SUNIO ONE

A STRATEGIC FRAMEWORK FOR URBAN TRANSFORMATION WITHIN PLANETARY BOUNDARIES

Vincent Dermody – Max Ryerson

09 September 2025

EXECUTIVE SUMMARY

Urban transformation represents one of the most complex challenges facing contemporary governance, requiring sophisticated frameworks that account for the multidimensional and interconnected nature of city systems while respecting Earth's biophysical limits. This paper presents an enhanced capability-driven approach to urban transformation that addresses critical gaps between strategic objectives, implementation outcomes, and planetary boundaries through systematic architectural thinking integrated with experience design principles.

Key Findings:

- Traditional linear approaches to urban transformation fail to account for systemic interdependencies, cascading effects, and planetary boundary constraints
- Cities consume approximately 75% of global resources while housing 55% of the population, making them critical leverage points for planetary sustainability
- A capability-based framework integrated with planetary boundaries and experience design enables cross-departmental coordination, measurable progress tracking, and citizen engagement
- The integration of motivation (WHY), focus (WHAT), landscape (WHERE), limits (WITHIN WHAT BOUNDARIES), and experience (HOW PEOPLE ENGAGE) dimensions provides a comprehensive transformation methodology
- Capability maturity models enhanced with planetary impact assessments and citizen experience metrics offer quantifiable measures for sustainable transformation

Policy Implications:

This enhanced framework offers city administrators and policymakers a structured approach to navigate the complexity of urban transformation while maintaining alignment with local priorities, international development objectives, and planetary boundaries. The integration of experience design ensures citizen engagement and behavioural change necessary for successful implementation.

INTRODUCTION

Cities worldwide face unprecedented pressure to transform rapidly in response to evolving economic, environmental, and social challenges while operating within Earth's biophysical limits.

From Saudi Arabia's Vision 2030 to the United Nations Sustainable Development Goals, municipal leaders must navigate increasingly complex webs of objectives, constraints, and stakeholder expectations. Yet despite substantial investments in transformation initiatives, many cities struggle to achieve their intended outcomes due to fundamental misalignments between strategic intent, implementation reality, and citizen experience.

Moreover, the planetary boundaries framework, first proposed in 2009 and updated in 2023, reveals that humanity has already transgressed six of nine critical Earth system boundaries. Cities, as concentrated centres of resource consumption and waste production, play a pivotal role in either exacerbating or alleviating these transgressions. This creates an imperative for urban transformation that not only achieves local objectives but also contributes to returning humanity to a safe operating space.

This paper addresses critical gaps in urban transformation methodology by proposing an enhanced capability-driven framework that integrates:

1. Established enterprise architecture principles
2. Planetary boundary constraints and allocations
3. Experience design methodologies for citizen engagement
4. Behavioural science insights for systemic change

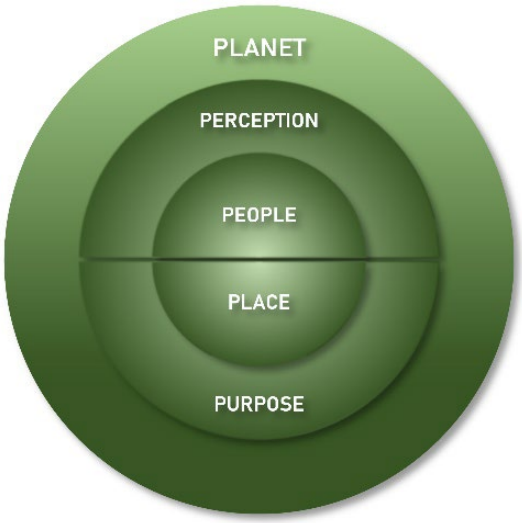
Drawing from international standards bodies including ISO and The Open Group, alongside Earth system science and human-centred design principles, we present a systematic approach that enables cities to manage transformation complexity while maintaining accountability to diverse stakeholders and planetary limits.

THE COMPLEXITY CHALLENGE IN URBAN TRANSFORMATION

Systemic Interdependencies

Urban systems exhibit characteristics of complex adaptive systems, where interventions in one domain create cascading effects across seemingly unrelated areas. Our analysis reveals that cities comprise five fundamental interconnected dimensions:

- **People:** Citizens, workers, visitors, and their behavioural patterns
- **Place:** Physical infrastructure, built environment, and geographic constraints
- **Purpose:** Economic functions, social objectives, and governance mandates
- **Planet:** Biophysical boundaries and ecological constraints
- **Perception:** How citizens experience and engage with urban systems



Consider the case of transportation infrastructure improvements. While intended to reduce congestion, such interventions may inadvertently decrease pedestrian activity, undermining walkability objectives and potentially affecting public health outcomes, local business vitality, community cohesion, and carbon emissions. This exemplifies the non-linear nature of urban system responses to policy interventions and their planetary impacts.

The Implementation Gap

Our research identifies a persistent disconnect between transformation objectives and actual outcomes, which we term the "implementation gap." This phenomenon typically manifests when human-centric requirements undergo translation into technological solutions, resulting in digital functionality that fails to deliver the intended human experience, service value, or behavioural change necessary for sustainability.

The root causes include:

- Insufficient clarity regarding the object of transformation itself
- Lack of citizen engagement in defining transformation objectives
- Absence of experience design in capability development
- Missing feedback loops between implementation and user experience
- Failure to consider planetary boundary constraints in design

Traditional approaches often conflate departments, functions, assets, and platforms with the capabilities they are meant to deliver, leading to suboptimal resource allocation, missed opportunities for cross-functional synergy, and solutions that citizens find difficult to adopt.

The Planetary Boundary Imperative

Cities face a new constraint that fundamentally reshapes transformation possibilities: planetary boundaries. The 2023 assessment shows six of nine boundaries transgressed:

- Climate change
- Biosphere integrity
- Biogeochemical flows
- Land-system change
- Freshwater change
- Novel entities

Urban transformation must now optimize for multiple objectives while operating within these biophysical constraints. This requires a fundamental shift from growth-oriented to boundary-respecting transformation models.

CITY TRANSFORMATION FRAMEWORK: THE FIVE-DIMENSION APPROACH

Building upon the Zachman Framework's architectural principles and integrating planetary boundaries with experience design, we propose a five-dimensional approach to urban transformation.

Motivation Dimension: The "WHY" of Transformation

The motivation dimension encompasses the full spectrum of objectives, considerations, constraints, and controls that drive transformation initiatives, including planetary boundaries as fundamental constraints. The Motivation Dimension provides a systematic structure for decomposing and organizing strategic elements into manageable, referenceable information records. This approach enables multiple strategic frameworks to coexist and complement each other within a single transformation initiative.
For example, a city might simultaneously manage:

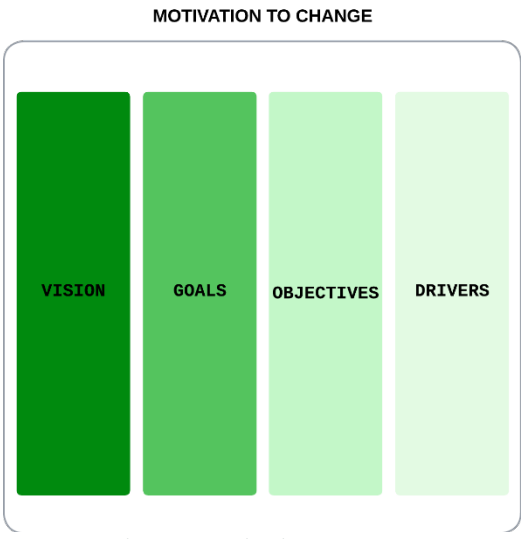


Figure 1: Motivation Elements

Strategic Objectives:

- National development strategies (e.g., Saudi Arabia's Vision 2030)
- International frameworks (e.g., UN Sustainable Development Goals)
- Regional competitive positioning requirements
- Local community priorities and mandates
- **Planetary boundary compliance targets**

Operational Constraints:

- Regulatory compliance requirements
- Budget limitations and fiscal policies
- Environmental boundaries and sustainability mandates
- Social equity and inclusion standards
- **City-scale planetary boundary allocations**
- **Carbon budgets and resource quotas**

Our framework emphasizes interoperability between diverse motivational factors, enabling single transformation actions to address multiple objectives while respecting planetary limits.
This structured approach ensures that transformation efforts can address multiple stakeholder requirements while maintaining clear traceability from high-level visions to specific implementation actions.

The Domains Structure: Organizing Focus Areas

The Domains Structure establishes domain categories that outline the primary areas through which objectives and goals are focused and realized. While these domains align with existing departmental structures, they operate independently to enable cross-functional coordination and meaningful benchmarking.

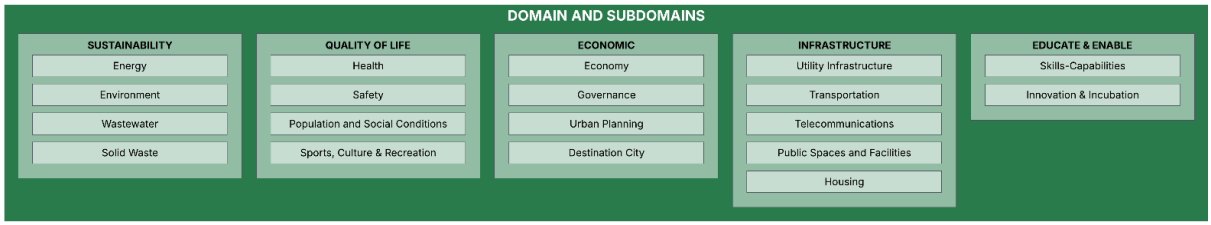


Figure 2: Domains for Madinah Vision 2030 decomposition

Strategic objectives are mapped through domains to create domain-specific objectives that can be managed and measured effectively. A single strategic objective often requires contributions from multiple domains.

For instance, "Improve the Urban Landscape in Saudi Cities" might decompose into domain objectives across:

- **Transport**: Integrated mobility solutions and infrastructure development
- **Urban Planning**: Zoning optimization and development coordination
- **Sustainability**: Environmental impact management and resource efficiency
- **Quality of Life**: Public space enhancement and community amenities

This domain mapping ensures comprehensive coverage while enabling specialized expertise to address specific aspects of complex challenges.

Focus Dimension: The "WHAT" of Transformation

The focus dimension centres on capabilities as the fundamental unit of transformation. We enhance the definition of capability as: "a means to deliver value, experience, or service that exists agnostic of the specific departments, technologies, or assets that underpin it, while minimizing planetary boundary transgressions.

Enhanced Capability Attributes:

- Cross-departmental coordination potential
- Comparative analysis enablement
- Outcome focus and measurement
- **Planetary boundary impact assessment**
- **Citizen experience quality metrics**
- **Behavioural change potential**

This approach aligns with established Strategic Architecture standards while addressing the unique complexities of municipal governance structures and planetary constraints.

The capability structure provides the "what" that gets transformed, independent of organizational structures or technological implementations. The act of transforming is to change a Capability from its current state, to the desired target state to meet the needs of an objective, or a decomposed element of an objective.

Thus, at the framework's centre lies a comprehensive business capability model that defines what the city must be able to do to serve its citizens and stakeholders effectively. In the diagram, the core capability model is complemented by a Digital City layer, which extends the definitions to take on a context of digital city.

The core city model can then be built out to include other contexts such as SDG and Planetary Boundaries.

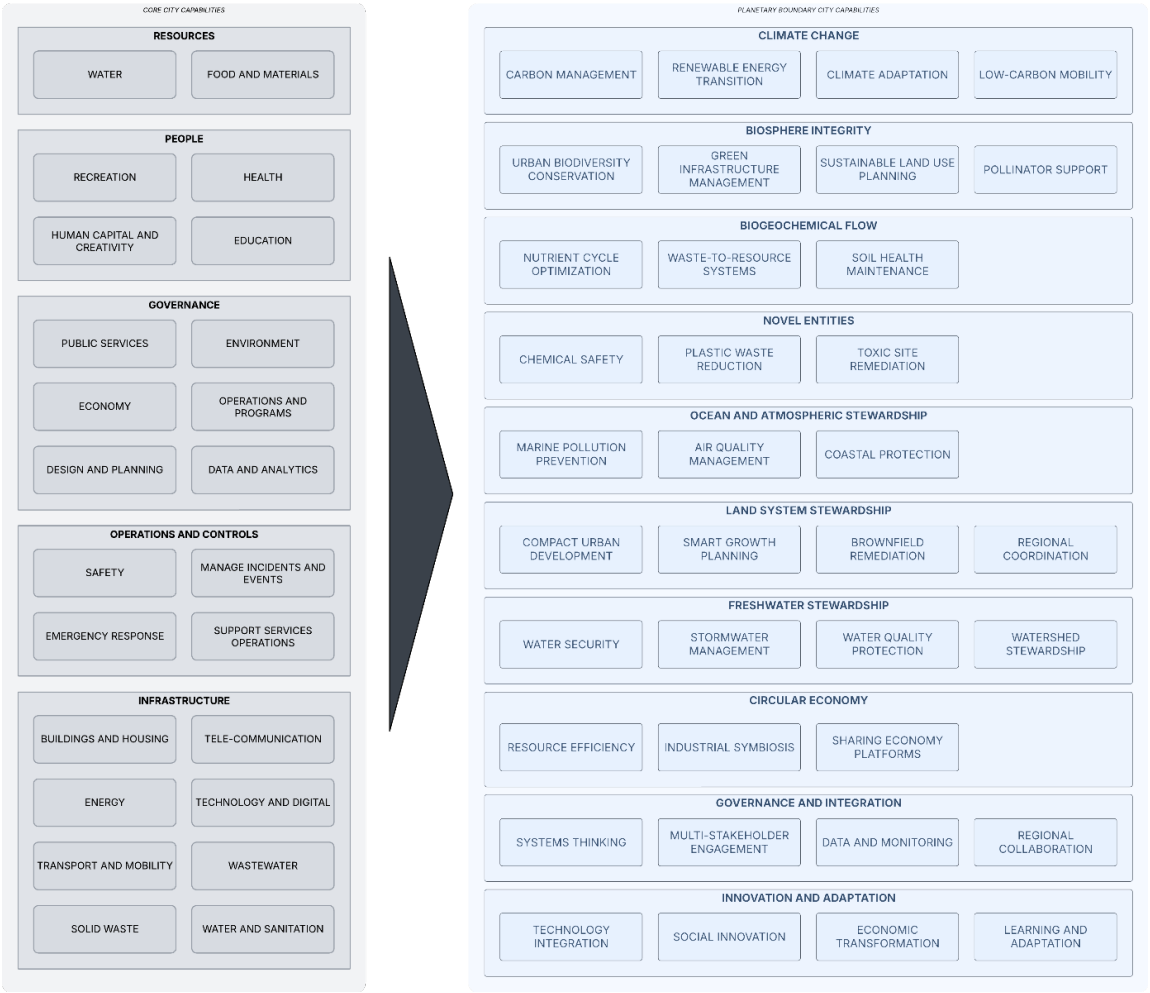


Figure 3 Conceptual City Capability Model

Landscape Dimension: The "WHERE" of Transformation

The landscape dimension maps the domains and subdomains through which cities typically organize their operations. Primary domains include:

- Education systems and human capital development
- Healthcare delivery and public health infrastructure
- Recreation, sports, and quality of life services
- Economic development and business environment
- Physical and digital infrastructure systems
- Environmental management and sustainability
- **Planetary boundary management and monitoring**

Cross-Domain Capability Relationships:

Capabilities exhibit complex relationships across domains and planetary boundaries. Transportation capabilities, for example, primarily reside within infrastructure domains but critically influence economic development, healthcare access, educational outcomes, climate change, and air quality boundaries.

Limits Dimension: The "WITHIN WHAT" of Transformation

This new dimension explicitly integrates planetary boundaries as fundamental constraints on urban transformation:

Urban Planetary Operating Space (UPOS):

- **Boundary Allocation**: City's fair share of global boundaries based on population, development status, and bioregional capacity
- **Impact Tracking**: Real-time monitoring of city activities against boundary limits
- **Trade-off Management**: Transparent decision-making when boundaries conflict with development objectives

Capability-to-Boundary Impact Matrix:

Each capability is assessed for its impact on planetary boundaries:

- Direct impacts (resource consumption, emissions, land use)
- Indirect impacts (supply chain, behavioural influences)
- Regenerative potential (contribution to returning within boundaries)

Experience Dimension: The "HOW PEOPLE ENGAGE" of Transformation

This critical new dimension addresses the human interface with transformation:

Experience Design Components:

- **Journey Mapping**: Understanding how citizens encounter capabilities
- **Service Blueprinting**: Connecting backend processes to frontend touchpoints
- **Behavioural Design**: Creating choice architectures that make sustainable options intuitive
- **Feedback Systems**: Providing real-time information on individual and collective impacts

Citizen Engagement Mechanisms:

- **Co-design Sessions**: Involving citizens in capability definition
- **Prototype Testing**: Validating solutions before scale
- **Participatory Budgeting**: Allocating resources within boundary constraints
- **Digital Platforms**: Enabling ongoing dialogue and feedback

The Transformation Infrastructure and Engine

The Transformation Continuum: Systematic Control Framework

The Transformation Continuum (also known as the Mangara Hierarchy) represents a sophisticated control structure that addresses the hierarchy of urban development needs through eight progressive layers.

Each layer operates as a continuum, continuously focusing on maintaining and advancing capability levels within its domain:

1. **Capable City**: Fundamental provision of mandatory services to all citizens
2. **Performing City**: Reliable and consistent service delivery across all functions
3. **Efficient City**: Optimized resource utilization and service quality management
4. **Resilient City**: Adaptive capacity for disruption management and recovery
5. **Clean City**: Environmental sustainability integration across all operations
6. **Healthy City**: Public health and wellbeing optimization in all planning decisions
7. **Enabled Citizen**: Comprehensive digital and physical access to municipal services
8. **Engaged Citizen**: Active citizen participation in governance and community development

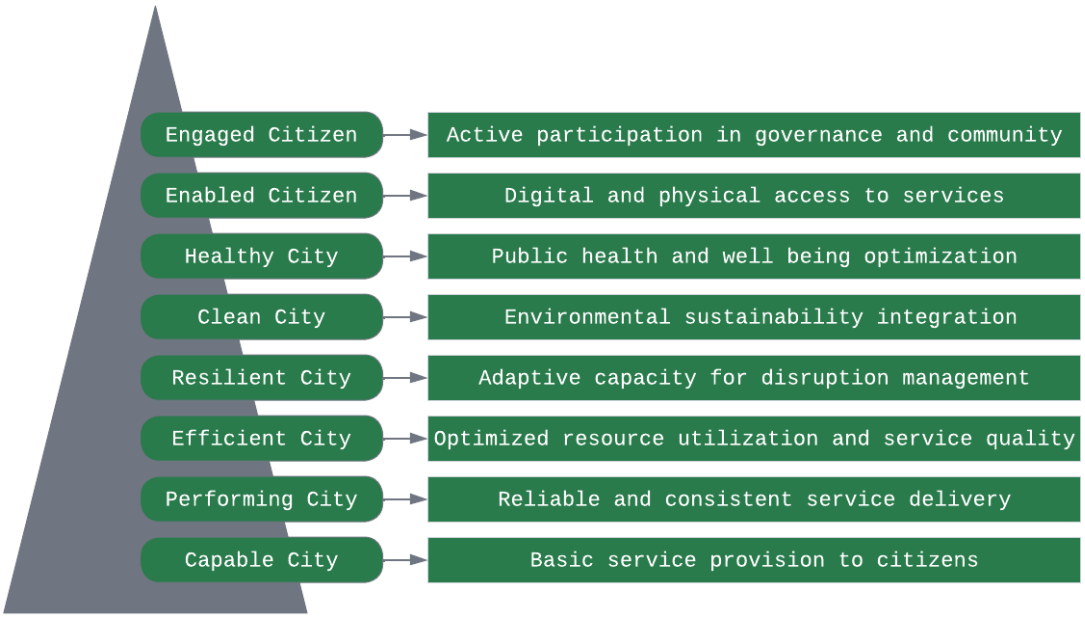


Figure 4 The Mangara City Hierarchy Model

Transformation Nodes: Specialized Control Mechanisms

Within each continuum layer, transformation nodes function as specialized groups responsible for specific transformation types and their associated standards and controls. Each node manages a defined set of capabilities within its transformation remit, ensuring:

- **Consistency**: Capability changes follow established standards and approaches
- **Coordination**: Cross-departmental alignment in transformation efforts
- **Accountability**: Clear ownership for specific transformation outcomes
- **Efficiency**: Reduced conflicting programs and resource duplication

Currently, the framework defines approximately 60 transformation nodes, with the flexibility to retire existing nodes and create new ones as priorities evolve.

For example, within the **Performing City** layer, nodes might include ***Service Quality Management***, ***Performance Analytics***, and might have ***Citizen Experience Optimization*** added at a later stage.

Transformation Nodes should include:

Core Composition:

- Department representatives
- Industry and academic experts
- **Experience designers**
- **Behavioural scientists**
- **Citizen representatives**
- **Youth council members** (for intergenerational perspective)

Enhanced Responsibilities:

- Coordinate capability changes to address objectives
- **Assess planetary boundary impacts of proposed changes**
- **Design citizen experiences around new capabilities**
- **Create behavioural interventions for sustainable adoption**
- **Monitor both technical and experiential success metrics**

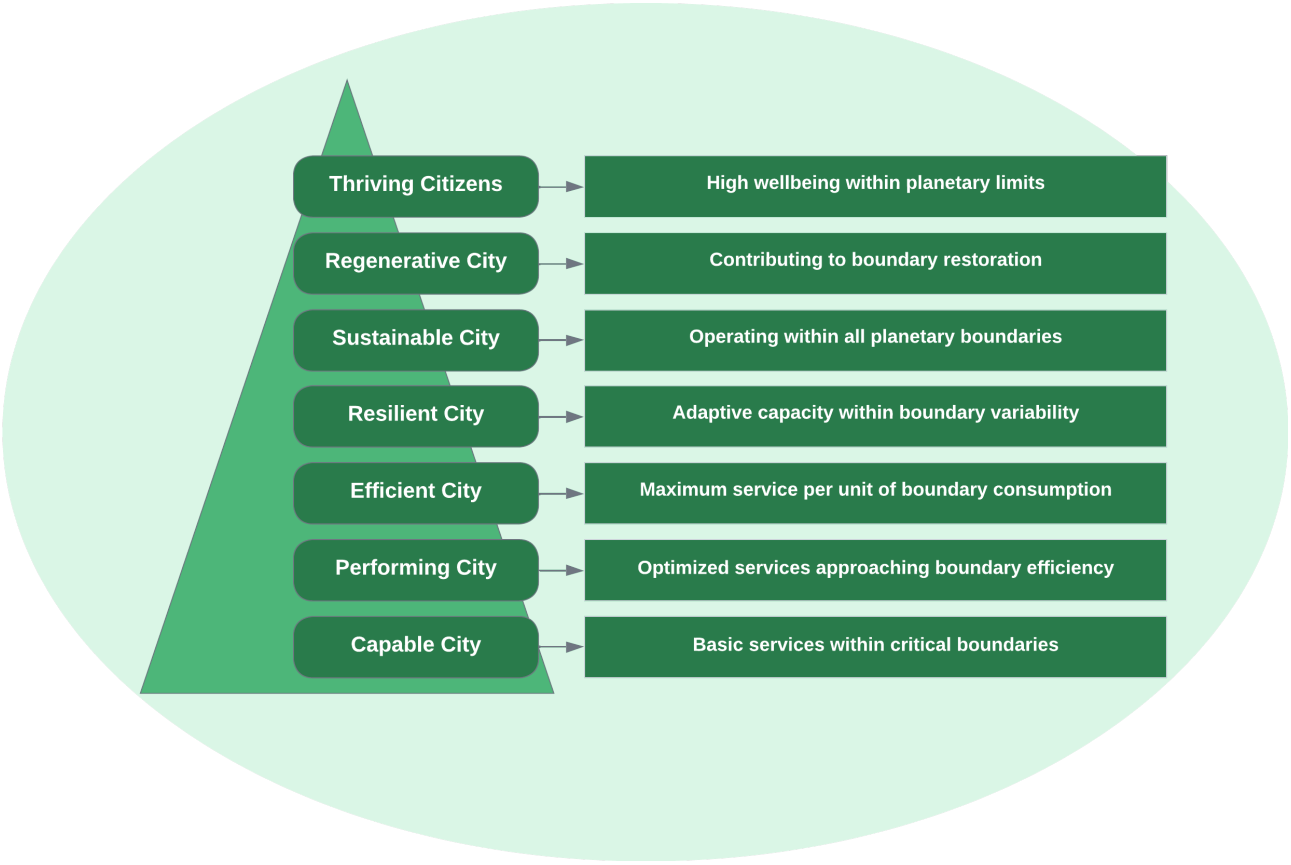
Example Transformation Node Definition:

<table>
<tr><td colspan="2"><u>Transformation Node: Effective City Services</u></td></tr>
<tr><td>Description:</td><td>The Effective City Services Transform Node is focused on ensuring the services provided by the city, are done in an effective manner, enabling a high-quality experience. Effective in enabling (e.g. Transport), effective in engaging (e.g. Citizen Services) and effective in ensuring (e.g. Security, Police, Safety).</td></tr>
<tr><td>Domain:</td><td>Economy</td></tr>
<tr><td>Associated Standards:</td><td>ISO 37120, ISO 37122, ISO 37123, ISO 14064 (GHG Accounting), ISO 26000 (Social Responsibility)</td></tr>
<tr><td>Planetary Boundaries Addressed</td><td>Climate Change (through digitalization and transport efficiency), Freshwater Change (primary - water sustainability target), Novel Entities (reducing material throughput via digital services), Land System Change (urban agriculture and green infrastructure)</td></tr>
<tr><td>Target Impact:</td><td>– Become part of the top 3 most liveable cities in KSA
– Increase old neighbourhoods living standards to 0.8 over 1 on the UN Human Development Index
– Develop touristic offerings across 5 cultural and historical sites in the city
– Become amongst the 50 most sustainable cities for water
– Increase the city's digital competitiveness ranking in KSA
– Achieve at least 20% of public transport mode share by 2030
– Reduce service-related emissions by 35% by 2030
– Achieve 90% citizen service satisfaction rate
– Maintain service delivery within allocated resource budgets</td></tr>
<tr><td>ISO Metrics:</td><td><table>
<tr><td>37120-9.2</td><td>Capital spending as a percentage of total expenditures</td></tr>
<tr><td>37122-20.1</td><td>Annual percentage of municipal budget spent on urban agriculture initiatives</td></tr>
<tr><td>37122-5.2</td><td>Survival rate of new businesses per 100 000 population</td></tr>
<tr><td>37122-9.2</td><td>Percentage of payments to the city that are paid electronically based on electronic invoice</td></tr>
<tr><td>37120-9.2</td><td>Capital spending as a percentage of total expenditures</td></tr>
<tr><td>37122-20.1</td><td>Annual percentage of municipal budget spent on urban agriculture initiatives</td></tr>
<tr><td>37122-5.2</td><td>Survival rate of new businesses per 100 000 population</td></tr>
<tr><td>37122-9.2</td><td>Percentage of payments to the city that are paid electronically based on electronic invoice</td></tr>
<tr><td>37123-5.1</td><td>Historical disaster losses as a percentage of city product</td></tr>
<tr><td>37123-5.2</td><td>Average annual disaster loss as a percentage of city product</td></tr>
<tr><td>37123-5.3</td><td>Percentage of properties with insurance coverage for high-risk hazards</td></tr>
<tr><td>37123-9.1</td><td>Annual expenditure on upgrades and maintenance of city service assets as a percentage of total city budget</td></tr>
<tr><td>37123-9.4</td><td>Annual expenditure on green and blue infrastructure as a percentage of total city budget</td></tr>
<tr><td>37123-9.5</td><td>Annual expenditure on emergency management planning as a percentage of total city budget</td></tr>
</table></td></tr>
<tr><td>Experience Metrics</td><td>– Service Satisfaction Score > 4.2/5 across all service categories
– Digital Service Adoption > 70% for eligible services
– Average Service Completion Time < 3 days for standard requests
– First Contact Resolution Rate > 80%
– Accessibility Score > 95% (services meeting universal design standards)
– Service Equity Index < 0.1 (minimal variance across neighbourhoods)
– Citizen Effort Score < 2.5 (ease of accessing services)
– Trust in City Services > 75%
– Emergency Response Satisfaction > 4.5/5
– Water Conservation Participation Rate > 60%</td></tr>
<tr><td>Planetary Performance Metrics:</td><td>– Carbon per Service Transaction (target: 50% reduction from baseline)
– Water Consumption per Capita (target: 20% reduction)
– Digital vs Physical Service Ratio (target: 70:30)
– Green Infrastructure Coverage (target: 15% of city area)
– Circular Economy Integration (% services using circular principles)</td></tr>
<tr><td>Stakeholder:</td><td>Citizens (including vulnerable populations), City Leadership, Department and agency leaders, Community organizations, Environmental groups, Business associations, Youth councils, Accessibility advocates</td></tr>
</table>

Transformation Continuums with Planetary Integration

The hierarchy of transformation includes planetary boundary considerations:

1. **Capable City**: Basic services within critical boundaries
2. **Performing City**: Optimized services approaching boundary efficiency
3. **Efficient City**: Maximum service per unit of boundary consumption
4. **Resilient City**: Adaptive capacity within boundary variability
5. **Sustainable City**: Operating within all planetary boundaries
6. **Regenerative City**: Contributing to boundary restoration
7. **Thriving Citizens**: High wellbeing within planetary limits



Integrated Transformation Governance

These components work together to create a structured transformation governance system that:

- **Connects strategic intent to action**: Links high-level motivation to specific domain objectives
- **Translates vision to implementation**: Converts strategic intent into measurable local outcomes
- **Maps capabilities systematically**: Ensures comprehensive coverage of transformation scope
- **Controls change effectively**: Aligns all modifications with continuum purposes and standards

This systematic approach enables cities to maintain strategic alignment while managing the complexity inherent in large-scale urban transformation initiatives, ensuring that every change contributes to the broader vision while meeting immediate operational requirements.

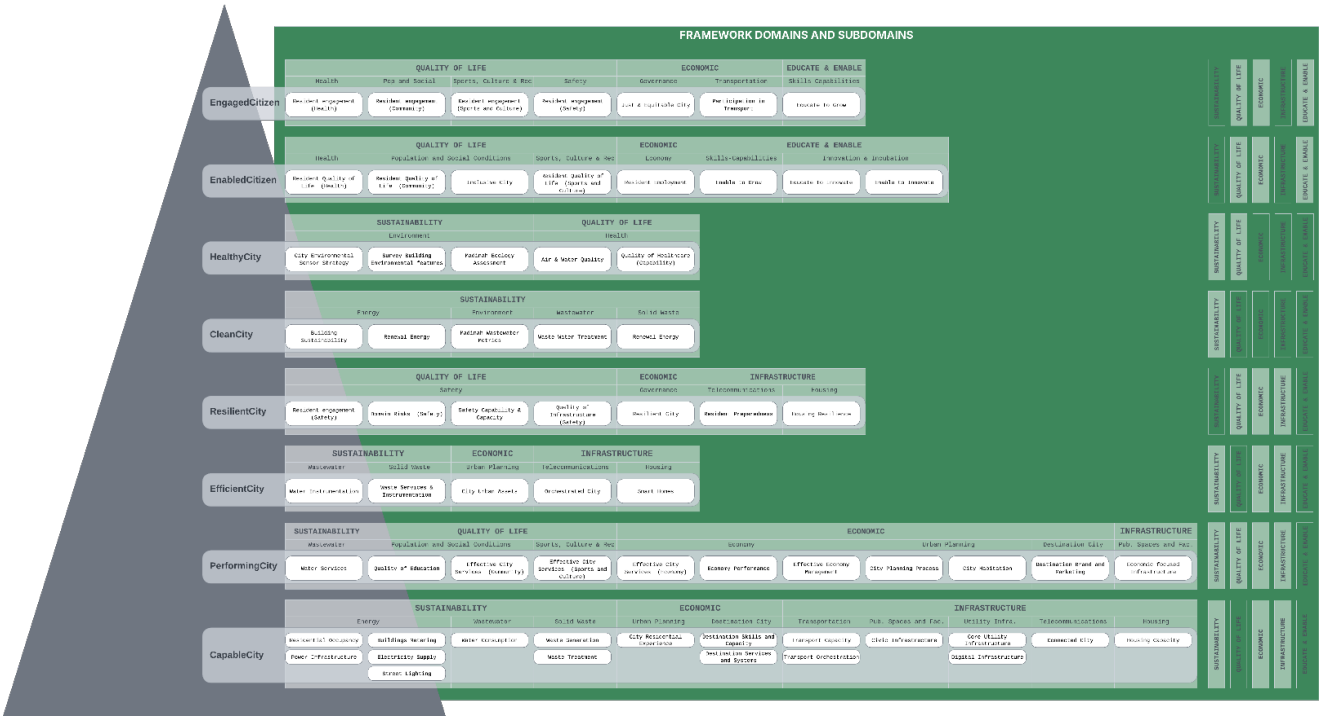


Figure 5 Transform Continuum: Node Mapping

THE ENHANCED TRANSFORMATION FLOW

Integrated Assessment Phase

First: Ingest and decompose all standards, strategies, mandates, and planetary boundary allocations. Map global boundaries to city-scale limits based on:

- Population share
- Development status
- Historical responsibility
- Bioregional capacity

Second: Map objectives to domains while assessing boundary implications. Each strategic objective is evaluated for:

- Boundary consumption requirements
- Potential for boundary-positive innovations
- Trade-offs with other objectives

Third: Design citizen engagement strategies for each domain objective:

- Communication approaches
- Participation mechanisms
- Feedback channels
- Behavioural intervention

Capability Development Phase

For each capability:

1. **Assess Current State**:
    a. Technical maturity level
    b. Planetary impact baseline
    c. Citizen experience quality
    d. Behavioural patterns

2. **Define Target State**:
    a. Required technical maturity
    b. Boundary-compliant operation
    c. Desired experience quality
    d. Behavioural change goals

3. **Design Transformation Path**:
    a. Technical development steps
    b. Impact reduction strategies
    c. Experience prototypes
    d. Behavioural interventions

Implementation with Experience Integration

Each Program Activity now includes:

- Technical implementation plan
- Boundary impact mitigation measures
- Experience design specifications
- Behavioural change strategy
- Citizen engagement approach
- Feedback and iteration cycles

MEASUREMENT AND MONITORING FRAMEWORK

Triple-Layer Metrics

Layer 1: Capability Performance

- Traditional maturity assessments
- Operational efficiency metrics
- Service delivery indicators

Layer 2: Planetary Performance

- Boundary consumption rates
- Impact reduction progress
- Regenerative contributions

Layer 3: Experience Performance

- Citizen satisfaction scores
- Engagement rates
- Behavioural change indicators
- Accessibility and equity metrics

Integrated Dashboards

Create multi-stakeholder dashboards showing:

- Real-time boundary status
- Capability maturity progress
- Citizen experience metrics
- Trade-off visualizations
- Success stories and challenges

CRITICAL SUCCESS FACTORS

Leadership and Governance

- Political commitment to boundary respect
- Transparent decision-making processes
- Long-term perspective beyond electoral cycles
- Adaptive governance structures

Citizen Engagement

- Meaningful participation opportunities
- Clear communication of constraints and possibilities
- Empowerment rather than restriction framing
- Recognition and rewards for sustainable behaviours

Innovation Ecosystem

- Investment in boundary-respecting innovations
- Support for circular economy initiatives
- Cross-sector collaboration platforms
- Knowledge sharing between cities

Justice and Equity

- Fair distribution of transformation benefits
- Protection of vulnerable populations
- Inclusive design processes
- Addressing historical inequities

IMPLEMENTATION ROADMAP

Phase 1: Foundation (Months 1-6)

- Establish baseline measurements across all dimensions
- Form enhanced Transformation Nodes
- Develop citizen engagement strategy
- Create initial boundary allocations

Phase 2: Integration (Months 6-12)

- Launch pilot projects in each domain
- Test experience design approaches
- Develop monitoring systems
- Build stakeholder coalitions

Phase 3: Activation (Months 12-24)

- Scale successful pilots
- Launch citizen platforms
- Implement behavioural interventions
- Begin systematic boundary management

Phase 4: Optimization (Year 2+)

- Refine based on data and feedback
- Share learnings globally
- Evolve toward regenerative approaches
- Deepen citizen co-governance

FUTURE DIRECTIONS

Technology Integration

- AI-powered optimization within boundaries
- Digital twins for transformation modelling
- Blockchain for transparent resource allocation
- IoT for real-time monitoring

Global Collaboration

- City-to-city learning networks
- Shared innovation platforms
- Coordinated boundary management
- Joint capability development

Regenerative Evolution

- Moving beyond sustainability to restoration
- Nature-based solutions integration
- Circular economy mainstreaming
- Wellbeing economy models

CONCLUSION

The enhanced framework presented here addresses the critical challenges of urban transformation in the Anthropocene. By integrating planetary boundaries as fundamental constraints and experience design as essential methodology, cities can navigate the complex path toward sustainable, equitable, and thriving urban futures.

The capability-based approach, enhanced with boundary considerations and citizen engagement, provides a practical pathway for cities to contribute to returning humanity to a safe operating space while improving quality of life for their residents.

Success requires unprecedented coordination across domains, meaningful citizen engagement, and unwavering commitment to operating within planetary boundaries. The framework provides the structure and tools necessary for this transformation, but ultimate success depends on the collective will to act.

As cities contain the majority of humanity and drive the majority of resource consumption, their transformation within planetary boundaries is not optional—it is essential for the continuation of human civilization as we know it. This framework offers a systematic approach to achieving that transformation while maintaining human dignity, agency, and hope for the future.

How Sunio One Can Help

Navigating urban transformation within planetary boundaries while ensuring meaningful citizen engagement represents one of the most complex challenges facing city leaders today. Sunio One offers a comprehensive platform that operationalizes this enhanced framework, transforming theoretical concepts into actionable, measurable transformation pathways.

The platform integrates capability mapping, planetary boundary tracking, and experience design into a unified system that enables cities to orchestrate transformation while maintaining clear visibility of progress across all dimensions - from technical maturity to citizen satisfaction to ecological impact.

Through Sunio One, Transformation Nodes gain access to dynamic dashboards that visualize the interdependencies between capabilities, their planetary impacts, and citizen experience metrics in real-time. The platform facilitates cross-departmental collaboration by providing shared workspaces where diverse stakeholders - from city officials to citizen representatives to behavioural scientists - can co-design interventions, track progress against both traditional ISO metrics and planetary boundaries, and rapidly iterate based on citizen feedback.

Most critically, Sunio One bridges the implementation gap by translating complex backend orchestration into citizen-facing interfaces that make transformation tangible and participatory. This includes citizen apps showing personal and neighbourhood-level impacts on planetary boundaries, feedback mechanisms that directly inform Transformation Node decisions, and behavioural nudges that make sustainable choices intuitive.

By providing this integrated infrastructure, Sunio One enables cities to move beyond fragmented initiatives toward systemic transformation that delivers measurable capability maturity growth while respecting Earth's limits and enhancing citizen wellbeing.

Get in touch

We've demonstrated how Sunio One uniquely enables cities to navigate urban transformation within planetary boundaries through the integration of Enterprise Architecture, Experience Design, and Earth system science.

From capability orchestration and planetary boundary tracking to citizen engagement and behavioural change, our platform transforms complex frameworks into actionable pathways that deliver measurable maturity growth across technical, ecological, and experiential dimensions.

Cities leveraging Sunio One consistently achieve more effective outcomes than traditional approaches - accelerating transformation timelines, reducing implementation risks, and building resilient foundations that serve both current citizens and future generations.

Our proven methodologies bridge the critical gap between strategic vision and lived experience, ensuring that urban transformation doesn't just meet ISO standards and sustainability targets, but creates cities where people genuinely thrive within Earth's limits.

Ready to transform your city's future?

Get in touch - we'd be delighted to help you realize the full potential of integrated, boundary-respecting, citizen-centred urban transformation.

SUNIO ONE

www.sunio.one

hello@sunio.one

Sydney
Australia

London
UK

Abu Dhabi
UAE
(coming soon)

Riyadh
KSA
(coming soon)

References

Planetary Boundaries and Earth System Science

Rockström, J., Steffen, W., Noone, K., Persson, Å., et al. (2009). A safe operating space for humanity. *Nature*, 461, 472-475.

Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S.E., et al. (2023). Earth beyond six of nine Planetary Boundaries. *Science Advances*, 9(37), eadh2458.

Steffen, W., Richardson, K., Rockström, J., Cornell, S.E., Fetzer, I., et al. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223), 1259855.

Urban Transformation and Sustainability

Bai, X., Elmqvist, T., Frantzeskaki, N., McPhearson, T., et al. (2016). Defining and advancing a systems approach for sustainable cities. *Current Opinion in Environmental Sustainability*, 23, 69-78.

Ramaswami, A., Russell, A.G., Culligan, P.J., Sharma, K.R., & Kumar, E. (2016). Meta-principles for developing smart, sustainable, and healthy cities. *Science*, 352(6288), 940-943.

Webb, R., Bai, X., Smith, M.S., Costanza, R., et al. (2018). Sustainable urban systems: Co-design and framing for transformation. *Ambio*, 47(1), 57-77.

Enterprise Architecture and Capability-Based Planning

The Open Group. (2018). *TOGAF® Standard*, Version 9.2. The Open Group Architecture Framework.

Zachman, J.A. (1987). A framework for information systems architecture. *IBM Systems Journal*, 26(3), 276-292.

ISO/IEC/IEEE 42010:2011. (2011). Systems and software engineering — Architecture description. International Organization for Standardization.

Smart Cities and Urban Standards

ISO 37120:2018. (2018). Sustainable cities and communities — Indicators for city services and quality of life. International Organization for Standardization.

ISO 37122:2019. (2019). Sustainable cities and communities — Indicators for smart cities. International Organization for Standardization.

ISO 37123:2019. (2019). Sustainable cities and communities — Indicators for resilient cities. International Organization for Standardization.

ISO 37106:2021. (2021). Sustainable cities and communities — Guidance on establishing smart city operating models for sustainable communities. International Organization for Standardization.

Experience Design and Behavioural Science

Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. HarperCollins.

Thaler, R.H., & Sunstein, C.R. (2008). Nudge: Improving Decisions about Health, Wealth, and Happiness. Yale University Press.

Norman, D. (2013). The Design of Everyday Things: Revised and Expanded Edition. Basic Books.

Stickdorn, M., Hormess, M., Lawrence, A., & Schneider, J. (2018). This is Service Design Doing. O'Reilly Media.

Urban Governance and Participation

Fung, A. (2015). Putting the public back into governance: The challenges of citizen participation and its future. Public Administration Review, 75(4), 513-522.

Meijer, A., & Bolívar, M.P.R. (2016). Governing the smart city: A review of the literature on smart urban governance. International Review of Administrative Sciences, 82(2), 392-408.

Complex Systems and Cities

Batty, M. (2013). The New Science of Cities. MIT Press.

Bettencourt, L.M. (2013). The origins of scaling in cities. Science, 340(6139), 1438-1441.

Holland, J.H. (2014). Complexity: A Very Short Introduction. Oxford University Press.

Saudi Vision 2030 and Regional Development

Kingdom of Saudi Arabia. (2016). Vision 2030. Retrieved from https://www.vision2030.gov.sa/

Al-Surf, M., Balabel, A., Alwetaishi, M., et al. (2021). Sustainable urban transformation in Saudi Arabian cities: A framework for green roof implementation. Sustainability, 13(1), 305.

Climate and Cities

C40 Cities Climate Leadership Group. (2019). The Future of Urban Consumption in a 1.5°C World. C40 Cities.

IPCC. (2023). Climate Change 2023: Synthesis Report. Intergovernmental Panel on Climate Change.

United Nations. (2018). The World's Cities in 2018—Data Booklet. UN Department of Economic and Social Affairs.

Digital Transformation and Smart Cities

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. GeoJournal, 79(1), 1-14.

Yigitcanlar, T., Kamruzzaman, M., Foth, M., et al. (2019). Can cities become smart without being sustainable? A systematic review of the literature. Sustainable Cities and Society, 45, 348-365.