SMART CITY CHALLENGE 2025
Solution Idea Proposal

SOLUTION TITLE: Real-Time Disaster Resilience Digital Twin
CHALLENGE ADDRESSING: Digital Twin for Disaster Management (City Resilience to Natural Hazards)
PROPOSING CITY: Bagcilar Municipality, Istanbul, Turkey
SOLUTION PROVIDER INFORMATION
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1. Solution Concept

Bagcilar is one of Istanbul's most disaster-sensitive urban districts—high seismic risk, flash flood exposure, dense population, aging infrastructure. Current disaster plans are static and quickly outdated when roads collapse, communications fail, or resources become blocked.

Hubbcast proposes an AI-powered Disaster Prediction Layer that complements Bagcilar's ongoing digital twin development and fully integrates with IMM's award-winning disaster-focused Digital Twin (CEB Award 2025, Seoul Smart City Prize 2024).

Core Innovations

1. **AI Impact Prediction**
   Real-time simulation of:
   - Earthquake building damage
   - Road blockages
   - Utility failures
   - Flooding extent and evacuation route viability
2. **Dynamic Resource Allocation**
   Optimized routing of:
   - Ambulances
   - Fire trucks
   - Rescue teams
   - Heavy equipment

   Uses rule-based optimization with optional reinforcement learning enhancements.

3. **Multi-Channel Emergency Alerts**
   SMS, push, WhatsApp, sirens
   - personalized safe-route guidance
   - offline maps for Internet outage
4. **Two-Way Citizen Interaction**
   - SOS location beacons
   - Citizen damage reports (AI-validated)
   - Family check-in system
   - Multi-language support

2. Technical Approach

2.1 Digital Twin Integration:

- Bi-directional data sharing with IMM Digital Twin
- District-level 3D model (buildings, roads, infrastructure)
- Hazard overlays (seismic, flood, landslide)

2.2 Sensor Network (Priority-based): A realistic 30–50 sensor pilot:

- Structural sensors (accelerometers, tilt)
- Flood sensors (water levels, drains)
- Weather units
- Utility & road sensors
- Existing traffic cameras

2.3 AI Modeling:

- Earthquake impact: probabilistic damage + access analysis
- Flood prediction: rainfall-runoff + drainage overload
- Resource optimization: vehicle availability, road status, casualty clusters
- Safe-route engine: recalculated every 30 seconds

2.4 Ethical, Legal & Security Compliance:

- KVKK-compliant alert system
- No personal data in simulations
- All routing decisions transparent
- Encrypted channels, RBAC, disaster-proof backups

2.5 Capacity Building:

- 150+ responders trained
- Scenario workshops
- District-level and cross-city drills

3. Expected Impact

Quantitative (24 Months):

- **50% faster emergency response**
- **40% faster damage assessment**
- **60% more efficient resource allocation**
- **100% coverage of critical infrastructure monitoring**
- **80% citizen enrollment in alert system**
- **≥90% satisfaction** among emergency responders

Life-Saving Potential**:** In a major earthquake scenario, optimized routing and faster alerts can reduce casualties by 20–30%.

Qualitative Impact:

- From reactive → proactive crisis management
- Increased public trust
- Better coordination with IMM & AFAD
- Accelerated post-disaster recovery

4. Pilot Implementation Plan (24 Months)

Phase 1 — Assessment & Infrastructure (Months 1–6)

- Hazard & vulnerability mapping
- Integration plan with IMM + AFAD
- Install 30–50 priority sensors
- Build 3D district model

Phase 2 — AI & Digital Twin Layer (Months 7–12)

- Core AI model development
- Flood & earthquake simulation calibration
- Resource optimization engine

Phase 3 — Engagement & Drills (Months 13–18)

- Mobile app + SMS gateway
- Multi-language alert system
- Tabletop exercises
- 5,000-person field drill

Phase 4 — Full Deployment (Months 19–24)

- District-wide activation
- 50,000-person evacuation simulation
- Final impact assessment
- Replication blueprint for other districts

5. Risks & Mitigation

Risk	Mitigation
Sensor installation delays	Phased rollouts + backup datasets
Integration complexity	Simple APIs + IMM collaboration
Citizen alert fatigue	Dynamic frequency control
Connectivity failure	Offline maps + multi-channel redundancy
Over-complex AI models	Rule-based core + optional RL

6. Alignment with FinEst Goals

Safe City: Direct citizen protection, early warnings, coordinated response.
Climate Resilience: Predicts extreme rainfall, flash floods, drainage failures.
Interdisciplinary: Engineering + data science + emergency management.
International Collaboration: Parallel pilot in Tallinn or Tartu for comparative research.
Scalability: Adaptable to all earthquake- and flood-prone cities.

7. Why Hubbcast

- Deep IoT + AI expertise
- Proven large-scale real-time systems
- Strong integration background
- Disaster modeling experience
- GDPR/KVKK-compliant by design
- Trusted by EU innovation networks

Conclusion

The Disaster Resilience Digital Twin transforms Bagcilar into one of Turkey's most prepared districts. Through AI simulation, optimized resource deployment, and personalized citizen alerts, the project directly protects 740,000 lives and provides a globally replicable model of district-level disaster preparedness.