FinEst Centre
for Smart Cities

SMART CITY CHALLENGE 2024
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) - **Smart Loading Zones for Freight**

Planned pilot project duration – 24 months

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1. Which urban challenge or problem are you planning to provide a solution to?

- Urban Freight Loading Zones challenge described by the City of Tallinn. This challenge arises from the increasing conflict between freight operations, pedestrian safety, and efficient use of curbside space, particularly considering the regulation effective from 1 July 2025 that prohibits stopping on sidewalks.

2. The solution you are proposing

- What is the solution you are proposing for the challenge above?
  The proposed solution is an integrated urban freight curbside management system that replaces informal pavement stopping with regulated, data-driven loading infrastructure. The system consists of three connected measures: (1) time-windowed loading bays near major trip generators, (2) smart loading zones equipped with digital booking and automated occupancy monitoring, and (3) curb extensions or "loading pockets" implemented in spatially constrained street environments.

  Time-windowed loading bays provide lawful, predictable stopping opportunities where demand is highest. Research shows that dedicated, time-restricted bays reduce illegal stopping, shorten search time for loading space, and improve overall delivery efficiency (*Holguín-Veras et al., 2020, p 366*). Furthermore, aligning loading windows with peak delivery periods has been shown to reduce double-parking and improve pedestrian safety (*Marcucci et al., 2015, p 244*).

  Smart loading zones introduce digital reservation systems, real-time occupancy monitoring and automated arrival registration. Evidence indicates that technology-enabled curbside management substantially increases curb utilization and reduces unnecessary circulation ("cruising") by freight vehicles (*Castrellon et al., 2024, p 7*). Digital allocation of loading slots also contributes to a more balanced temporal distribution of loading demand and reduces queueing in areas with dense commercial activity *(Dalla Chiara & Cheah, 2017, p 8*).

  Curb extensions and loading pockets provide additional safe loading capacity in narrow streets without disrupting pedestrian continuity. European design guidelines confirm that reallocating small segments of curb space for structured freight loading reduces pedestrian-vehicle conflicts and improves visibility at crossings (*SLOADZ Consortium, 2022, p 19*).

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Together, these measures directly address Tallinn's challenge arising from the 1 July 2025 regulation prohibiting pavement stopping. The proposed integrated system establishes a formal, enforceable, and data-driven framework that supports regulatory compliance, ensures uninterrupted business access, and enables the dynamic management of curb space based on real-world usage patterns.

- How does it solve the city challenge you target?
  - **Reduction of sidewalk stopping and double-parking** by relocating freight activity into designated loading bays, thereby lowering the incidence of illegal stopping and conflicts with pedestrians.
  - **Improved traffic safety and pedestrian comfort** as freight vehicles are removed from sidewalks and crossing areas, while structured curbside zones reduce conflict points and enhance visibility**.**
  - **Reduced search time for loading space and lower congestion levels** through digital booking systems and real-time occupancy information, which limits unnecessary cruising for parking.
  - **Enhanced compliance and enforcement enabled by automated arrival registration and dwell-time monitoring**, which are essential components of an effective curbside management policy.
  - **Support for data-driven curbside governance**, through continuous data collection that enables adaptive adjustments of time windows, locations, and regulatory parameters.
  - **Creation of a clear, lawful, and predictable operating framework** aligned with the 1 July 2025 regulation, improving transparency for drivers and logistics operators.

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?
  - Several European cities have already introduced digital or time-regulated loading zones (incl. *Barcelona, Madrid, London, Paris).* However, many existing solutions remain partially automated and operationally fragmented, as urban freight management is still largely based on isolated technological tools rather than integrated end-to-end solutions (*Holguín-Veras et al., 2020, lk 362*).
  - The proposed solution advances current practice by offering a fully integrated and largely automated system, where loading bay reservation, arrival registration, invoicing and enforcement operate as a single unified workflow. The main innovation lies in direct integration with transport companies' fleet management and route-planning systems, allowing loading bays to automatically reserve during route generation.
  - The model is also innovative because it works as a public–private partnership. The city provides the space and the regulatory framework, while the solution provider is responsible for the hardware, software, markings and day-to-day operations. This reduces the city's upfront investment and ensures financial sustainability through reservation fees and enforcement revenues.
- What do the cities need for piloting the proposed solution? How the piloting could work?

  Responsibilities of the City:
  - Designate and sign 3–5 priority loading bays in high-demand corridors
  - Define applicable time windows and approve selected bays for smart-zone testing.

  Responsibilities of the solution provider:
  - Identify key loading hotspots in cooperation with stakeholders.
  - Mark and prepare the bays (install required hardware).
  - Deploy the pilot software for booking, integration, payment handling and penalty management.
  - Train users and support daily operations.

- Monitor occupancy rates, dwell times and compliance and adjust operational parameters based on feedback.

Responsibilities of transport companies:

- Use the pilot loading bays and provide feedback on operations.
- Test automatic booking through fleet-planning integration or use manual booking and follow pilot rules.

- 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.
    - The pilot is supported by the TTK University of Applied Sciences Mobility Research Team, whose members include Kirke Williamson, Rõõt Laigu, Sven Kreek, Rene Maas, Ott Koppel and TalTech researchers Jelizaveta Janno and Tanel Jairus, ensuring strong research capacity and direct academic support from TalTech. From the private sector will be involved installation companies, parking solution companies who will contribute with extensive practical expertise, including physical marking of parking areas, installation of hardware (cameras, LED displays, self-service kiosks), development of custom parking-management software, and the daily operation of parking control services.

4. Expected impact of your pilot solution.

- What is the potential impact for city environments, sustainability and citizens?
    - Safer and more comfortable sidewalks, as loading activity is removed from pavements and away from crossings; structured curbside management reduces pedestrian–vehicle conflict points (*Conway et al., 2022, p 5*).
    - Less double-parking and shorter search time for loading space through time-windowed and smart loading zones, improving operational flow in dense areas (*Marcucci et al., 2015, p 244; Dalla Chiara & Cheah, 2017, p 8*).
    - Lower emissions, noise and congestion, as reduced cruising for parking decreases unnecessary vehicle kilometers driven by freight vehicles (*Jaller & Holguín-Veras, 2019, lk 783*).
    - More predictable and livable streets for citizens, characterized by clearer sidewalk space, improved visibility and better walkability.

Disclaimer: by submitting this form you will give the FinEst Centre for Smart Cities the right to share this idea with cities and other researchers, companies through FinEst Centre homepage. If this idea is selected, the FinEst Centre for Smart Cities has the right to implement this idea with offering you an active role in conducting the pilot. If this pilot is selected then the financing is an investment by the FinEst Centre for Smart Cities.

CHECKLIST AND FAQ

Are you a researcher from TalTech? - Yes – you are warmly welcome to propose one or more solutions ideas.

Are you a researcher from another university? - Yes – you are warmly welcome to propose a solution but form a team with TalTech researchers. Need help with contacts, please ask.

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Are you from a company? - Yes - you are warmly welcome to propose a solution but form a team with TalTech researchers. Need help with contacts, please ask. NB! But keep in mind that we cannot finance the costs of companies as partner. The companies are welcome to propose ideas in case they would need researchers to develop their solutions considerably further and they would like to become the commercialisation partners of these solutions. The companies need to be mature enough to cover their own expenses for participation.

Are you a city, municipality or a campus / private real estate developer? - Yes – do not propose solution ideas but wait the researchers and companies to propose the solutions and read their proposals from our homepage from Dec 2.

Which urban challenge can the solution idea address? - Please choose one from the list of the urban challenges chosen for the Smart City Challenge 2025, i.e. Round 5. The challenge needs to have minimum 1 city from Estonia and one from another country interested, the more the better.

How will the proposed solution ideas be evaluated? – We will not evaluate the proposed initial solution ideas but cities/municipalities/campuses/private real estate developers will say to you if they are ready to join your proposal and pilot the solution proposed by you or not. You will need minimum one Estonian city/county and one city/county from another country to make the pilot project proposal already together with them by Febr 28, 2026.

Can we have private real estate developers or campuses instead of cities as partners? – No, you need minimum one Estonian city/county and one city/county from another country but you are welcome to have private real estate developers and campuses as additional partners. In several cases they are more likely future customers for your solution. And there can be other possible customer segments who are worth to involve in one or other way as well. We can cover the costs of any private partner.

Do we need to send a confirmation letter from the cities with the challenges we address? – No, you do not. But you are very welcome to discuss and develop your idea with these cities already in this phase. That would raise the probability to be successful in the next phases considerably. The city contacts are available at FinEst Centre homepage under the Smart City Challenge 2025 challenge list.

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