainty

Urban systems exhibit complex adaptive behaviour: multiple urban actors respond to incentives and constraints, producing feedback loops and emergent outcomes. Non-linearity is common: small interventions can trigger disproportionate impacts, and large investments can underperform if they ignore systemic interactions.

Uncertainty arises from interaction across domains (e.g., mobility and land use, energy and digitalization, climate and public health). It also arises from external drivers such as geopolitics, supply chain disruptions, and national policy shifts. Cities should, therefore, adopt methods that recognize interdependencies and do not assume stable conditions.

1.4 Purpose and scope

The purpose of this document is to provide cities with a practical governance framework for institutionalizing urban future foresight as a permanent capability rather than a one-off exercise. It explains how a city can systematically explore uncertainty, develop plausible future scenarios, translate insight into robust and adaptive decisions, and embed the whole cycle into day-to-day governance. The framework is deliberately modular: it can be applied citywide, at district or neighbourhood level, or within specific domains such as mobility, housing, digital services, climate resilience, health or economic development. It is also scalable, usable by large metropolitan administrations with dedicated foresight units and by smaller municipalities working through partnerships and shared services.

1.5 Relationship to urban planning, strategy, and policy cycles

Urban planning, master planning, and sector strategies often operate on fixed cycles and may assume continuity. Future foresight adds value by challenging baseline trajectories, surfacing discontinuities, and enabling robustness testing across multiple plausible conditions.

Integration points should be explicit. Recommended integration points may include, among others, strategy formulation and refresh; regulatory review cycles; capital investment appraisals; and major procurement decisions.

The framework also supports a "learning city" approach by creating a continuous improvement loop across planning cycles.

1.6 Scope of application (city, local)

The framework may be applied at multiple scales. Citywide application addresses cross-sector interdependencies and overarching governance questions. Local application may focus on districts, corridors, and vulnerable zones with distinct risk profiles or service needs.

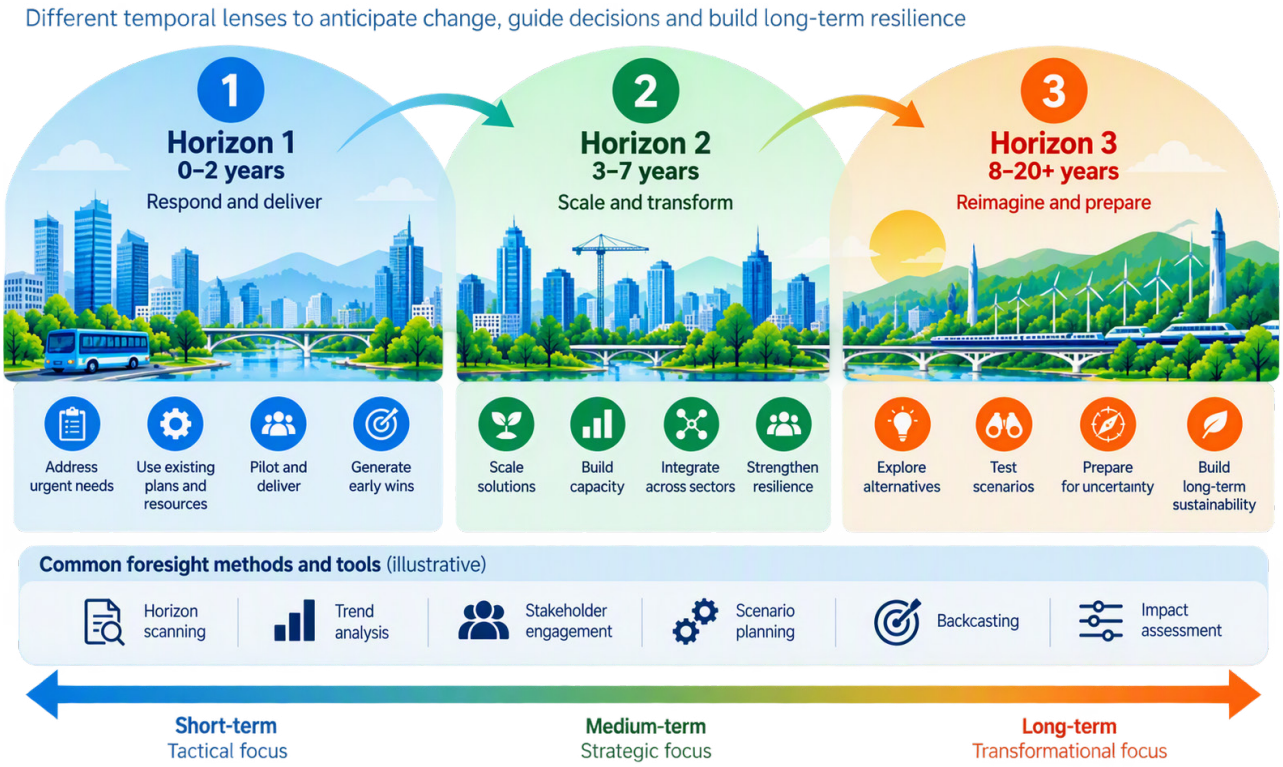
Sectoral application is recommended for domains where rapid change or high stakes are present (e.g., mobility, health care, education).

A phased approach is recommended whereby cities can build practitioner capability and credibility in a limited scope and then scale up through governance mechanisms.

2 Principles and Design Criteria

2.1 Long-term orientation and multihorizon thinking

Figure 2: Three time horizons for urban foresight



Urban interventions often have long-lived consequences. Infrastructure assets can remain in place for 20–50 years, while land-use decisions can shape affordability and mobility for generations. A long-term orientation is, therefore, a governance necessity, not an optional strategic preference.

Multihorizon thinking distinguishes between short-term operational improvements, medium-term transitions, and long-term structural shifts. It ensures that near-term gains do not compromise long-term resilience, sustainability, and equity.

Operationally, this framework recommends defining at least three time horizons: short (e.g., 0–2 years), medium (e.g., 3–7 years), and long (e.g., 8–20+ years), and explicitly mapping which drivers and decisions operate in each horizon.

2.2 Inclusivity and legitimacy

Urban futures are experienced differently across populations. Inclusivity is essential to legitimacy. Participation should include diverse socio-economic groups, youth, persons with disabilities, local businesses, and sector representatives.

Inclusive processes reduce blind spots and improve feasibility by contextualizing future foresight and incorporating local knowledge and lived experience. They also strengthen trust by making trade-offs explicit and by ensuring transparency on how inputs influence decisions.

2.3 Evidence-based yet imaginative exploration

Future foresight requires disciplined imagination. Evidence anchors analysis in plausible mechanisms and constraints, while imagination enables exploration of novel combinations and discontinuities that may not be visible through current data.

Triangulation is recommended: combine quantitative indicators, qualitative expert judgments, and participatory insights.

Narratives and prototypes may be used to make scenarios tangible, provided they remain consistent with the scope and do not imply unjustified certainty.

2.4 Robustness over optimization

Optimization assumes relatively stable conditions and a single goal. Urban governance requires balancing multiple objectives (equity, resilience, sustainability, competitiveness, safety) under uncertain conditions. Robustness therefore becomes the preferred design criterion.

Robust strategies perform acceptably across multiple plausible futures. They rely on no-regret actions, flexible investments, modular architectures, and adaptive regulations. They also include contingency options that can be activated if indicators shift.

Robustness assessment should be explicit, using scenario-based stress testing and transparent criteria for acceptable performance.

2.5 Adaptivity and continuous learning

Adaptivity converts future foresight from a report into an operating model. It requires monitoring systems, early warning indicators, periodic synthesis, and governance triggers for review and adjustment.

Learning loops should capture implementation lessons as well as changes in external conditions. Institutional memory is strengthened through structured and repeatable methods.

Policies can be designed as adaptive instruments through review clauses, staged deployment, regulatory sandboxes, and modular procurement structures.

2.6 Ethical, social, and intergenerational considerations

Urban future foresight should address ethics and intergenerational equity. Technologies and policies can create unequal impacts and may affect rights, privacy, access, and distributive outcomes. Ethical future foresight requires early identification of potential harms and mitigation mechanisms.

Intergenerational considerations require evaluation of long-term burdens and benefits, including climate risks, debt-financed investments, and irreversible environmental impacts. It also requires representing future residents and youth perspectives in participation mechanisms. Where relevant, risk assessments should be aligned to applicable legal and human rights standards.

PART II – ANALYSIS: SYSTEMIC EXPLORATION OF URBAN FUTURES

Part II provides a structured analysis for exploring urban futures. It covers framing, drivers of change, trends and signals, key uncertainties, horizon scanning, emerging technologies and scenario development, with emphasis on traceability, plausibility, and decision relevance.

3 Framing the Future Foresight Question

3.1 Defining strategic urban challenges

The framing stage clarifies what decisions the future foresight activity will support. A well-defined challenge is expressed as a governance question, not solely as a technical problem.

Framing should identify why the issue is strategic: the scale of potential impact, the degree of uncertainty, and the risk of lock-in. It should also specify what success looks like from a public value perspective (for example: equity, resilience, affordability, safety, sustainability).

Framing can include: (i) decision context; (ii) scope and boundaries; (iii) time horizons; (iv) stakeholder map; (v) assumptions and uncertainties; and (vi) integration plan.

3.2 Determining time horizons (short, medium, long term)

Time horizons determine which drivers matter most, which interventions are feasible, and how uncertainty should be treated. Short horizons prioritize operational and regulatory readiness. Medium horizons address transitions and capability building. Long horizons explore structural transformations and irreversible risks.

Horizon selection should reflect asset lifecycles, fiscal cycles, and statutory planning timelines. Digital systems may evolve within months, whereas physical infrastructure and land use evolve over decades. A multihorizon approach helps reconcile these tempos within a coherent governance approach.

Practitioners of future foresight can define horizon-specific outputs, such as near-term operational scenarios; medium-term transition pathways; and long-term stress-test scenarios for resilience, climate, and institutional legitimacy.

3.3 Spatial scales and functional boundaries

Urban challenges often cross administrative boundaries and include regional dependencies. Scoping should define the spatial unit (city, metro, district, corridor) and functional boundary (mobility, housing, energy, water, digital services, public safety, or cross-cutting resilience).

Functional boundaries should explicitly account for interdependencies. For example, mobility transitions affect land use, energy demand, air quality, and equity. Digital infrastructure affects service continuity, economic competitiveness, and emergency response.

Boundary definitions should identify adjacent systems and external dependencies that may produce spillover effects.

3.4 Key assumptions and known unknowns

Assumptions should be made explicit to reduce hidden dependencies and cognitive bias. Assumptions may relate to, among others, demography, economic growth, climate conditions, technology adoption, or regulatory stability.

Known unknowns are uncertainties that can be described but not resolved at the outset. They should be captured with an initial assessment of potential impact and uncertainty.

Assumptions and known unknowns should be revisited. When major assumptions change, the implications for strategies and pathways should be reassessed.

3.5 Key uncertainties and volatility factors

Critical uncertainties are high-impact factors whose future direction is uncertain and which can generate divergent futures. Volatility factors include the timing and magnitude of shocks such as extreme weather events, cyberincidents, market crashes, or geopolitical disruptions.

The recommended approach is to rank uncertainties by impact and uncertainty, select a limited set for scenario axes, and document additional volatility factors for stress testing.

Where feasible, uncertainties should be associated with observable indicators to support monitoring and adaptive triggers.

4 Drivers of Change and Uncertainty

Understanding the drivers of change is a foundational step in urban future foresight. Drivers are the underlying forces that shape how cities evolve over time. They influence economic activity, infrastructure demand, governance structures, technological adoption, and the lived experiences of residents.

Cities operate within multilayered systems where global dynamics interact with regional and local contexts. Technological innovation, geopolitical shifts, demographic transitions, environmental pressures, and regulatory developments simultaneously affect urban systems. These forces rarely

act independently; rather, they combine through complex interactions that generate emergent outcomes and non-linear effects.

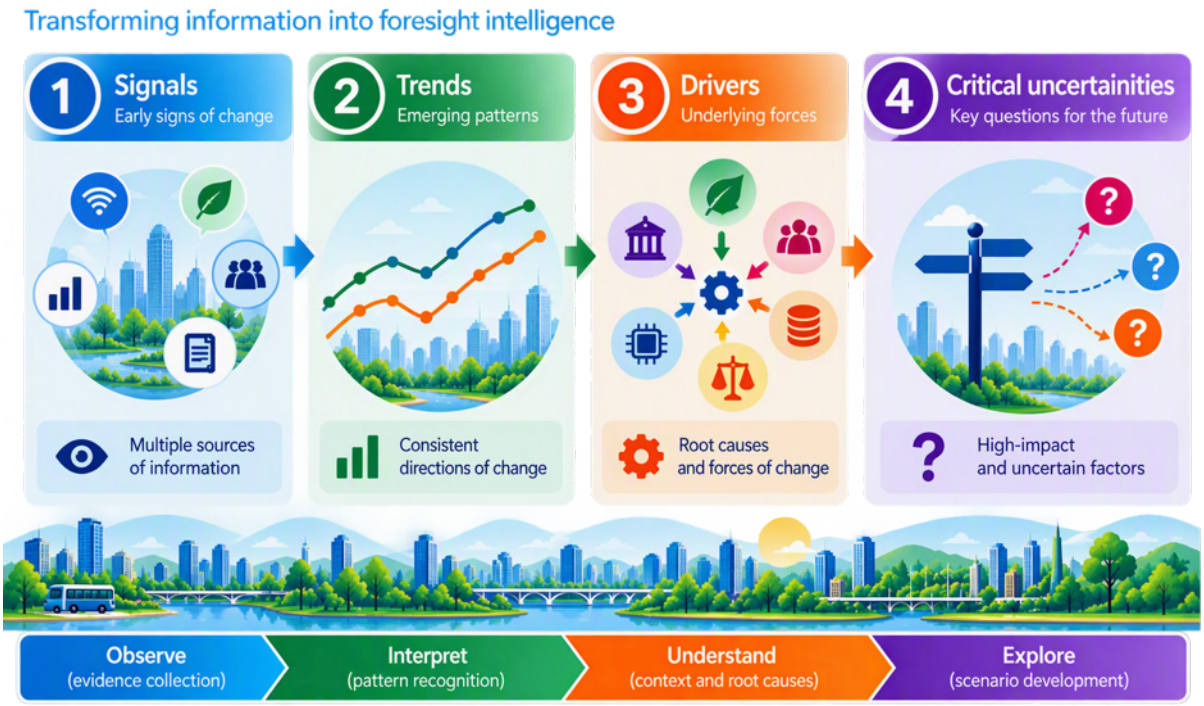
Urban future foresight therefore requires a structured approach to identifying, analysing, and prioritizing drivers of change. This involves:

- Detecting **long-term structural trends**
- Monitoring **emerging signals of change**
- Identifying **uncertainties and volatility factors**
- Assessing how these forces interact across sectors and time horizons.

Driver analysis provides the analytical foundation for **scenario development**, enabling cities to explore plausible futures and design strategies that remain robust under different conditions.

5 Global, Regional, and Local Drivers

Figure 3: Global, regional and local drivers shaping urban futures



Urban futures are shaped by drivers operating at **multiple spatial scales**. Effective foresight requires understanding how global trends interact with regional dynamics and local characteristics.

5.1 Global drivers

Global drivers originate from large-scale transformations affecting the international system. They often evolve over decades and influence cities indirectly through economic systems, technological diffusion, and environmental conditions.

Some illustrative examples of global drivers are:

- Climate change and planetary environmental shifts
- Global technological innovation cycles
- Demographic transitions and migration flows
- International economic restructuring
- Geopolitical realignments and supply chain dynamics
- Global health risks and pandemics
- Cross-border movements of multinational enterprises

While cities do not control these forces, they need to anticipate and adapt to the implications that are relevant to them.

For example:

- Global decarbonization policies reshape urban energy systems.
- Advances in artificial intelligence transform labour markets and service delivery.
- Climate-driven migration influences housing demand and urban planning.

5.2 Regional drivers

Regional drivers reflect economic, political, and environmental dynamics within a broader geographic area, such as a continent, economic bloc, or regional economic system.

Examples include:

- Regional trade agreements and economic integration
- Cross-border infrastructure corridors
- Regional labour mobility
- Shared environmental systems (river basins, coastal zones)
- Regional security dynamics
- Regional regulatory frameworks

Regional drivers may influence cities through investment flows, infrastructure development, migration patterns, and policy coordination mechanisms.

For example:

- Regional logistics networks may reshape port and transport infrastructure.
- Regional energy markets influence electricity supply and energy pricing.
- Regional innovation clusters may attract high-skilled talent and industries.

5.3 Local drivers

Local drivers originate from city-specific characteristics, policies, and institutional conditions. These drivers determine how global and regional forces are experienced at the city level.

Examples include:

- Local governance capacity and institutional effectiveness
- Urban planning frameworks and zoning policies
- Infrastructure capacity and urban form
- Local economic structure and sector specialization
- Social cohesion and community dynamics
- Public trust in institutions

Local drivers often determine the pace and trajectory of urban transformation, even when external drivers create pressure for change.

For example:

- Cities with strong digital infrastructure may adopt emerging technologies faster.
- Urban design policies influence climate resilience and mobility patterns.
- Local policy choices can accelerate or constrain innovation ecosystems.

5.4 Interactions across scales

Drivers at different scales interact in complex ways.

A global technological shift, such as artificial intelligence, may create new economic opportunities and pose challenges to labour markets. However, the extent to which a city benefits depends on regional policy frameworks and local institutional readiness.

Similarly, global climate trends interact with local geography, infrastructure resilience, and governance capacity, producing varied impacts across cities.

Urban future foresight therefore requires a multiscale analysis that considers how drivers reinforce, counteract, or amplify one another.

6 STEEPLE / PESTLE Analysis for Urban Contexts

Figure 4: STEEPLE analysis for urban foresight



A commonly used framework for analysing drivers of change is STEEPLE or PESTLE analysis, which categorizes drivers according to their primary domain of influence.

This structured approach helps analysts systematically examine a wide range of external forces that may influence urban systems.

6.1 Social drivers

Social drivers relate to demographic change, cultural dynamics, and social expectations that influence urban life.

Examples include:

- Population growth or decline
- Ageing societies or youth bulges
- Migration patterns
- Changing household structures
- Digital lifestyles and citizen expectations
- Inequality and social mobility

These drivers affect housing demand, transportation needs, health-care systems, and social services.

6.2 Technological drivers

Technological drivers involve innovations that reshape urban infrastructure, economic activity, and governance capabilities.

Examples include:

- Artificial intelligence and automation
- Internet of Things and smart infrastructure
- Autonomous mobility
- Digital identity systems
- Robotics and physical AI
- Advanced connectivity (5G, 6G, satellite networks)
- Digital twins and simulation platforms

Technological drivers often create both opportunities and governance challenges, requiring regulatory adaptation and institutional capacity.

6.3 Economic drivers

Economic drivers shape employment patterns, business ecosystems, and investment flows.

Examples include:

- Digital economy expansion
- Platform-based business models
- Global supply chain restructuring

- Remote work and distributed labour markets
- Urban competitiveness and talent attraction
- Innovation ecosystems and startup activity
- Economic complexity

Economic drivers influence fiscal stability, infrastructure demand, and economic diversification strategies.

6.4 Environmental drivers

Environmental drivers include natural systems and ecological pressures that affect urban sustainability and resilience.

Examples include:

- Climate change
- Extreme weather events
- Water scarcity
- Biodiversity loss
- Urban heat island effects
- Energy transition pressures

Environmental drivers often require long-term infrastructure investments and governance coordination.

6.5 Political and governance drivers

Political drivers relate to institutional frameworks, governance models, and policy priorities.

Examples include:

- Regulatory reforms
- Government innovation policies
- International agreements
- Urban governance structures
- Public sector digital transformation

Political drivers influence how effectively cities can respond to emerging challenges.

6.6 Legal drivers

Legal drivers include laws, standards, and regulatory mechanisms that shape urban governance.

Examples include:

- Data protection regulations
- AI governance frameworks
- Environmental regulations
- Building standards
- Public procurement rules

Legal frameworks can enable or constrain innovation and determine accountability structures.

6.7 Ethical drivers

Ethical drivers involve societal expectations related to fairness, privacy, transparency, and inclusion.

Examples include:

- Ethical AI deployment
- Digital rights
- Surveillance concerns
- Equity in service access
- Responsible data use

Cities should balance technological advancement with ethical considerations to maintain public trust.

7 Structural Trends vs Emerging Signals

Not all drivers evolve at the same pace or level of certainty. Future foresight analysis distinguishes between structural trends and emerging signals.

7.1 Structural trends

Structural trends are long-term, observable patterns that evolve gradually and have strong supporting evidence.

Examples include:

- Urbanization
- Population ageing
- Climate change
- Digitalization of services
- Growth of data-driven economies
- Global connectedness
- Institutional leadership

Structural trends provide a relatively stable foundation for planning, although their magnitude and timing may still vary.

Cities should incorporate structural trends into long-term strategies, infrastructure planning, and regulatory frameworks.

7.2 Emerging signals

Emerging signals are early indicators of potential change that may develop into significant trends in the future.

Signals are often:

- Fragmented
- Ambiguous
- Observed in niche contexts
- Not yet widely adopted

Examples include:

- Early deployments of autonomous urban services
- Novel digital governance models
- Experimental urban mobility systems
- New economic models such as decentralized platforms

Signals may evolve into trends, remain niche innovations, or disappear entirely.

Systematic monitoring of signals helps cities anticipate emerging transformations before they become widespread.

7.3 Weak signals

Weak signals are particularly early indicators that may hint at significant future shifts.

They often appear in:

- Academic research
- Pilot projects
- Startups
- Policy experiments
- Niche communities

Although uncertain, weak signals are valuable for expanding the range of plausible futures considered in scenario development.

8 Key Uncertainties and Volatility Factors

Urban futures are shaped not only by trends but also by uncertainties and volatility factors.

Uncertainties arise when the direction, speed, or magnitude of a driver cannot be predicted confidently.

Examples include:

- Pace of technological adoption
- Economic shocks
- Geopolitical instability
- Regulatory changes
- Climate tipping points

In future foresight practice, the most important uncertainties tend to be those that combine high impact with high unpredictability.

These are often referred to as critical uncertainties.

8.1 Critical uncertainties

Critical uncertainties form the basis of many scenario planning exercises.

Examples include:

- Centralized vs decentralized governance models
- Rapid vs slow technological adoption
- High vs low public trust in institutions
- Stable vs volatile global economic conditions

Selecting two critical uncertainties often allows the construction of scenario matrices that generate multiple plausible futures (see 11.2).

8.2 Volatility factors

Volatility factors represent events or dynamics that may cause sudden disruptions to urban systems.

Examples include:

- Extreme climate events
- Financial crises
- Cyberattacks on critical infrastructure
- Pandemics
- Geopolitical conflicts affecting supply chains

While difficult to predict, volatility factors should be considered in resilience planning.

8.3 Monitoring uncertainties

Cities should monitor uncertainties through early warning indicators, including:

- Technological adoption metrics
- Economic indicators
- Environmental monitoring systems
- Public sentiment and trust indicators
- Infrastructure stress signals

Tracking these indicators enables cities to detect when conditions begin to shift toward one future trajectory or another.

8.4 Role in scenario development

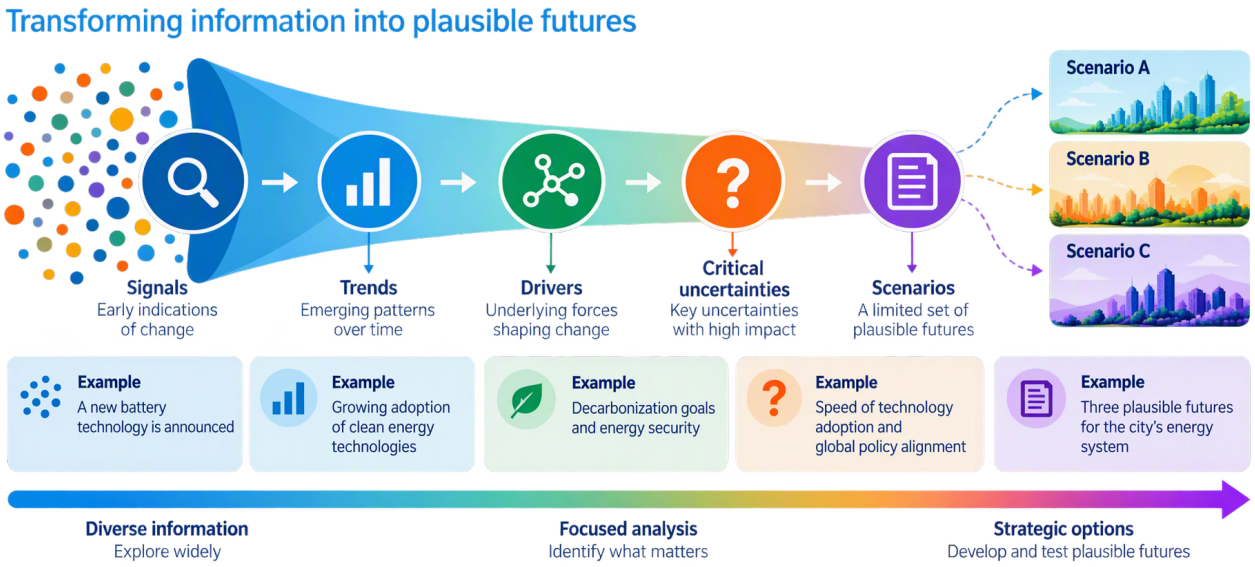
Drivers and uncertainties together provide the analytical foundation for scenario development.

While trends describe what is likely to continue, uncertainties reveal where futures may diverge.

Understanding both dimensions enables cities to design strategies that are robust, adaptive and resilient across multiple plausible futures.

9 Horizon Scanning and Trends

Figure 5: From signals to scenarios: transforming information into plausible futures



9.1 Purpose and scope of horizon scanning

Horizon scanning builds the evidence base for future foresight by detecting early signals of change and identifying emerging issues before they become mainstream. In urban contexts, horizon scanning supports anticipatory regulation, early investment decisions, and preparedness for shocks.

Scanning should be defined by a protocol that specifies cadence, sources and quality criteria. A mixed approach is recommended, combining automated data collection with expert interpretation and cross-sector review.

The scope of scanning should match the foresight question. Citywide scanning captures cross-sector drivers; domain scanning focuses on sector-specific innovations and regulations.

9.2 Sources of intelligence

A robust scanning system draws from diverse intelligence streams: academic literature; policy and regulatory developments; standards bodies; credible international organizations; industry roadmaps; venture and patent signals; open-source ecosystems; and public sentiment.

Local intelligence is equally important, including service delivery data, incident logs, citizen feedback, local business insights, and community organization reports. These sources help contextualize global trends. Community-based reporting and local knowledge may act as a continuous source for identifying weak signals, emerging needs, and localized risks, particularly those that may not be captured through conventional data sources.

Cities should document the intelligence they acquire, with metadata to support traceability (e.g., source, date, domain tags, confidence, maturity stage, and preliminary implications).

9.3 Detecting weak signals, anomalies, and wild cards

Weak signals (see 7.3) are early indicators of emerging change that may be ambiguous, fragmented, or localized. Anomalies can indicate structural shifts or novel dynamics. Wild cards are low-probability, high-impact events that require preparedness planning.

Detection should combine automated techniques (keyword tracking, topic modelling, anomaly detection) and qualitative methods (expert panels, field insights, participatory reporting).

Signals should be captured even when uncertain, provided they are tagged appropriately and periodically reviewed for maturation, validation, or dismissal.

9.4 Assessing signal maturity and relevance

Signal assessment determines whether an observed item is noise, an emerging issue, or a stable trend. Maturity criteria may include recurrence across sources, evidence of acceleration, investment signals, policy attention, and observable adoption.

Relevance assessment links signals to the local urban system and to the decision context. A globally prominent signal may be locally constrained by governance, infrastructure, or social factors.

9.5 Identifying trends and translating signals into strategic implications

Trends are sustained directional patterns derived from clusters of verified signals.

Strategic implications translate trends into decision-relevant insights for governance, regulation, service design and investment.

Trend implications should be presented in clear language with uncertainty ranges and suggested monitoring indicators.

10 Emerging Technologies and Urban Futures

10.1 Technology as driver, enabler, and disruptor

Technology influences urban futures as a driver (creating new capabilities and behaviours), as an enabler (supporting policy goals), and as a disruptor (undermining existing rules and business models). Cities should evaluate technology through a governance lens, not only a technical lens.

Technology assessment should cover: maturity and adoption pathways; dependencies on data and infrastructure; cybersecurity and privacy risk; vendor lock-in risk; workforce implications; and social trust considerations.

Where uncertainty is high, cities can use staged approaches: research, proof of concept, prototype, and scaled implementation, with governance checkpoints at each stage.

10.2 Key technology domains

Examples of key technology domains commonly relevant to cities include: AI and automation; digital identity and trust infrastructure; IoT and sensor networks; robotics and autonomous mobility; advanced connectivity (5G/6G, satellite, edge computing); cybersecurity and privacy-enhancing technologies; digital twins and simulation; distributed ledgers and tokenization; and clean energy technologies.

Domain prioritization should reflect the foresight question and local strategy. The assessment should distinguish near-term operational technologies from longer-term disruptive technologies, and identify prerequisites for adoption.

For each domain, cities may analyse the opportunity and risk summary, the governance implications, and the required capabilities, potential pilot and implementation candidates.

10.3 Socio-technical interactions

Socio-technical interactions describe how technologies interact with institutions, norms, markets, and behaviours. For example, AI-enabled decision support can improve service targeting but may create accountability and bias concerns; autonomous mobility can improve safety but requires regulatory redesign and public acceptance. Humanoid robot assistants can support services but will require consideration of public safety, privacy and anthropomorphism risks.

Adoption is shaped by incentives, procurement models, regulation, skills and public trust. Pilot design should, therefore, include governance design, stakeholder engagement, and evaluation metrics.

Stakeholder mapping is essential to identify who benefits, who bears risks, and who controls critical infrastructure and data.

10.4 Risks, ethics, and governance implications

Technology risks include cybersecurity threats, privacy breaches, systemic fragility, exclusion, and erosion of trust. Governance implications include standards, auditability, procurement safeguards and oversight mechanisms.

Ethical considerations include, among others, fairness, transparency, explainability, accessibility, and human oversight, particularly where automated systems affect rights and entitlements.

Cities may use tools such as regulatory sandboxes, certification, standards-as-code, audit requirements, incident reporting, and continuous monitoring to assess and address ethical concerns.

11 Scenario Development and Plausible Futures

11.1 Purpose and types of scenarios

Scenarios are structured narratives used to test strategies and reveal trade-offs under uncertainty. They are not predictions. Scenarios improve preparedness by enabling decision-makers to explore how interacting drivers may produce plausible futures.

Common types include exploratory scenarios, normative (preferred) scenarios, and shock scenarios. A portfolio approach provides both strategic exploration and resilience stress testing.

11.2 Scenario axes and critical uncertainties

Critical uncertainties (see Chapter 8) provide the axes for scenario construction. Selecting two primary uncertainties can create a 2x2 matrix producing four distinct scenarios. Axes should be independent and capable of generating divergent implications.

Axis selection should be transparent and evidence informed. Additional uncertainties should be embedded within narratives or treated as volatility factors for stress testing.

A good axis definition is framed as a spectrum (e.g., high trust to low trust, rapid transition to delayed transition) and includes what would make each end of the spectrum observable.

11.3 Narrative scenario construction

Narratives should describe causal trajectories: how drivers interact over time, which actors shape outcomes, and what milestones mark the evolution of each scenario. Narratives should include governance choices, market responses and citizen behaviours.

Scenario narratives should incorporate second-order and third-order effects to avoid simplistic storylines. For example, a shift to remote work affects mobility, retail, housing patterns, energy demand and social cohesion.

Narratives should be written for decision-maker usability and supported by analytical annexes (assumptions, drivers and indicators).

11.4 Visualizing scenarios

Visual outputs make scenarios accessible and support deliberation. Options include scenario matrices, future timelines, maps, system diagrams, and illustrative storyboards.

Where feasible, cities should include a set of indicators for each scenario to support monitoring and early warning systems.

11.5 Backcasting

Backcasting starts with a future scenario and works backward to identify milestones and actions required to reach it. It is valuable where transformative change is required and where existing trajectories are insufficient.

Backcasting roadmaps should include sequencing, dependencies, and governance ownership. They should specify near-term actions that enable future flexibility (for example: enabling regulation, data infrastructure, skills development).

Backcasting outputs should be integrated into strategy and programme portfolios with defined KPIs and monitoring indicators.

11.6 Stress-testing assumptions across scenarios

Stress-testing evaluates how strategies and options perform under each scenario. It highlights vulnerabilities, identifies no-regret actions, and clarifies where flexibility is required.

Stress-testing should also assess institutional readiness when a disruption does not follow the anticipated pathway. Beyond testing whether a policy performs across scenarios, cities should test whether information can move across organizational boundaries, whether decision rights remain

clear under pressure, and whether coordination arrangements can be reconfigured quickly when assumptions fail. This helps distinguish robustness on paper from operational adaptability.

Stress-testing should use explicit criteria (e.g., service continuity, affordability, equity, resilience, fiscal sustainability, trust) and should document rationale for scores and judgments.

Box 1: Kuala Lumpur, Malaysia: when the future outgrows the design

Kuala Lumpur opened the Stormwater Management and Road Tunnel (SMART) in 2007: a 9.7 km tunnel that carries traffic in dry weather and is switched to floodwater on the basis of a forecast flood peak, not an observed one. It has repeatedly protected the city centre. In December 2021, however, a flood that officials described as a once-in-a-century event caused losses officially estimated at MYR 5.3–6.5 billion and showed that infrastructure sized for past storms can be overtaken by a changing climate. The city's plans now pair engineered defences with nature-based "sponge city" drainage, earlier flood warning and long-term targets set in the Kuala Lumpur Structure Plan 2040 and the Climate Action Plan 2050.

Lesson for cities: anticipatory infrastructure works only within the assumptions it was designed for, so those assumptions need to be stress-tested again as conditions change.

Source: U4SSC case study on Kuala Lumpur, prepared from published sources (forthcoming compendium of city case studies).

PART III – SYNTHESIS AND DECISION

Part III translates foresight analysis into decision support. It focuses on defining preferred futures, identifying options and pathways, and integrating foresight outputs into strategies, plans, regulations, and investment portfolios.

12 Visioning and Preferred Futures

12.1 Visioning and public value

Visioning establishes a shared picture of the future the city seeks to achieve. It clarifies values and public outcomes and creates alignment across agencies, partners and communities. Visioning should be grounded in feasibility and governance capacity while remaining aspirational.

Preferred futures should be expressed as outcomes for people and places: inclusion, safety, affordability, sustainability, opportunity and trust.

Visioning should build on scenario insights, acknowledging trade-offs and uncertainties. It may draw desirable elements from multiple scenarios while remaining honest about constraints.

12.2 Methods and participation for visioning

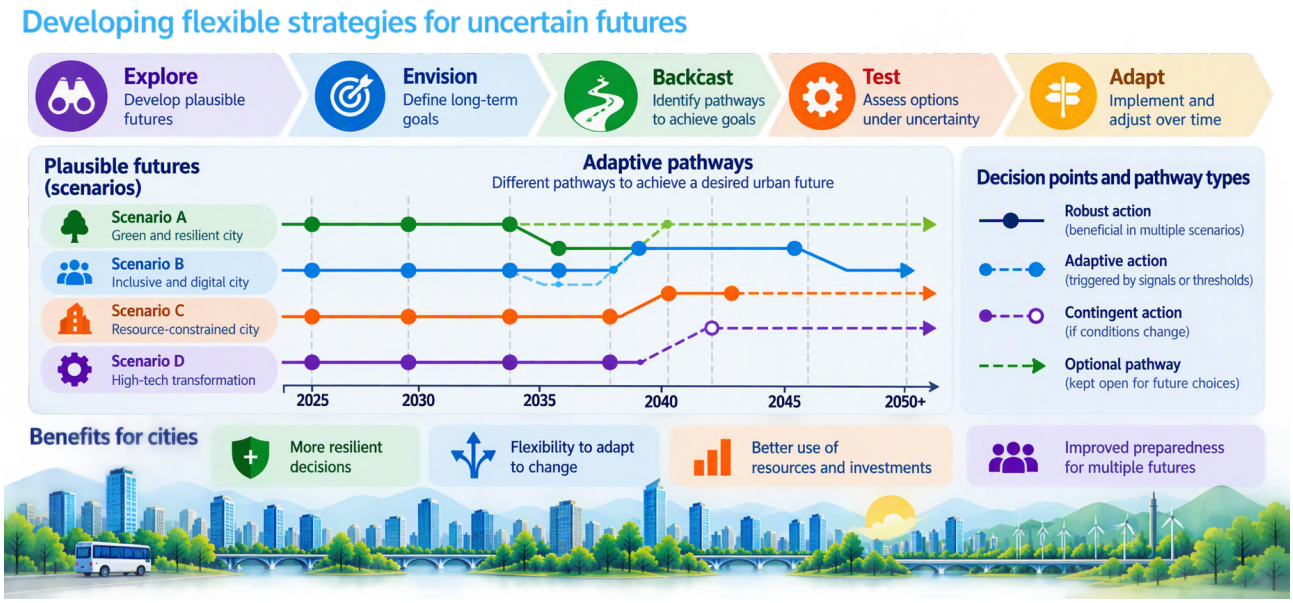
Visioning methods include facilitated workshops, participatory design sessions, citizen assemblies, and expert panels. Visual and narrative techniques support accessibility and shared understanding.

Participation should be representative, with safeguards for inclusion and transparency. Youth engagement is recommended to represent intergenerational interests. Intergenerational foresight should bring different generations together to challenge assumptions, assess long-term trade-offs, and jointly shape priorities for urban decision-making.

Vision outputs should be translated into measurable objectives aligned to existing strategies and international commitments where relevant.

13 Future Options and Policy Pathways

Figure 6: From scenarios to action: backcasting and adaptive pathways



13.1 Decision-making under uncertainty

Decision-making under uncertainty requires tools that support robustness and flexibility.

Cities should clarify risk tolerances and decision thresholds, particularly for safety-critical services, rights-impacting decisions, and long-lived assets.

A decision framework should distinguish between actions that can be taken immediately, actions requiring additional evidence, and actions requiring capability development or partnership formation.

13.2 Future foresight pathways and actions

This framework provides a portfolio of action types. Pathways may combine multiple action types across time horizons.

Action selection should reflect: evidence strength, urgency, potential impact, governance readiness, and resource availability. For high-uncertainty domains, monitoring and research may precede pilots; for high-urgency risks, immediate policy tools and implementations may be required.

A list of action types is indicated below:

Action	Description
Do nothing but monitor	Maintain watchlists and indicators; reassess periodically.
Conduct research	Commission studies or data collection to reduce uncertainty.
Develop regulatory and policy tools	Prepare governance frameworks, standards, and enforcement mechanisms.
Develop scenario plans	Deepen analysis, expand stakeholder engagement, and refine pathways.
Implement PoC	Test feasibility in controlled conditions with defined success criteria.
Implement prototype	Test integration, user experience, and operational processes.
Implement	Scale with governance, monitoring, accountability, and continuous improvement.
Establish international alliance or collaboration	Share learning, co-develop standards, and coordinate cross-border issues.

Box 2: Dubai, United Arab Emirates: every foresight topic ends in a decision

The Dubai Digital Authority adopted a Future Foresight Policy and Framework in 2024, after two years of piloting. The policy treats foresight as a responsibility shared across the organization and coordinated by the strategy function, not as a separate unit. Signals and trends are scanned and scored for impact and relevance, and each prioritized topic is assigned an explicit action type, from "monitor" to implementation or international collaboration. Each topic then follows a documented "future pathway" from first research to a defined endpoint, such as a public service, a policy, a strategy or a recorded lesson from a pilot. By 2026 the Authority reported more than 60 pathways carrying 89 foresight actions.

Lesson for cities: requiring every topic to reach a recorded decision, even if that decision is to keep watching, is what separates a foresight portfolio from a shelf of reports.

Source: U4SSC case study on the Dubai Digital Authority; figures as reported by the Authority (forthcoming compendium of city case studies).

13.3 Integration into urban strategies and plans

Integration ensures foresight influences real decisions. Scenarios and pathways should be embedded into strategy documents, sector plans, capital investment processes, and regulatory roadmaps.

A formal integration protocol should define accountabilities, how decisions are made, and how pathways are translated into funded programmes and procurement plans.

Integration should include monitoring indicators linked to strategy review triggers. This converts future foresight into an adaptive governance system.

PART IV – INSTITUTIONALIZING FORESIGHT

Part IV describes how to embed foresight as a permanent governance capability. It covers organizational models, processes and cycles, data and tools, capacity building, participatory methods, monitoring and learning, and a phased roadmap for adoption.

14 Organizational Models for Urban Future Foresight

14.1 Central Future Foresight Office

A central foresight office provides dedicated capability responsible for scanning, scenario development, synthesis, and integration into city strategies. It improves method consistency, institutional memory, and cross-sector coordination.

This model is suitable where the city has a strong central coordinating authority and where whole-of-city coherence is required. It is also appropriate where sensitive cross-sector issues require controlled governance and quality assurance.

Risks include over-centralization and limited domain depth unless supported by agency focal points and partnership mechanisms.

14.2 Distributed model (central + agency)

In a distributed model, city agencies maintain future foresight capability aligned to a shared framework. A central unit provides coordination, standards and shared repositories.

This model embeds future foresight into operational realities and improves domain relevance. However, it requires strong coordination to avoid fragmentation and inconsistent quality.

Success factors include: shared taxonomies, regular synthesis cycles, and clear escalation pathways for cross-sector issues.

14.3 Hybrid model (central + urban sector/domain)

A hybrid model combines central coordination with designated sector/domain hubs (for example: climate resilience, mobility, digital services, economic development). This model supports both cross-sector synthesis and deep domain expertise.

It is suitable for complex challenges where specialized analysis and implementation pathways are required, while maintaining whole-of-city coherence.

Governance should specify decision rights, reporting lines, and coordination mechanisms across hubs.

14.4 External partnership model

External partnership models leverage universities, think tanks, research institutes, civil society organizations, and private sector partners. Partnerships increase capacity, diversity of perspectives, and access to specialized expertise.

Partnerships require governance safeguards for quality, ethics, and conflicts of interest. Clear agreements are required on data handling, intellectual property, and publication rights.

Partnership models are particularly valuable for deep dives, advanced modelling, and participatory programmes.

Important Note:

Cities can combine the organizational models described above as they see fit. For example, the external partnership model may be combined with the central or hybrid model to enrich future foresight.

Additionally, small and medium-sized cities often face resource constraints that hinder the operation of standalone foresight units. To prevent an "anticipatory divide" across urban systems, the framework can be operationalized through multilevel governance arrangements. In this model, national ministries, regional authorities, or municipal associations act as aggregators and enablers, providing, for example, centralized horizon scanning repositories, shared foresight toolkits and pooled expert rosters. In return, local weak signals and community-level insights are channelled upward establishing a two-way regional foresight ecosystem.

15 Processes, Cycles, and Governance Mechanisms

15.1 Continuous and periodic scanning

Scanning should operate continuously with periodic synthesis outputs. Continuous scanning captures emerging signals; periodic synthesis produces sensemaking and decision relevance.

A recommended minimum cadence includes monthly signal review, quarterly synthesis briefs, annual scenario refresh, and multi-year deep dives aligned to strategy cycles.

Governance should define validation roles, prioritization criteria, and dissemination channels.

15.2 Periodic synthesis and annual scenario refresh

Periodic synthesis clusters signals into trends and implications and updates driver maps. An annual scenario refresh updates narratives, assumptions, and indicator sets based on new evidence.

Refresh activities should include stakeholder check-ins, expert validation, and review of monitoring indicators. Major shocks should trigger ad hoc updates.

Scenario refresh outputs should be integrated into strategy updates and portfolio governance to ensure practical uptake.

15.3 Multi-year deep dives aligned to strategy cycles

Deep dives may address priority themes requiring advanced analysis, modelling and stakeholder engagement. They may include simulation models, policy design, pilots, and regulatory tool development.

Deep dives should produce actionable recommendations, capability requirements, and implementation roadmaps. They should be aligned to strategy cycles and supported by multi-year resourcing.

Governance should define sponsor ownership and ensure cross-sector alignment.

15.4 Governance committees and decision rights

Institutionalization requires clear accountabilities and decision rights (e.g., a steering committee for oversight, technical working groups for analysis, and an integration committee linked to strategy and budget decisions).

Decision rights should specify who approves scenarios, who owns pathway implementation, and how trade-offs are escalated.

Governance bodies may also cover ethical oversight and data governance, among other functions.

Box 3: Yakutsk, Russian Federation: who receives the results?

Yakutsk, a city built on permafrost, hosted two anticipatory exercises aimed at the same 2032 horizon. A foresight session in July 2017 gathered more than 150 participants and produced sixteen project ideas, but left no published report. A resilience profiling programme with UN-Habitat (2016–2020) had a formal agreement, a fixed schedule, trained municipal focal points and a published report with eighteen recommended actions, and it was cited in the city strategy adopted in 2019. Even so, the 2023 edition of the strategy refers to neither exercise. The case study finds that the city had strategic-management structures, but no body with an explicit mandate to receive foresight results and carry them into later planning cycles.

Lesson for cities: before commissioning a foresight exercise, decide which body must respond to its results, in which document and by when.

Source: U4SSC case study on Yakutsk, based on published documents (forthcoming compendium of city case studies).

16 Data, Tools, and Infrastructure

16.1 Signals repository

A signals repository captures items such as scanned items, metadata, tags, and analyst notes. It supports institutional memory and enables trend analysis over time. It can be designed for searchability, traceability, and controlled access.

Repository governance can specify, among others, access and classification, retention policies, and audit logging.

Metadata may include source, date, domain, relevance score, maturity stage, confidence, and linked implications.

16.2 Shared libraries (trends, reports, scenarios)

Shared libraries provide curated knowledge assets: trend briefs, scenario narratives, method templates, and reference materials. Libraries reduce duplication and improve quality across agencies.

A tiered access model may be used for public summaries, internal practitioner assets, and restricted governance materials.

16.3 Monitoring dashboard and futures platform

A monitoring dashboard links indicators to scenarios and pathways. It supports early warning and adaptive decision triggers. Dashboards should include both external signals and internal performance indicators.

17 Capacity Building and Foresight Literacy

17.1 Leaders

Leadership capacity focuses on interpreting uncertainty, using scenarios to make robust decisions, and integrating foresight into governance. Leaders require practical literacy rather than technical method mastery.

Sustained leadership demand is among the most important enablers of future foresight institutionalization.

17.2 Practitioners

Practitioners require competence in scanning, synthesis, scenario building, facilitation, and communication. They should also be skilled in evidence management, stakeholder engagement, and documentation standards.

Capability building can include mentoring, communities of practice, and applied delivery projects among city practitioners.

Practitioner development should also include data literacy, visualization skills, and tool training aligned to repositories and dashboards.

17.3 Future experts

Future experts include specialists in specific areas such as systems modelling, quantitative scenario analysis, advanced facilitation, and method governance. They may be internal or supported through partnerships.

Expert roles include, among others, advanced modelling for deep dives, scenario planning using MICMAC,[1] guidance on ethical safeguards and auditability.

[1] MICMAC (Cross-Impact Matrix Multiplication Applied to Classification) is a structural analysis technique used in scenario planning to systematically evaluate the direct and indirect relationships between complex variables, categorizing them by their relative levels of influence and dependence to identify the primary driving forces shaping future outcomes.

Succession planning is recommended to reduce dependence on a small number of experts and to maintain institutional resilience.

18 Stakeholder Engagement and Participatory Foresight

18.1 Engagement modalities

Participatory future foresight improves legitimacy and quality by incorporating diverse perspectives. Modalities include workshops, citizen assemblies, expert panels, youth councils, business roundtables, and digital participation platforms. Young people can take active roles beyond mere representation or consultation, for example in co-design, scenario testing, pathway prioritization, and monitoring.

Engagement design should clarify the purpose (consultation, co-design, deliberation), representation criteria, and how inputs will influence outputs. Safeguards are required to manage misinformation, conflict and participant safety.

Participation should be integrated into the future foresight cycle at defined points: framing, scenario testing, pathway prioritization, and monitoring feedback.

18.2 Communication, transparency, and trust

Foresight communication should be clear, accessible, and honest about uncertainty. Overclaiming undermines trust; technical jargon can exclude stakeholders. Communication products should be tailored for leadership, agencies, and public audiences. Trust, however, is not a single quantity to be protected or built: it has at least three dimensions, each of which can fail, and be repaired, in a different way.

Confidence in a foresight process can fail when the messenger is not believed (a credibility problem), when the evidence behind a claim is contested or hard to verify (an evidence problem), or when an accurate, well-evidenced message does not fit with how a community experiences its own reality (a resonance problem). Transparency alone cannot resolve all three.

This distinction has practical value. Where this framework uses "high trust to low trust" as a scenario axis, or logs "declining trust" as a weak signal, foresight teams should specify which of the three dimensions is at stake, because each calls for a different response: provenance and track record for a credibility shortfall, independent validation for contested evidence, and co-design and facilitated dialogue for a resonance gap. In practice, a dedicated facilitation function may be needed to diagnose which dimension is failing before a generic remedy is applied.

Transparency includes documenting assumptions, limitations, and how stakeholder inputs were used. Sensitive information should be handled through classification, redaction, and controlled dissemination protocols.

Feedback loops are essential: participants should be informed of outcomes and decisions following engagement.

19 Monitoring, Learning, and Adaptation

19.1 Cadence of activities

Monitoring and learning ensure foresight remains relevant and accountable. Cadence should align with the city's governance cycles and with the pace of change in priority domains.

Cities can adapt the minimum cadence recommended in 15.1 (monthly signal review, quarterly synthesis, annual scenario refresh and multi-year deep dives) to their own context. Ad hoc reviews may be required after major shocks.

Cadence should include defined deliverables and decision points to ensure outputs influence action.

19.2 Indicators review (KPIs: input, output, outcome, impact)

Indicators provide evidence for monitoring both the future foresight process and the effectiveness of chosen pathways. A complete KPI model includes input, output, outcome, and impact measures.

Input KPIs track resources and participation. Output KPIs track produced assets (briefs, scenarios, dashboards). Outcome KPIs track adoption into strategies and decisions. Impact KPIs track long-term effects on resilience, service quality, equity, sustainability and trust.

Future foresight indicators governance should define data sources, owners, frequency, and quality assurance. Indicators should be linked to decision triggers for adaptive governance.

19.3 Post-implementation lessons learned and continuous improvement

Learning requires after-action reviews and post-implementation evaluations. Lessons should be documented, shared, and used to update methods, assumptions and governance practices.

A lessons-learned repository supports institutional memory and avoids repeating errors. Lessons should be linked to specific interventions, contexts, and outcomes to be actionable.

Continuous improvement strengthens credibility and ensures future foresight remains a living governance function.

20 A Phased Roadmap for Adoption

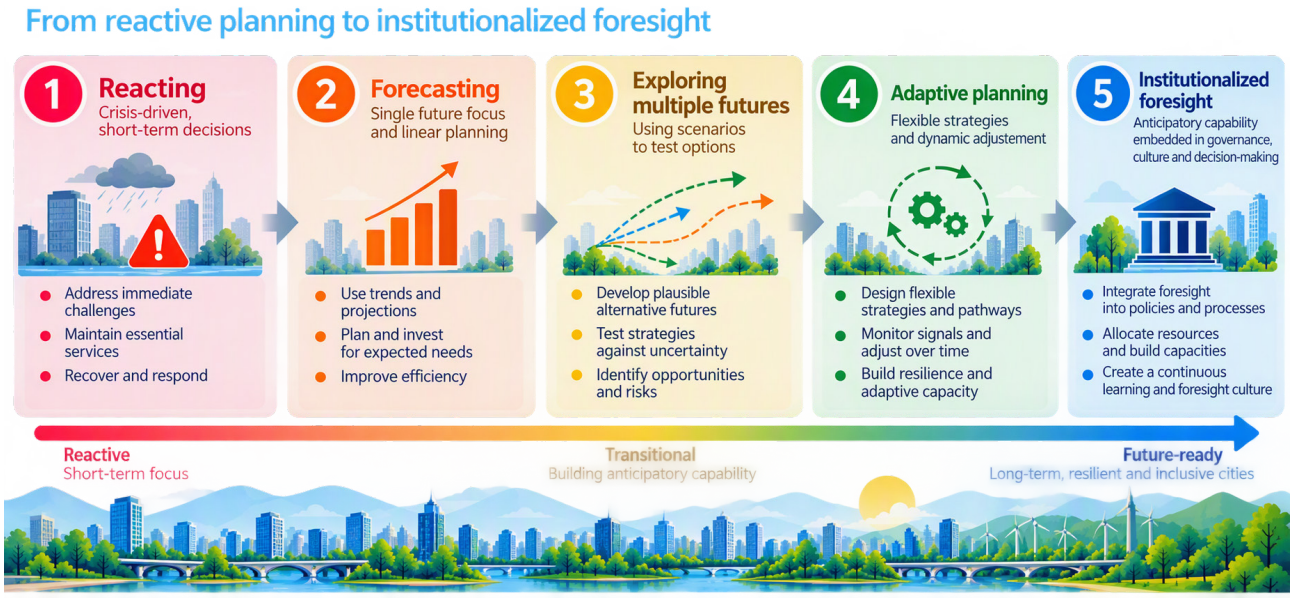
Cities differ in size, mandate and resources, and few will implement the full framework at once. The roadmap below is indicative. It shows one way of sequencing the elements described in Parts I to IV: starting with a limited scope, demonstrating value and then scaling up through governance mechanisms (see 1.6). The duration of each phase should be adapted to local strategy and budget cycles.

Phase	Focus and typical activities
Phase 1: Initiate	Secure leadership sponsorship and a clear mandate; designate an owner and choose an organizational model (Chapter 14); frame one priority foresight question linked to a real decision (Chapter 3); run a first scanning and scenario exercise. Result: a demonstrated use case and a core team.
Phase 2: Build	Establish the scanning protocol and signals repository (Chapters 9 and 16); set the review cadence (15.1); train leaders and practitioners (Chapter 17); stress-test selected strategies and investments (11.6); begin structured participation (Chapter 18). Result: a repeatable cycle and a shared evidence base.
Phase 3: Embed	Adopt an integration protocol linking foresight to strategy, budget, regulation and investment decisions (13.3); define committees and decision rights (15.4); link indicators to review triggers and KPIs (Chapter 19); extend foresight to further domains and districts. Result: foresight as a routine part of governance.
Phase 4: Sustain	Refresh scenarios annually and run deep dives aligned to strategy cycles (15.2 and 15.3); capture lessons learned (19.3); plan succession (17.3); share intelligence through regional, national and international networks (14.4). Result: a living capability that endures beyond individual leaders and electoral cycles.

Small and medium-sized cities may compress these phases or deliver them through the multilevel arrangements described in Chapter 14. Whatever the pace, each phase should end with a leadership decision on whether and how to proceed, so that the capability grows in step with demonstrated value.

21 Conclusion – From Foresight to Anticipatory Urban Governance

Figure 7: Pathway from reactive planning to institutionalized anticipatory governance



The future of a city cannot be predicted with certainty, but it can be explored systematically, shaped deliberately and prepared for more effectively. This is the central premise of the Urban Future Foresight Framework. In an environment characterized by accelerating technological change, climate pressures, demographic transformation, economic volatility, evolving social expectations, and geopolitical uncertainty, cities require capabilities that extend beyond conventional forecasting and periodic strategic planning. They need the institutional capacity to anticipate change, recognize emerging possibilities, test assumptions, and adapt decisions as conditions evolve.

Urban foresight should, therefore, be understood not as a prediction exercise or a stand-alone research activity, but as a core capability of modern urban governance. Its value lies in connecting long-term thinking with decisions made today. Horizon scanning identifies emerging change; analysis reveals the drivers and uncertainties shaping the urban system; scenarios make alternative futures tangible; visioning establishes direction; backcasting and policy pathways translate preferred futures into action; and monitoring enables strategies to evolve as new evidence emerges. Together, these elements create a continuous cycle of anticipation, decision, action, learning and adaptation.

For cities, the objective should not be to develop a single plan optimized for an assumed future. The objective should be to build robustness and strategic optionality: policies, institutions, infrastructure, capabilities, and investments that can perform across multiple plausible futures and adapt when circumstances change. Cities should distinguish between actions that warrant immediate implementation, areas requiring experimentation or research, issues requiring new regulatory or policy instruments, and developments that should remain under active observation. Major and difficult-to-reverse decisions should be systematically stress-tested against alternative futures before long-term commitments are made.

Effective urban foresight must also remain people-centred, inclusive, and intergenerational. Technological advancement, economic growth, resilience, and efficiency are important objectives, but they are means to broader public outcomes. Cities should explicitly examine who benefits from change, who may bear its costs, which communities may be disproportionately exposed to emerging risks, and what consequences today's decisions may create for future generations. Citizens, young people, businesses, experts, academia, civil society, and other urban actors should, therefore, be treated not simply as consultees, but as contributors to understanding and shaping possible futures.

Institutionalization is ultimately what distinguishes sustained foresight capability from episodic futures exercises. Cities should establish clear ownership, recurring foresight cycles, shared intelligence repositories, common methodologies, multidisciplinary capabilities, participatory mechanisms, and formal links to strategy, policy, regulation, budgeting, investment, and performance management. Foresight findings should reach the institutions and decision-makers capable of acting upon them. Equally, implementation experience and changing external conditions should flow back into the foresight process.

The framework therefore calls on cities to progressively move:

From	To
Forecasting what is expected	Exploring what is possible
Reacting to disruption	Anticipating emerging change
Planning around a single future	Preparing for multiple plausible futures
Fixed long-term plans	Robust and adaptive pathways
Isolated foresight exercises	Institutionalized anticipatory governance

No foresight framework can remove uncertainty. Nor should it seek to do so. Its purpose is to ensure that uncertainty becomes an explicit and manageable dimension of public decision-making rather than an unexamined source of vulnerability. The measure of a mature foresight system is, therefore, not whether it correctly predicts what happens next, but whether it enables the city to recognize change earlier, challenge assumptions systematically, make better-informed choices, preserve future options, respond faster when conditions change, and sustain public value across generations.

Cities should ultimately aspire to become anticipatory institutions: continuously sensing change, collectively interpreting its implications, deliberately shaping preferred futures, and adapting their actions as the future unfolds. In this way, urban foresight becomes more than a methodology for thinking about tomorrow; it becomes an enduring capability for governing responsibly today.

Appendix A – Compendium of Foresight Methods

This compendium provides a selection of foresight methods. Method selection should align to scope, maturity, decision context, and capacity.

Method	Operational purpose and notes
Horizon scanning	Systematic detection and interpretation of signals, weak signals, and emerging issues; includes source curation, tagging taxonomy, and review cadence.
Trend analysis	Clustering and validation of signals into sustained directional patterns; includes mechanisms, uncertainties, timelines and indicators.
Drivers of change mapping	Identification and structuring of drivers across technological, social, environmental, economic, and regulatory domains; supports scenario logic.
Systems mapping	Causal loop diagrams and interdependency maps capturing feedback loops and cascading risks; supports complexity-aware policy design.
Scenario matrix (2x2)	Construction of four scenarios using two critical uncertainties as axes; includes definition of extremes and observable indicators.
Cross-impact analysis	Assessment of interdependencies among drivers and events to validate scenario consistency and explore second-order effects.
Delphi method	Structured expert elicitation to assess uncertain developments; useful for contested topics and emerging technologies.
Futures wheel	Structured exploration of first-, second-, and third-order consequences of a change event; supports implication analysis.
Shock and wild card scenarios	Low-probability, high-impact stress tests for preparedness; supports contingency planning and resilience design.
Policy wind-tunnelling	Testing policies against multiple scenarios to reveal vulnerabilities and identify robustness enhancements.
Backcasting	Working backwards from a plausible future to define milestones, actions, and sequencing; supports transformation roadmaps.
Adaptive pathways planning	Designing staged pathways with trigger points and decision gates; supports flexibility under uncertainty.
Robustness testing	Evaluating strategies across scenarios using explicit performance criteria; produces no-regret and contingent action sets.
Participatory methods	Citizen assemblies, youth councils, expert panels, and co-design workshops; enhances legitimacy and feasibility.



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