FinEst Centre
for Smart Cities

SMART CITY CHALLENGE 2025
Solution idea for the city challenges

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

Solution Idea Title (max 5 words) – *Civil Protection Toolkit*

Planned pilot project duration – ***24 months***

Main contact/-s : *Wolfgang Gerstlberger, wolfgang.gerstlberger@taltech.ee, +372 5138441, TalTech Department of Business Administration, Head of Sustainable Value Chain Management Research Unit*

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

Safety in case of natural or human disasters

(Civil Protection Toolkit for disruptive events)

- Which city challenge/-s proposed by the cities / counties you are? ‘

Urban areas are increasingly vulnerable to human-made threats, polycrises, and compound emergencies stemming from disruptive events and representing risks for the citizens. Thus, we want to support, based on consultations in the last weeks, in the first place the cities and communities of Saaremaa and Jelgava (contact: Jaanika Tiitson and Marija Stocka) to conduct a preliminary analysis together with a feasibility study for the creation of a dual-usable infrastructure together with an appropriate service portfolio for facing challenges related to natural disasters and security risks for improving the level of civil protection. As much as possible we also would open our proposed solution for further interested cities in suggested problem. The dual-use infrastructure consists of a network of fixed and mobile civil protection facilities offering security and support services for citizens. Since the fixed components of the dual-use infrastructure are dominated by their function of shelters, the mobile components can be equipped with a variety of services for the citizens so that the network of fixed and mobile infrastructure can be adapted to the needs in different emergency situations. Together with development of appropriate dual-use infrastructure elements, evacuation plans for the citizens as well as the allocation of mobile units for offering services for residents are developed that can be applied in case events of disruption.
The toolkit aims to empower the citizens together with the city government and further public as well as private partners to develop a more autonomous protection of their communities. The creation of a toolkit aims to improve and develop smart communities that can support and protect themselves but also to collect and analyse data as support of the decision-making process. Key element of the toolkit represents also the interface to the citizens including the training of public servants as well as for the citizens about what to do in case of a disruptive of risky event and how to interpret the messages from civil protection authorities.

2. The solution you are proposing

- What is the solution you are proposing for the challenge above?

In order to be better prepared to face human-made threats, emergencies and disruptive events, different measures are under discussion. Since the type of possible disruptive events is multifaceted reaching from natural catastrophes over infrastructural failures to human-based security events, the needed support and protection services to the citizens depend on the type of a certain disruptive event. Therefore, we follow the idea of a flexible network approach consisting of fixed and mobile dual-use infrastructure components together with appropriate service portfolios that can be customized and adapted needs of a certain disruptive event. inspired by the existing concept of adaptive supply chain management our solution is aiming for realization of a toolkit embracing agility, resilience and sustainability.

The fixed components of the underlying infrastructure represent dual-use protection facilities that are of public interest, i.e. the creation of an accessible and modern temporary shelter infrastructure for its residents so that in the event of sudden threats citizens have no easily accessible, designated places to stay safe for several hours until danger has passed. Since the fixed infrastructure is distributed of the communities these components mainly consist of simply equipped constructions for the protection against physical threat to mitigate the risks and the protect the citizens, e.g. strengthened bus stops or other public spaces that are normally used

daily, but could quickly serve as protective shelters in emergencies. However, even the design, equipment and placements of the fixed components must be analysed and optimized.

In addition to the network of fixed infrastructure, in accordance with the type of disruptive event, the fixed infrastructure must be complemented by additional capacity and by appropriate service to the citizens. Here, our proposed solution consists of the creation of mobile Multifunctional Resilience Centre — a modular, renewable-powered hub designed to provide safety, continuity, and community support during emergencies, while serving as a sustainable mobility and energy node during normal times. The MRC will be deployed in community centres, public buildings, and urban neighbourhoods, with each unit capable of hosting 20–30 people for 48–72 hours. It will offer light, warmth, information access, device charging, and basic food supplies. In regular times, it will support e-bike and EV charging, powered by solar or wind energy integrating Vehicle-to-Everything functionality for mobile resilience.

The challenge is to provide a network of adaptive civil protection units that are distributed across the municipalities that are close to people in their everyday life and allow a short-term activation in case of appearing disruptive events. The fixed infrastructure consisting of distributed shelters against physical threads should be fast to reach, whereas the mobile modules should be deployable in the municipalities and the linked services to the citizens should be scalable in adaption of the appearing emergencies, ranging from communication and monitoring services to supply of energy, water and food up to the offering of medical services. The equipment of the mobile modules requires a demand forecast for different emergency scenarios as well as a related allocation plan together with underlying logistics services based on modern supply chain management concepts.

The integration of the mobile as well as the fixed approach is trying to improve the level of the civil protection system, and they require an analysis of the civil protection needs for the citizens including the specification of the underlying hardware together with the functionalities and services that must be offered and safeguarded by the protection system. Furthermore, since an integrated civil protection system from mobile and fixed units needs to be coordinated and adapted to changing frame conditions and scenarios, a deployment plan together with corresponding logistics capacities must be analysed and developed. And finally, the interface to the citizens has to be considered, which leads to the development to a tool kit for public level as well for the citizens.

The proposed solution is a toolkit, based on a suitable hard- and software infrastructure as well as on preliminary and follow-up empirical analyses, which supports a 'behavioural resilience plan' for potentially affected citizens. This toolkit comprises the following:

- *Deployment plans, logistics action plans as well as network optimalization concepts for the underlaying infrastructure*
- *Demand forecast of emergency scenarios for different types of disruptive events*
- *Information and awareness raising campaign for citizens about the new resilience system (including non-written materials like e.g. short videos);*
- *coordinated practices for citizens, organised by city government staff and additional helpers;*
- *detailed guidelines for setting up resilience system control headquarters together with a resilience information network for citizens, which are organised by the city government, but also include additional staff from police, rescue services, hospitals etc.*

Furthermore, the following technical components are necessary:

- *Specification of the mobile and fixed parts of the civil protection system*
    - *In the case of the MRC's different functionalities can be considered including medical services*
- *Decentralised sensor systems for neighbourhoods to support the centralized governmental warning system;*
- *Hard- and software for the resilience control headquarters;*
- *Technical devices for resilience information network for neighbourhoods and citizens;*
- *Apps for mobile phones and computers to get access to the resilience information network.*

Conditions for realizing this solution are the following:

To investigate what is the current civil protection situation in cities and formulate requirements for an improved decentralised flood resilience system. The new civil protection system aims for a sustainable resilience approach that minimises casualties and reduced significantly the civil risks compared to the current situation. Thus, the main objective is to create a blueprint for a municipal, decentralised civil protection system composed of mobile and fixed components in cooperation with the relevant stakeholders, i.e. municipality, citizens and their neighbourhood initiatives, public security and rescue organisations, and private companies, to help to interact in the most effective way. As a private company participating to the project, we consider, e.g. insurance and security companies in order to reduce all kind of damages, costs and environmental disadvantages, which have later to be covered and financed by assurances besides the public sector.

Implementation challenges:

To better integrate the centralized governmental and warning system with decentralized municipality and neighbourhood resilience systems:

- *Interfaces have to been bridged and different public and private actors to be coordinated in a more effective way than so for;*
- *Potentially affected citizens must be informed via various channels.*

- How does it solve the city challenge you target?
  Potentially affected citizens will be warned and prepared much more systematically and much earlier than under the current systems in the different operating systems
- What is the expected impact to citizens you expect to see if the challenge gets solved?

The security of potentially affected citizens and regarding their health and property will be considerably increased.

- What is the expected impact to the governance of the involved cities you expect to see if the challenge gets solved?

The information, communication and decision processes inside the city government as well as between city government and involved further/external stakeholders will be improved considerably.

Innovation and piloting of your pilot solution

- What are the best solutions available now that solve the challenge you target? How will your solution be better? What is the innovation in it?

Our solution idea represents a significant innovation, because it introduces a novel and effective solution not yet implemented or explored in these and many other cities.

- Bring this significant innovation to market and create a reliable business case for this aim, there are different options. First, some of the involved partner cities are already in contact with potentially interested private firms, with whom for example a license agreement could be developed based on a viable prototype. Second, starting from the current project proposal development team, a TalTech spin-off for commercialization could be created, potentially with additional partners.

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

The involved cities need in the first line some suitable test sites as well as some budget for the demonstration projects and implementation activities. The pilot will be – so far – carried out in Saaremaa and Jelgava.

The proposed team:

Wolfgang Gerstlberger, wolfgang.gerstlberger@taltech.ee, +372 5138441, TalTech Department of Business Administration, Head of Sustainable Value Chain Management Research Unit); he will contribute in need analysis as well as business model innovation/development.
Yannick Le Moullec, yannick.lemoullec@taltech.ee, Department of Electronics, Head of Research Laboratory for Cognitronics; He will contribute in sensor-related development for the proposed solutions
Thomas Hollstein, Thomas.hollstein@taltech.ee, Adjoint Professor, IT Faculty
Thomas Hoffmann, Thomas.hoffmann@taltech.ee, Tallinn Law School
Gunnar Prause, Gunnar.Prause@taltech.ee, TalTech Department of Business Administration, he will contribute with adaptive Supply Chain Models and Sustainable Process Optimization
Merle Küttim, merle.kuttim@taltech.ee, Researcher at Sustainable Value Chain Management Unit: Department of Business Administration, she will contribute with cooperation management and business model development
Tarmo Tuisk, Tarmo.Tuisk@taltech.ee, Project specialist at Sustainable Value Chain Management Unit: Department of Business Administration, he will contribute with project management and (qualitative/quantitative) data collection/analysis
Marina Järvis, marina.jarvis@taltech.ee, Assistant Professor at Organisation and Management Unit: Department of Business Administration, she will contribute with risk and safety management
Liis Ojamäe, liis.ojamae@taltech.ee, Associate Professor at Marketing Unit: Department of Business Administration, she will contribute with urban planning and qualitative data analysis
Jaana Merisaar, jaana.merisaar@taltech.ee, Early Stage Researcher at Sustainable Value Chain Management Unit: Department of Business Administration, she will contribute to project management and qualitative/quantitative data collection

3. Expected impact of your pilot solution.

What is the potential impact for city environments, sustainability and citizens?
The overall health, well-being, material safety and quality of life of citizens will be clearly improved as well as negative impact on city environments. Moreover, the performance of city governments and their external stakeholders will be clearly improved.