FinEst Centre
for Smart Cities

SMART CITY CHALLENGE 2025
Solution idea for the city challenges

Max 3 pages
send to smartcity@taltech.ee by Nov 30, 2025

Solution Idea Title (max 5 words, no acronyms) - Transparent Infrastructure Investment Platform
Planned pilot project duration – 24 months
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1. Which urban challenge or problem are you planning to provide a solution to?

- Title on list: City Infrastructure Management System
- The City of Tallinn, summary of issue:

Tallinn's departments currently operate with fragmented information systems, resulting in:

- investment decisions that rely on manual interpretation of scattered data;
- limited transparency in prioritization;
- inability to systematically compare projects;
- subjective or inconsistent evaluation;
- insufficient use of existing data, because the volume of information now exceeds the staff's analytical capacity

The city requires a unified, data-driven prioritization and maintenance management solution to consolidate municipal datasets and support high-quality decision-making.

2. The solution you are proposing

I propose a Transparent unified Infrastructure Investment Platform, consisting of:

A. Unified City Infrastructure Data Hub (postgresql + postGIS)

A minimal, standards-based data integration layer that consolidates Tallinn's core infrastructure datasets

1. Built using open source solutions for assets, geometry, maintenance logs etc.
2. Designed for extensibility toward future sectors (parks, mobility, utilities).

We intentionally avoid traditional GIS software (e.g., ArcGIS, proprietary tools) because these introduce:

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1. high licensing costs
2. complex workflows
3. vendor lock-in
4. irrelevant features for Tallinn's needs (and majority of the cities!)

B. Investment Prioritization Calculator

A transparent, multi-criteria scoring engine that evaluates proposed investment projects using:

1. location context
2. infrastructure condition
3. user numbers and demographics
4. risk, cost, and timing
5. alignment with policies and long-term plans

This directly fulfills Tallinn's need for an objective scoring basis (as stated on page 2 of the challenge document: "a score based on all available information regarding the construction site and its surroundings"

C. Maintenance Prioritization & Alerts

A simple interface ranking maintenance tasks ("worst-first + usage"), combined with automated signals for inspections, lifecycle replacements, or anomalies.

D. Predictive Maintenance Lite (optional extension)

Light machine learning models trained on existing data for one or two high-impact asset types (e.g., pavement, lighting or pipes). The operational system and the database remains simple and city-owned.

No new sensors required. Huggingface or databricks is used for:

1. model training
2. feature engineering
3. exploratory analytics

E. Lightweight 3D Viewer (optional extension)

A minimal 3D visualization interface (Cesium/Google 3D Tiles) to support planners' spatial understanding. Not a full digital twin, no simulations or 3D/IFC/BIM models, just visualization.

The platform solves Tallinn's problem by:

1. Unifying siloed infrastructure data
2. Automating investment scoring
3. Automating maintenance prioritization
4. Providing predictive signals for inspections

5. Ensuring full transparency of why a project ranks higher
6. Giving planners more time for quality design, rather than data gathering
7. Providing citizens with better value for money, fully aligned with Tallinn's objectives

This matches all future-system characteristics listed in problem description.

3. Innovation and piloting of your pilot solution.

What are the best solutions available now that solve the challenge you target? (There are some solutions there for sure) How will your solution be better? What is the innovation in it?

Existing systems in cities like Cascais, Helsinki, San Francisco, and Virginia's SMART SCALE provide project scoring or infrastructure analytics. However:

1. They rely on heavy GIS platforms or proprietary tools.
2. They are not transferable to Tallinn without expensive customization.
3. They often require data standards Tallinn does not currently use.
4. They introduce vendor lock-in.
5. They require long procurement lifecycles, incompatible with a rapid research pilot.

Our key innovations:
Spatial functions are implemented in PostgreSQL/PostGIS, avoiding the complexity and cost of heavy GIS technologies. Every score, weight, and rule is visible and adjustable by the city. Separate layers for data, scoring, maintenance, predictive modeling, 3D visualization (optional) helps to develop each layer based on need without waiting for new big updates of the vendors. Purpose driven ML models train on existing data only, avoiding expensive sensor deployments or a lot of computation cost.

What do the cities need for piloting the proposed solution? How the piloting could work?

- Access to current fragmented data or database if there is any
- Access to current workflows and a sample of decision making documentation
- Asset condition data if there is any
- Maintenance logs
- Involvement of planners for co-design to see the current scoring rules for investments and giving feedback for new rules and workflows.

Please provide short information about the capabilities of the research and development proposed team. Your team should have members from TalTech as well for sure. In case you do not have them yet, which skills would you need from TalTech.

I am alone at this stage but have quite good cross functional and multi-diciplinary qualities that can be useful to form, shape and lead the work further. All skills needed are listed below:

- AI/ML competence
- Geoinformatics
- Data ecosystems (hopefully Databricks competence)
- Infrastructure expert (construction or design)
- City planner or spatial decision support system expert
- software architecture & development, preferably Fullstack in pilot phase with simpler UI

4. Expected impact of your pilot solution.

Environmental & Climate Impact

- More transparent, data-driven infrastructure decisions
- Better long-term planning of investments
- Significant reduction of manual analysis effort
- Stronger justification for public spending, as requested in the challenge document

Citizen Impact

- Higher quality public spaces
- More fair, equitable distribution of investment
- Consistency and clarity around why projects are selected
- Better return per euro spent

City Governance Impact

- Unified view of assets and projects
- Predictable maintenance cycles
- Clear communication between departments
- Workflows optimized around evidence rather than intuition

As Annex, I attach even longer span of a roadmap, which would hopefully be adopted by startup for long term commercialization as an spinoff.

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Annex — Roadmap & Startup Commercialisation Plan

Phase 1 (0–6 months): Data + Scoring

- Operational PostgreSQL/PostGIS data hub
- Transparent scoring model
- Pilot UI for Tallinn planners

Phase 2 (6–12 months): Maintenance

- Maintenance ranking dashboard
- Automatic inspection alerts
- Cross-department coordination

Phase 3 (12–18 months): Predictive Maintenance Lite

- ML models for 1–2 asset types using Databricks
- Calibration with Tallinn field teams

Phase 4 (18–24 months): Second-city Deployment

- Deploy platform in international partner city
- Evaluate transferability and scaling

Phase 5 (Post-pilot): Commercialization

- A separate startup commercializes the platform
- Offers SaaS hosting, support, and scaling
- Uses cloud credits (AWS/Azure/GCP/Databricks) to minimize early cost
- Ensures long-term sustainability beyond research funding

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