

FinEst Centre
for Smart Cities

SMART CITY CHALLENGE 2025

City Challenge

Challenge Title

Disaster-Focused Digital Twin of Istanbul

City/county and country

Istanbul / Türkiye

Main contact from your city/county – name, organization, job title, e-mail, phone

Ali TAŞDEMİR, Smart City Directorate of Istanbul Metropolitan Municipality, Director, ali.tasdemir@ibb.gov.tr, +902124494405

1. What is the future urban challenge that would need a solution to?

- Please describe the challenge of your city / county neighboring a city?

Istanbul is highly vulnerable to a major earthquake due to its dense urban structure and large population, which makes the city particularly fragile. In the first phase of the Disaster-Focused Digital Twin Project, the goal is to identify collapsed or damaged buildings using satellite imagery. This will provide a real-time map of areas most in need of urgent intervention.

In the second phase, the challenge is to ensure the most effective deployment of search and rescue teams and vehicles to these areas. This is a highly dynamic problem because teams vary in size, capacity, skills, location, and available equipment. After the initial earthquake, new teams, including local, international, and volunteer units, may join the system, while exhausted teams may be withdrawn. Aftershocks can also lead to additional building collapses, requiring continuous reassignment of resources. Efficiently coordinating all these factors under rapidly changing conditions is a complex logistical challenge.

- Which category your challenge is primarily in: safe city, happy city, and climate resilient city? **Safe Cities**
- Why is it important for your city to solve it? How big priority it is for you and why?

Addressing this challenge is critical for Istanbul. Mismanagement or delays in emergency response can result in significant loss of life and increased damage. The 2023 earthquakes in southeastern Turkey showed that uncoordinated disaster response can leave some areas without support while others experience team congestion. Given Istanbul's dense population and highly built environment, the city is particularly at risk. Therefore, deploying emergency resources effectively is a top priority. The project aims to implement dynamic algorithms to assign and redirect teams in real time, ensuring rapid and efficient response to save lives.



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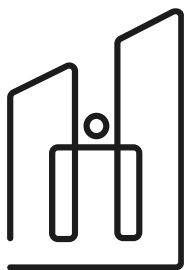


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- Is this a unique challenge/problem of your city, why or is this by your knowledge a challenge/problem that many cities have – which kind of other cities?

This challenge is not unique to Istanbul. Other large, densely populated cities at high risk of earthquakes, such as Tokyo or cities in California, face similar difficulties in coordinating emergency response after disasters. However, Istanbul's combination of high population density and complex urban structure increases its vulnerability, making efficient disaster management particularly urgent. The solutions that will be developed with this challenge proposal could therefore serve as a model for other major cities with similar risks.

2. Innovation.

- How have you solved that issue so far? Why aren't the present solutions good enough? Are there legal obstacles, which ones?

So far, disaster response in Istanbul has relied on manual coordination of emergency teams and vehicles, using static maps and pre-planned routes. While this approach has some effectiveness, it is not sufficient for a city with a dense urban structure and a large population. Static planning cannot adapt to dynamic conditions such as exhausted teams, newly arriving volunteers, unexpected building collapses, or aftershocks. Past earthquakes showed that uncoordinated deployment often leads to chaos. Current solutions are therefore too rigid, slow, and unable to respond in real time to rapidly changing needs.

Legal obstacles may arise regarding access to real-time satellite imagery, integration of international and volunteer teams, and sharing sensitive location or personal data of citizens and buildings. Data privacy regulations and disaster management protocols must be carefully considered to ensure compliance while allowing efficient operation of the system.

- What should be the main features, characteristics of the future solution to be potentially best for that challenge or problem?

The future solution should include:

Dynamic resource allocation: Algorithms that continuously optimize team and vehicle deployment based on real-time conditions.

Integration of multiple data sources: Satellite imagery, GIS data, sensor networks, and real-time field reports.

Flexibility and scalability: The system should handle changes in available teams, capacities, and locations, including international and volunteer units.

Resilience to aftershocks: The solution should quickly adapt to new building collapses or additional hazards.

User-friendly interface: Emergency coordinators should easily visualize priorities, assignments, and progress in real time.



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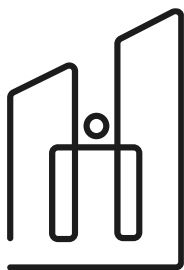


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Compliance with legal and privacy standards: The system must respect data privacy and disaster management regulations.

This approach would allow Istanbul to deploy emergency resources efficiently, reduce response times, and ultimately save more lives during an earthquake.

3. Expected impact of your pilot solution.

- What is the expected impact to your city environment you expect to see if the challenge gets solved?

If this challenge is successfully addressed, Istanbul's urban environment will be better protected during earthquakes. Efficient deployment of emergency teams will reduce uncontrolled damage, prevent secondary hazards such as fires or structural collapses, and minimize chaos in critical areas. Moreover, the system will enable better monitoring and planning for high-risk zones, contributing to long-term urban resilience.

- What is the expected impact to your citizens you expect to see if the challenge gets solved?

For citizens, the solution will save lives by ensuring faster and more effective emergency response. People in damaged areas will receive aid more quickly, reducing casualties and health risks. The system will also increase public confidence in disaster management, as residents will know that resources are allocated efficiently and dynamically based on real-time needs.

- What is the expected impact to your city governance you expect to see if the challenge gets solved?

For city governance, solving this challenge will strengthen Istanbul's disaster preparedness and operational capacity. Authorities will gain access to real-time decision-support tools, allowing them to manage resources efficiently, coordinate multiple teams, and respond flexibly to evolving disaster scenarios. This will improve transparency, accountability, and overall resilience of municipal disaster management systems.

4. Piloting

- Why would you be interested to become a piloting partner of a proposed solution to the challenge you are describing here? Describe shortly your capability to participate.

Istanbul is highly interested in becoming a piloting partner for the proposed solution because the city faces a high earthquake risk, and testing a dynamic, real-time disaster response system here would provide valuable insights for both the city and the project. The Smart City Directorate of IMM has strong experience in coordinating multi-agency operations and integrating digital solutions into urban management. Istanbul can provide a realistic urban environment for piloting the solution, facilitate collaboration with relevant municipal and national agencies, and offer expert feedback on system design, adaptability, and usability.



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