Tomorrow's Cities Decision Support Environment Istanbul Case

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Urban Risk in Transition

WORKING GLOBALLY TO REDUCE DISASTER RISK FOR THE URBAN POOR

About the project

The Tomorrow’s Cities Project started in 2019. This multi-partner project is led by the University of Edinburgh (UK) and funded by the United Kingdom Research and Innovation (UKRI) under the «Global Challenges Research Fund (GCRF)».

Boğaziçi University Kandilli Observatory and Earthquake Research Institute, Department of Earthquake Engineering, carry out the Istanbul case study of the project.

The project’s local partners in Istanbul are **Istanbul Metropolitan Municipality and Büyükçekmece Municipality.**

The project’s main objective is to ensure that all groups of society, especially vulnerable groups, are minimally affected by future hazards.

In line with this objective, the project aims to institutionalize a decision-making approach based on the future aspirations of all stakeholders, taking into account the possible natural hazards in the future.

Five basic stages were developed within the scope of the project to achieve the goal of ensuring disaster risk mitigation. These five stages constitute the **«Tomorrow’s Cities Decision Support Environment»**:

1- Future visioning

2- Visioning scenarios

3- Impact modeling

4- Risk agreement and learning

5- Institutionalization

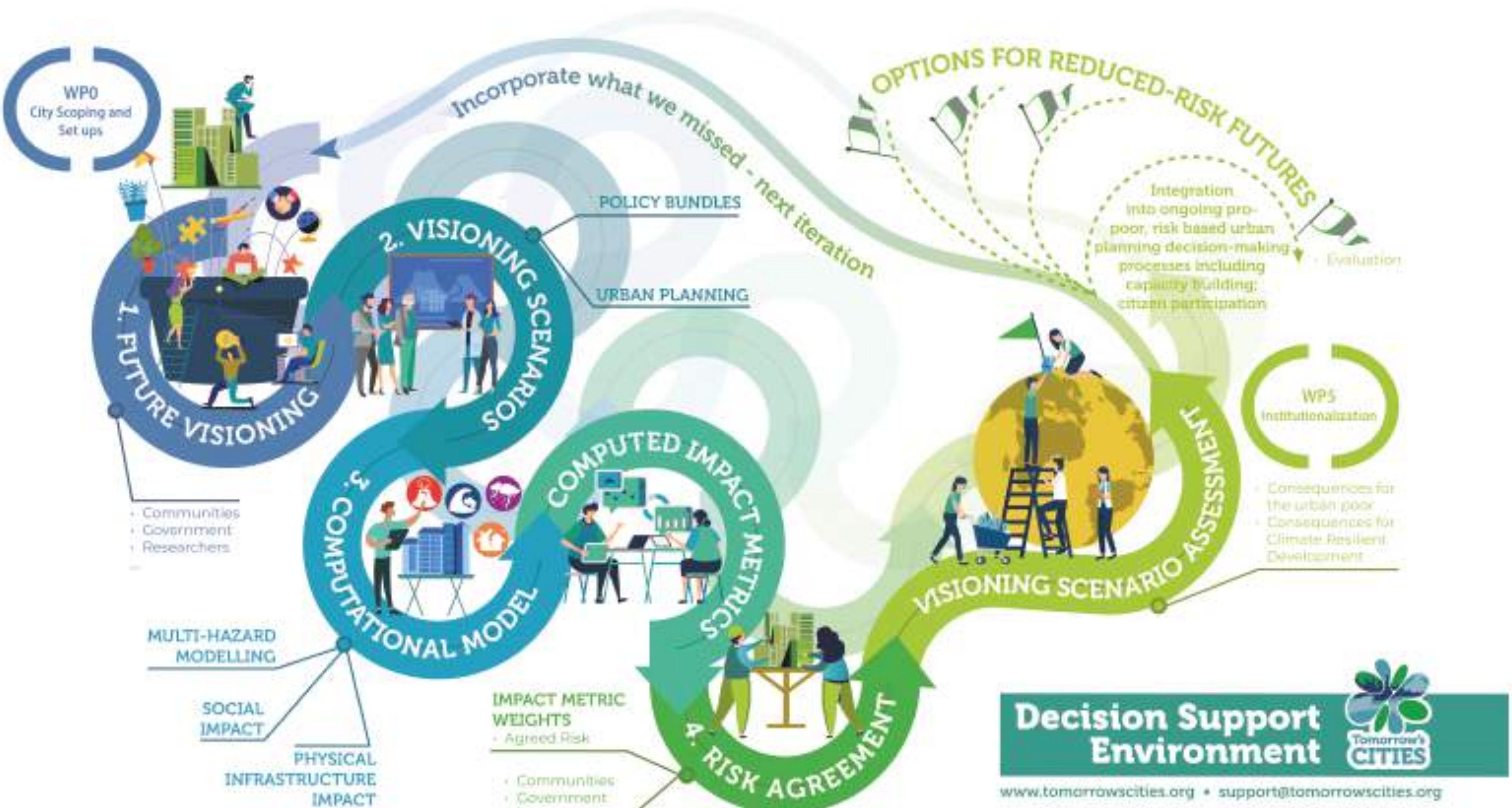
These five stages were implemented in the plot area identified in the Büyükçekmece District of Istanbul, and they were also tested in nine different cities over five years. In the implementations carried out for these cities representing various social and urban textures, specific analyses were developed for each pilot site, and site-specific characteristics were included in the method to make the study more comprehensive.

Study area

Study area took place in Büyükçekmece District, in Istanbul’s western side.

The are is approximately 500 ha large and accomodates approximately 15.000 people.

In the land use plans, prepared by the local municipalities, the area is assigned as «development zone», which indicates the are can be urbanized in the future. At its current state, while the eastern side of the study are is more populated around industrial facilities, the West side is mostly agricultural or open lands.



WP0
City Scoping and Set ups
Incorporate what we missed - next iteration
OPTIONS FOR REDUCED-RISK FUTURES
1. FUTURE VISIONING
2. VISIONING SCENARIOS
POLICY BUNDLES
URBAN PLANNING
Integration into ongoing pro-poor, risk based urban planning decision-making processes including capacity building; citizen participation
Evaluation
WP5
Institutionalization
3. COMPUTATIONAL MODEL
COMPUTED IMPACT METRICS
VISIONING SCENARIO ASSESSMENT
Communities
Government
Researchers
Consequences for the urban poor
Consequences for Climate Resilient Development
MULTI-HAZARD MODELLING
SOCIAL IMPACT
PHYSICAL INFRASTRUCTURE IMPACT
IMPACT METRIC WEIGHTS
Agreed Risk
Communities
Government
Researchers
4. RISK AGREEMENT
Decision Support Environment
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Implementation step-1: Future visioning

Future visioning is the starting point of the methodology and the stage where the **individual factor** is most prominent. At this stage, different focus groups of the society come together to discuss their **expectations and aspirations** for the future's resilient city against hazards.

The **«future vision»** developed at the end of this phase reflects the expectations and aspirations of the community. With the support of innovative and participation-based methodologies, future aspirations are translated into **spatial expressions**, and solutions regarding risk mitigation are outlined.

The study in Büyükçekmece was conducted with six focus groups:

Youth, Women, Elderly, Disabled, Social Assistance Beneficiaries, and Roma.

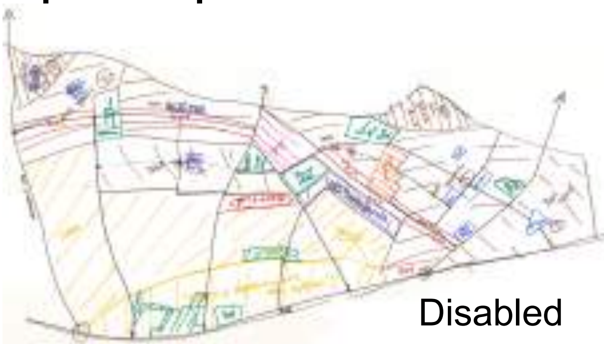
We learned about the future aspirations of these groups by organizing both **focus group meetings** and **participatory planning workshops**. We mapped their aspirations related to **the development and planning of their neighborhood in the future**.

Implementation step-1: Future visioning Findings

Future Aspirations

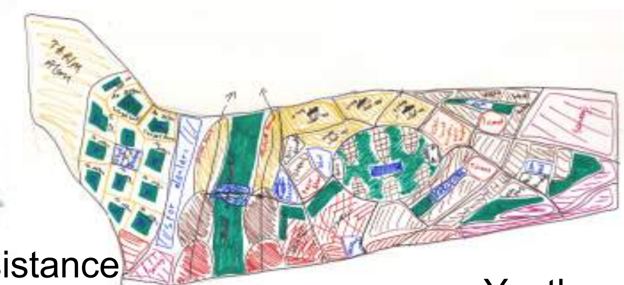
- Earthquake resilient
- Low density, safe settlements, where neighborhood relations are preserved
- Prepared for the climate crisis
- Green and social areas
- Sufficient infrastructure facilities
- An accessible urban environment where everyone can access basic needs and services

Spatial Aspirations

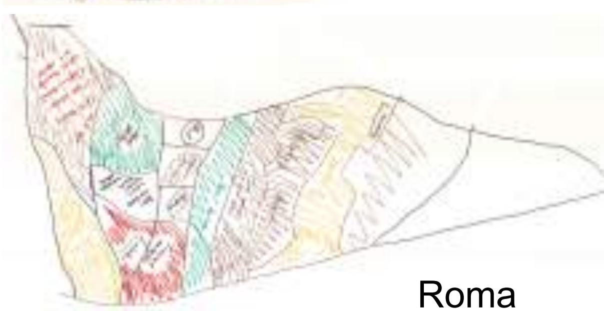


Disabled

Social assistance beneficiaries



Youth



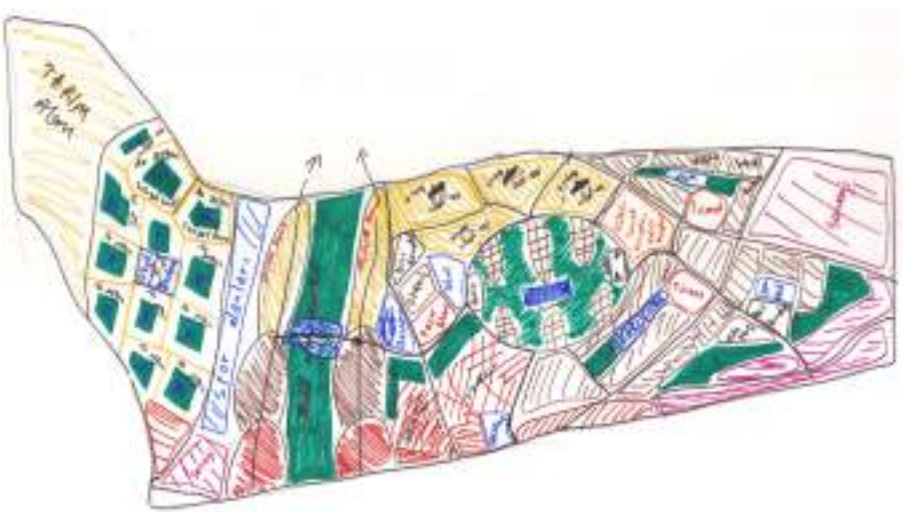
Roma

Women

Elderly

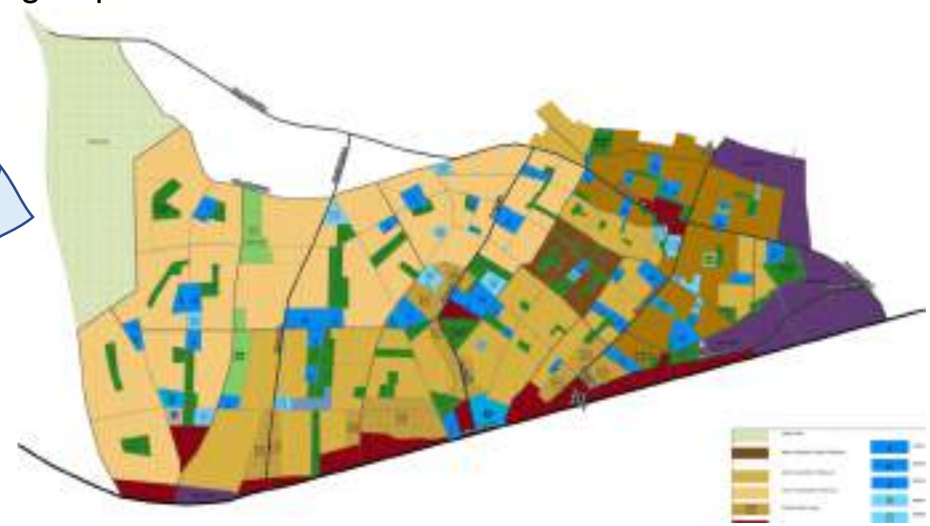
Implementation step-2: Visioning scenarios

At this stage, the «future vision» of the community is transformed into a «visioning scenario». This scenario represents the urban environment of the future, which is created based on the **common aspirations** of the society. While designing the **future urban environment**, **the policies and actions** by which the city should be governed are determined in addition to **the physical and social characteristics** of the city.



The transition from future vision to visioning scenario is achieved by integrating the aspirations of the community with the planning standards and the basic principles of spatial planning in an expert oriented way. Then scenarios crafted by experts are reviewed and revised by focus groups again to ensure the compliance with their visions.

In this way, a **community-based**, **rational**, and **applicable** land use plan is developed. Scenario development is carried out seperately for each group.



Implementation step-2: Visioning scenarios Findings (Youth Group)

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"A Büyükçekmece with a vibrant social life, job opportunities and alternative energy source"

Urban texture

Land use plan

Future population structure

Total population: ~ 30,000
Total number of households: 9,685

Income: Low-income 21%
Middle-income 45%
High-income 34%

Education: Literate only 12%
Primary school graduate 20%
Secondary school graduate 23%
High school graduate 24%
University graduate 21%

Age groups: <14 years 20%
≤ 65 years 9%

Working age population rate 36%

Predicted building layout

Total number of buildings: 2,019
Existing: 1,738 Predicted: 281

Building height categories
Low rise (1-4 storey): 81%
Middle rise (5-8 storey): 10%
High rise (9 and more): 9%

Building construction type
Adobe: 1%
Wood: 0,50%
Reinforced concrete: 93%
Reinforced concrete shear wall and frame system: 5%
Prefabricated: 0.50%

Policy recommendations

- Development of open, green areas for each neighborhood
- Low-density development
- Physically connected and accessible schools and green spaces

Implementation step-3: Multi-hazard / Impact modeling

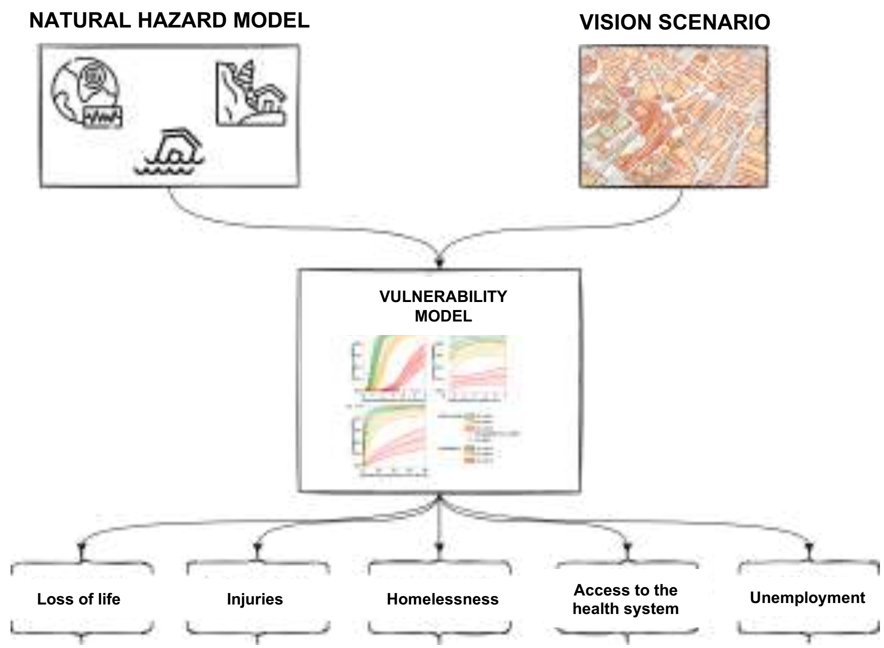
Each «visioning scenario» is exposed to multiple hazards (earthquake, flood, landslide, etc.) at this stage. The potential damages and impacts of the hazards in the scenarios are estimated through simulations.

Estimates are made of potential impacts, such as the number of casualties and injuries, the number of families forced to relocate, and the number of families without access to hospitals or schools. The calculations are performed with the Tomorrow's Cities Decision Support Environment (TCDSE) web application.

TCDSE web application

At this stage, that can also be considered as a risk analysis, **natural hazard data**, **vulnerability models**, and **visioning scenarios** are overlaid, and potential impacts are calculated.

The vulnerability model developed for each natural hazard and scenario forms the backbone of the analysis. The flow diagram is given below.



Implementation step-3: Hazard / Impact modeling Findings

For Büyükçekmece, earthquake scenarios likely to affect the project site have been modeled in different combinations. The image on the right shows the three basic scenarios taken as basis.

Using scenario ground motion simulations, ambient vibration measurements, and seismic sounding data, the potential earthquake hazard in Büyükçekmece was determined for an area of approximately 6 km2.

The actual measurement locations are given in the image below.

After the analyses were completed in the TCDSE web application, they were transferred to the online GIS-based panel that users can interact with.

Implementation step-4: Understanding risk / Risk agreement

Once the disaster impacts have been calculated, the community groups that created the visions need to learn about the consequences of their decisions, i.e. to see what level of risk their land use decisions may lead to.

Different visioning scenarios generate various impacts, and different community groups assess these impacts differently. In this step, groups discuss about what a future with less risk would be like, and they seek a common solution to the hazard impacts identified.

The ultimate goal of the study is to develop policy options that address the causes & drivers of risk and to generate inclusive & concrete solutions for the future.

In the workshop, at the heart of this phase, community representatives come together to examine vision scenarios, hazard scenarios, and the consequences.

In line with the findings of this study, the scenarios are updated, and community-based land use decisions are produced based on «disaster risk».

Implementation step-4:
Risk agreement and learning
Findings

In our workshop in Büyükçekmece, each focus group examined vision scenarios, hazard scenarios and impact outcomes as defined in the methodology.

This examination acts as a learning process to understand the impact's root causes and address these factors.

In each group, reserachers were involved in the discussions to ensure that the examination was conducted in line with scientific data.

As a result, it was found that while there were points of agreement between all community groups, there were also issues of divergence. The most prioritized common demands for a resilient urban future are listed as:

- Renewing the building inspection process and make it reliable,
- Zoning and urban transformation policies that prioritize disaster risk mitigation,
- Critical facilities such as hospitals, schools and green spaces are accessible to all members of the society,
- Creating financial opportunities, especially for low-income inhabitants in the urban renewal process.

Implementation step-5: Institutionalization

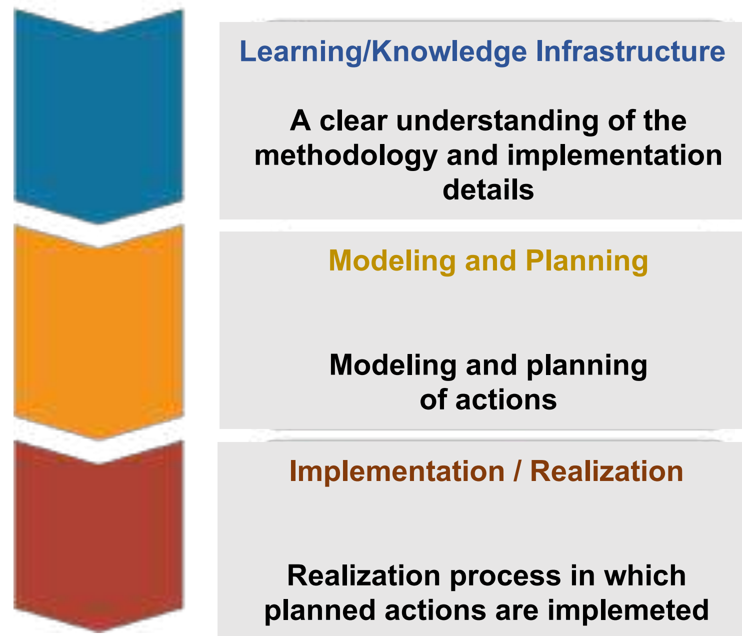
At this stage, it is ensured that the TCDSE methodology (community-based and disaster-risk-oriented decision-making) is adopted and integrated into practice by relevant decision-making institutions, particularly local governments.

The primary objective is to ensure that stakeholders with a say in spatial decision-making **properly understand** the study outputs. Various workshops, focus group meetings, and bilateral meetings are planned in this context.

Based on this information background and the achievements in implementing the first four steps of TCDSE, the second objective of institutionalization is to **model and plan the actions** that will enable institutions to implement the TCDSE methodology. At this stage, it is expected to identify the activities that will allow institutions to transition to community-based and disaster-risk-oriented spatial decision-making.

The third objective of institutionalization is to see the modeled and planned **actions put into practice**. This goal can also be considered the longer-term final goal of the project. As of this stage, it is aimed that TCDSE components will be involved in the decision-making process, albeit partially.

Institutionalization Steps



Implementation step-5: Institutionalization Findings

In the Büyükçekmece case of the Tomorrow's Cities Project, **community-based, evidence-based, and disaster-risk-oriented** spatial decision-making was implemented over approximately one year. The main impressions gained during the project, which included dozens of meetings and interaction with hundreds of people, are as follows under three main headings:

Participation	Planning	Disaster Risk Reduction
The community is closely engaged with urban challenges, particularly the earthquake, and clearly desires to be part of the solution. The community feels it is not sufficiently included in the current decision-making process. Therefore, the community has actively and efficiently contributed to the participatory planning activities carried out within the project's scope, with experts' contribution and support. The community can effectively participate in decision-making given the appropriate environment and tools.	For local governments, what stands out as the most substantial aspect of TCDSE is that; spatial decisions are made, reflecting scientific knowledge of the outputs while considering society's demands. With this structure, the proposed model strengthens the hand of local governments in the face of a frequently changing political environment. The methodology has shown that the participatory decision-making approach can be integrated into existing planning practices. As such, its applicability has also been verified.	The methodology produces outputs that can be used as a basis for disaster risk. Thus, it presents a planning approach that contributes to understanding disaster risk. Disaster risk cannot be reduced only by renovating buildings. Disaster risk cannot be reduced without a planning process in which all layers of society are involved, and shared strategies for the future are developed. Today's society does not adopt top-down solutions, so the actions planned in this way are not sustainable.

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