Verifiable Cities
USE CASE LANDSCAPE

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The Use Case Lab is an applied research initiative at the <u>Ethereum Foundation</u> focused on advancing under-explored, high-impact use cases for Ethereum through collaborative prototyping, pilots, and standards. The Verifiable Cities track examines where coordination and verifiability constraints are most acute in urban systems, and where public blockchains can meaningfully expand civic and state capacity.

Contact
<u>Interest Form</u>
<u>usecaselab.org</u>

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This following brief and open call for implementations serves as a map of the current use case landscape and resource to support further inquiry as the space evolves.

Overview

Cities are increasingly expected to deliver public services with greater effectiveness and accountability. While many are beginning to adopt AI and data-driven systems, a shared digital foundation to support coordination and verifiability across organizations and domains remains largely absent. As a result, long-standing public-sector challenges—such as fragmented data sharing, citizen privacy concerns, slow financial flows, and high compliance and reporting costs—continue to divert institutional capacity away from improving services and outcomes. Instead, this capacity is often spent managing public trust through short-term political negotiation and manual administrative processes.

Rather than introduce new centralized or closed platforms, as previous and current government modernization efforts have done, recent advances in public blockchains make it possible to transparently embed verification, accountability, and coordination capabilities directly into how public rules and finances operate. These technologies offer a practical path to increasing state capacity without expanding state power and vendor control, or adding further administrative overhead. In doing so, they can enable the development of a shared digital "trust" layer across cities that extend accountability from administrative processes to transparent technical mechanisms.

Why Cities

- **HYPOTHESIS #1:** Cities are the primary institutional level where coordination and service delivery must happen in real time due to their proximity to operational pressure.

- **HYPOTHESIS #2:** Cities face immediate service demands, operate across dense networks of public and private actors, and contend with real implications and constraints that require equally pragmatic solutions.

- **HYPOTHESIS #3:** Despite wide variation in competitive pressures and context, thousands of municipal governments and service providers worldwide face common operational needs, creating clear but currently underleveraged opportunities for experimentation and knowledge transfer.

- **HYPOTHESIS #4:** Together these conditions make cities powerful levers for public sector innovation, offering a scalable pathway for modernizing civic and state capacity.

Verifiable Cities Use Case Landscape

APPLICATIONS OF CRYPTOGRAPHIC TECHNOLOGIES IN URBAN SYSTEMS

Transparency = making things visible
Verifiability = making claims independently checkable

Trust via Institutional Authority
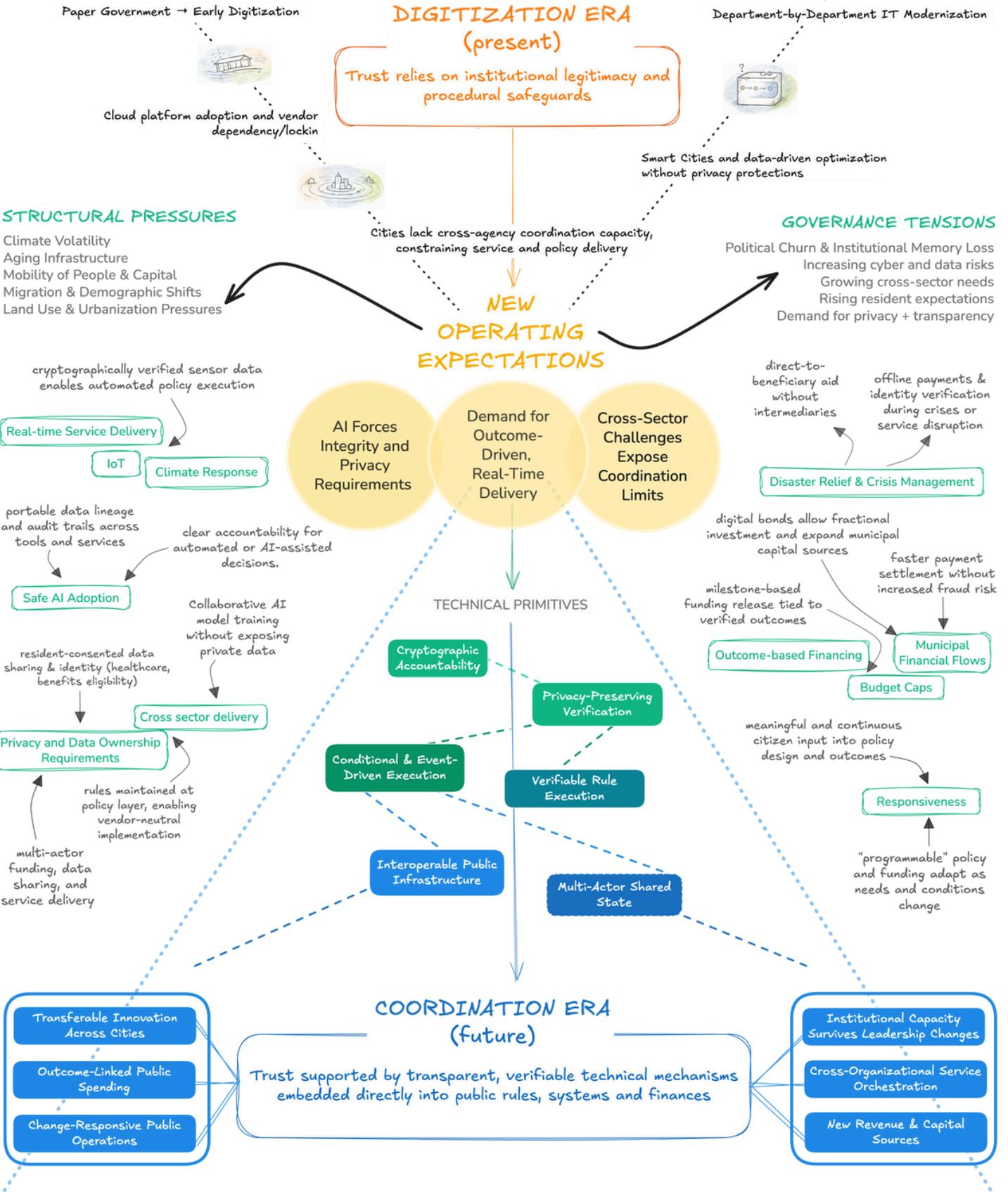Public trust and legitimacy of Institutions created through human judgement, procedural safeguards and formal operational processes.

Siloed Systems by Design
City systems evolved to optimise for individual agency mandates rather than cross-agency coordination due to legal and privacy risks.

Ex Post Verifiability
Verification and accountability are conducted ex post (after decisions or actions have been completed), rather than ex ante (beforehand or during).

Paper Government → Early Digitization

DIGITIZATION ERA (present)

Trust relies on institutional legitimacy and procedural safeguards

Department-by-Department IT Modernization

Cloud platform adoption and vendor dependency/lockin

Smart Cities and data-driven optimization without privacy protections

STRUCTURAL PRESSURES
Climate Volatility
Aging Infrastructure
Mobility of People & Capital
Migration & Demographic Shifts
Land Use & Urbanization Pressures

Cities lack cross-agency coordination capacity, constraining service and policy delivery

GOVERNANCE TENSIONS
Political Churn & Institutional Memory Loss
Increasing cyber and data risks
Growing cross-sector needs
Rising resident expectations
Demand for privacy + transparency

NEW OPERATING EXPECTATIONS

cryptographically verified sensor data enables automated policy execution

Real-time Service Delivery
IoT
Climate Response

AI Forces Integrity and Privacy Requirements

Demand for Outcome-Driven, Real-Time Delivery

Cross-Sector Challenges Expose Coordination Limits

direct-to-beneficiary aid without intermediaries

offline payments & identity verification during crises or service disruption

Disaster Relief & Crisis Management

portable data lineage and audit trails across tools and services

clear accountability for automated or AI-assisted decisions.

Safe AI Adoption

Collaborative AI model training without exposing private data

digital bonds allow fractional investment and expand municipal capital sources

milestone-based funding release tied to verified outcomes

faster payment settlement without increased fraud risk

Outcome-based Financing

Municipal Financial Flows

Budget Caps

resident-consented data sharing & identity (healthcare, benefits eligibility)

Cross sector delivery

TECHNICAL PRIMITIVES

Cryptographic Accountability

Privacy-Preserving Verification

Privacy and Data Ownership Requirements

rules maintained at policy layer, enabling vendor-neutral implementation

Conditional & Event-Driven Execution

Verifiable Rule Execution

meaningful and continuous citizen input into policy design and outcomes

Responsiveness

multi-actor funding, data sharing, and service delivery

Interoperable Public Infrastructure

Multi-Actor Shared State

"programmable" policy and funding adapt as needs and conditions change

COORDINATION ERA (future)

Trust supported by transparent, verifiable technical mechanisms embedded directly into public rules, systems and finances

Transferable Innovation Across Cities
Outcome-Linked Public Spending
Change-Responsive Public Operations

Institutional Capacity Survives Leadership Changes
Cross-Organizational Service Orchestration
New Revenue & Capital Sources

Verifiable Cities
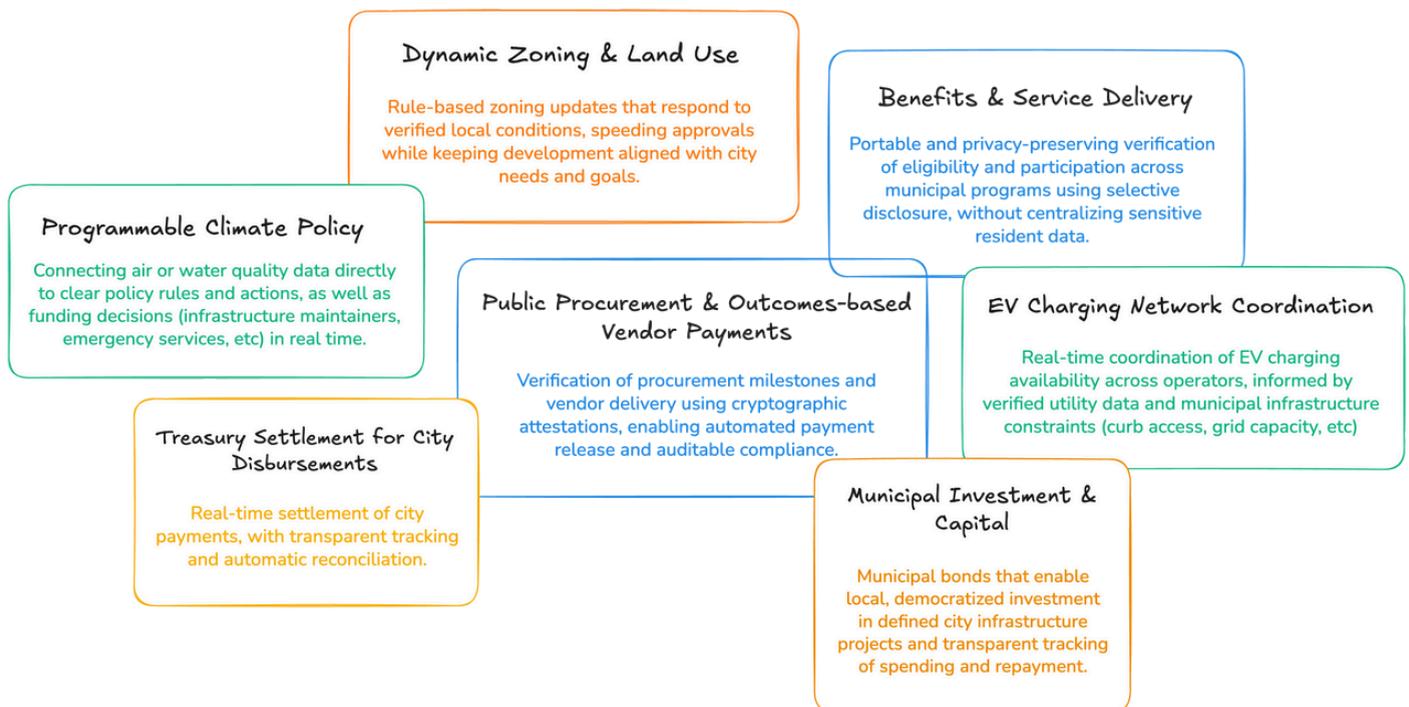## CALL FOR IMPLEMENTATIONS

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The Verifiable Cities landscape is intended to frame early areas of inquiry and surface concrete use cases with the potential to meaningfully improve city operations and outcomes.

As part of this work, the Ethereum Foundation Use Case Lab is issuing an open call for implementations. The work is oriented toward collaboration with city and regional governments, as well as other funders and organizations engaged in municipal innovation. Priority is given to implementations that are narrowly scoped, aware of real-world deployment considerations, and test approaches that can inform broader adoption over time.

Implementations may take several forms, including:

- *Sandboxed/Focused Pilots*

- *Policy Frameworks & Regulatory Guidance*

- *Technical Primitives & Open Standards*

Select Implementation Examples

Dynamic Zoning & Land Use

Rule-based zoning updates that respond to verified local conditions, speeding approvals while keeping development aligned with city needs and goals.

Benefits & Service Delivery

Portable and privacy-preserving verification of eligibility and participation across municipal programs using selective disclosure, without centralizing sensitive resident data.

Programmable Climate Policy

Connecting air or water quality data directly to clear policy rules and actions, as well as funding decisions (infrastructure maintainers, emergency services, etc) in real time.

Public Procurement & Outcomes-based Vendor Payments

Verification of procurement milestones and vendor delivery using cryptographic attestations, enabling automated payment release and auditable compliance.

EV Charging Network Coordination

Real-time coordination of EV charging availability across operators, informed by verified utility data and municipal infrastructure constraints (curb access, grid capacity, etc)

Treasury Settlement for City Disbursements

Real-time settlement of city payments, with transparent tracking and automatic reconciliation.

Municipal Investment & Capital

Municipal bonds that enable local, democratized investment in defined city infrastructure projects and transparent tracking of spending and repayment.

We anticipate supporting a select number of implementations through a combination of technical support, exploratory funding, and connections to relevant collaborators and ecosystems. The specific form and scope of resourcing will be determined through initial conversations as appropriate.

If you are currently working in or are interested in exploring this space, we invite you to reach out via this **form**.

Inspiration
KEY READINGS & REFERENCES

The following pieces have shaped our thinking around the Verifiable Cities track. The list serves as a non-exhaustive set of reference points for the space, providing both historical context and insights into the current state of the field.

AI & Programmability

- How Blockchain & AI are Solving Each others Biggest Challenges - Tonya M. Evans
- The Agentic State: Rethinking Government for the Era of Agentic AI - Ilves et al.
- Rules as Code Demonstration - MIT Law
- Gap Map: Manual Policy Creation and Evaluation - Convergent Research

Trust & Verifiability

- The Importance of Full-Stack Openness and Verifiability - Vitalik Buterin
- Trust in Public Institutions - UNDP
- Atoms, Institutions, and Blockchains - Josh Stark
- Trust Everything Everywhere Programme Opportunity Space - ARIA (*landscape mapping format inspiration)
- Primer to Cryptography Primitives - Nothing Research

City & Policy Innovation

- Can Cities Be the Source of Scalable Innovations? - Christof Brandtner
- Administration Markets - Chris Beiser
- Crypto Cities - Vitalik Buterin
- An Organizational Theory of State Capacity - Erik Snowberg & Michael M. Ting
- The New Problem-Solving Skills That All Cities Need - James Anderson

Planning & Digital Public Infrastructure

- How Government Procurement Creates Tech Stack Chaos - Joy Bonaguro
- The Future of Planning | Rules-Based Planning - Alastair Parvin
- Further Thoughts on a New Local Government Digital Service - Theo Blackwell MBE
- The Path to a Sovereign Tech Stack Is via a Commodified Tech Stack - David Eaves
- How to Digitize the Government - Statecraft

Use Case Radar

- California DMV puts 42 million car titles on blockchain to fight fraud
- Bhutan launches national digital identity on Ethereum
- How blockchain could make zoning work for people
- Plural voting for participatory budgeting in NYC
- Quincy, Massachusetts: First U.S. city to issue blockchain-based municipal bonds
- How Shreveport, Louisiana, used blockchain technology to build a low-cost public WiFi network
- Blockchain unifying public transport payments across Madrid, Spain
- Buenos Aires government rolls out digital ID on Ethereum
- Blockchain-enabled water metering & management
- Spanish town holds referendum on Ethereum
- Blockchain-based public procurement to reduce corruption
- Seoul launches blockchain voting system
- Seven Oakland non-profits will receive quadratically matched donor contributions
- Dubai Customs launches blockchain platform to improve supply chain and commercial shipping transparency