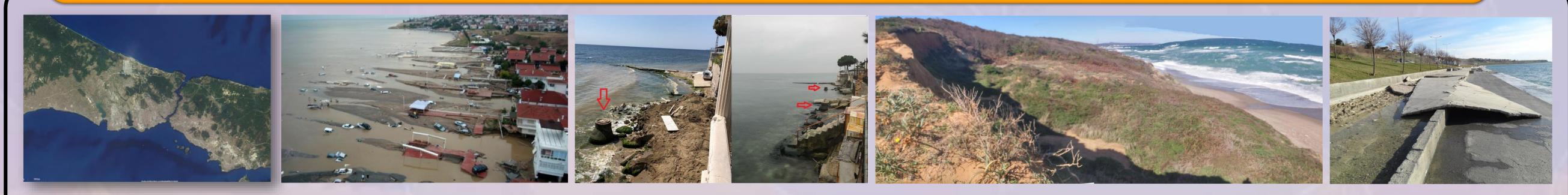
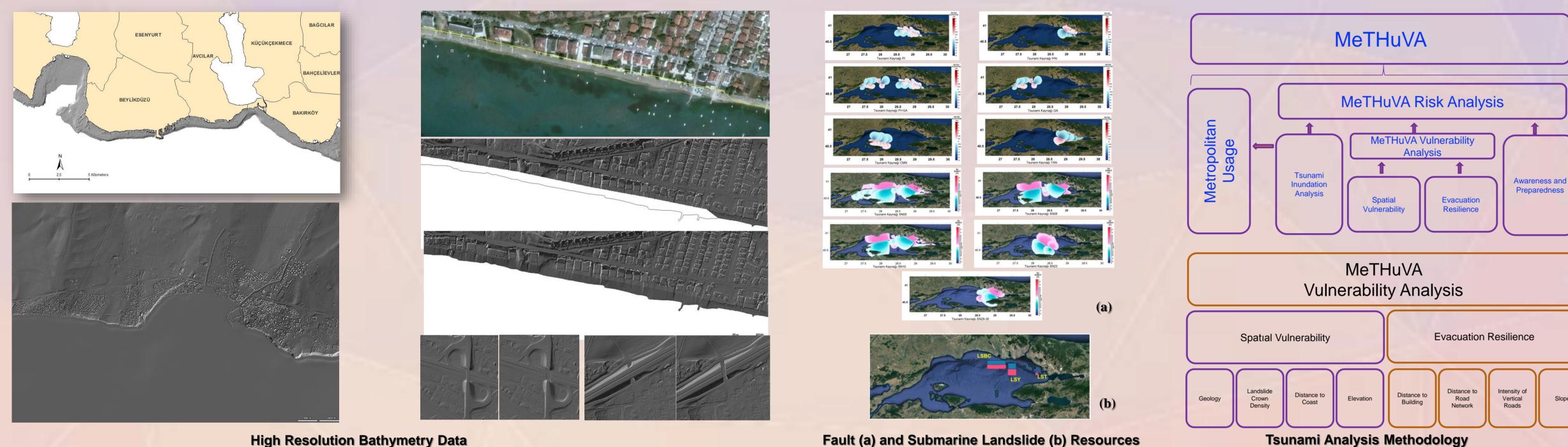




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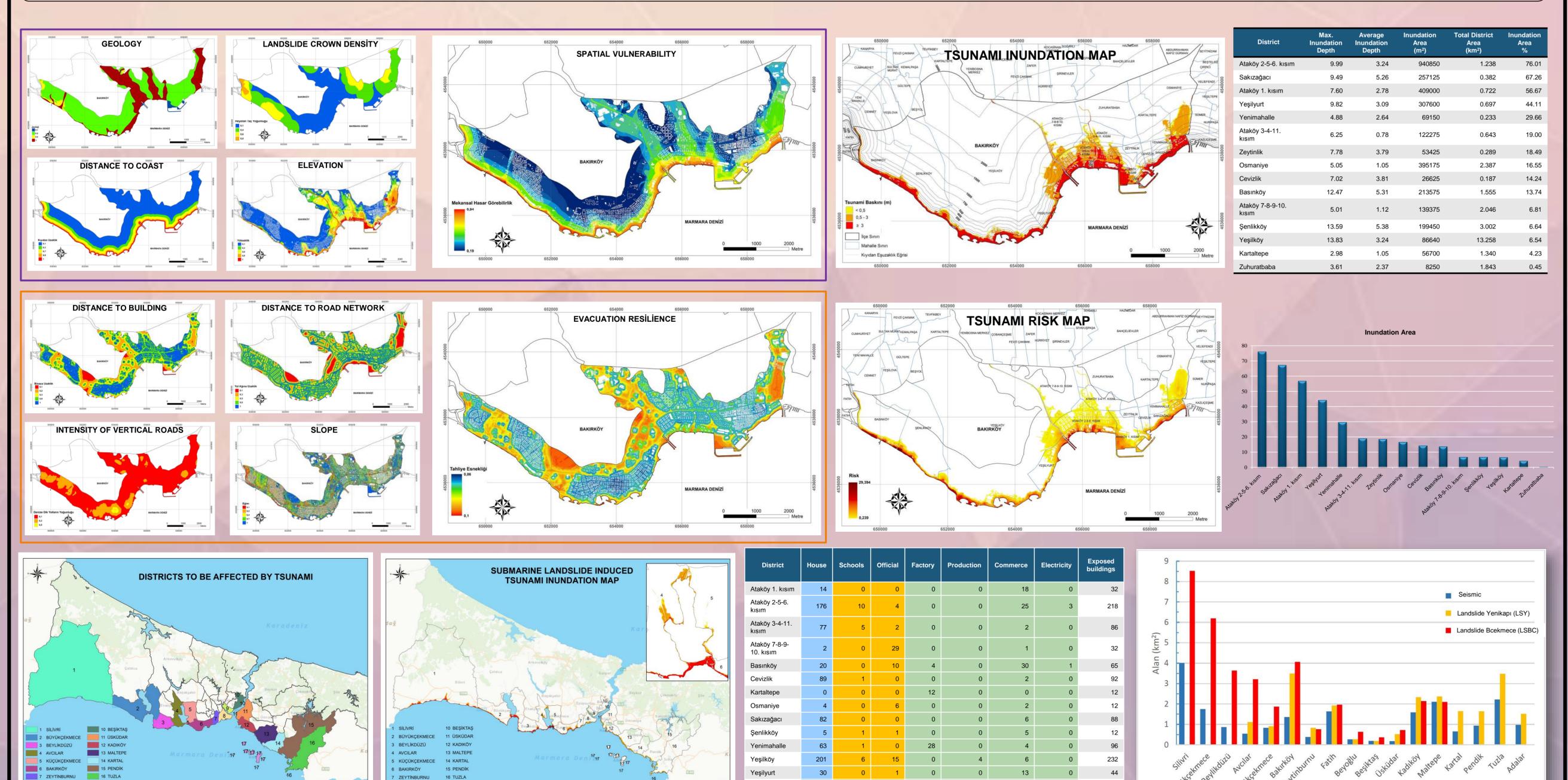
İstanbul has been hosting many different civilizations throughout history and has become a center of trade, economy and tourism with its rich and strategic position in terms of its historical, cultural and regional characteristics. Besides, as a result of climate change induced heavy and sudden precipitation and especially earthquake, Istanbul is exposed to different hazards such as floods, landslides and coastal deformations. When we look at the records of the previous period, it is seen that the earthquakes in the Marmara Sea caused serious losses in the city. In recent years, central and local governments have been developing projects to reduce the physical risks associated with disaster. But a critical ignored issue is tsunami disaster that could threaten coastline. There are critical structures that can be exposed to tsunami impacts on the shores of the Marmara Sea. The most important reason for not taking the necessary measures for these structures is the limited and low probability of tsunami occurrence due to seismic activity in Istanbul. However, if the stability of the three different critical submarine landslides close to the coastline due to seismic activity deteriorates, it is considered that tsunami events are inevitable. According to historical records, 30 of the 90 tsunami events affecting the coasts of Turkey occurred in the Marmara Sea. Especially in 1509 and in the 1894 earthquakes, tsunami waves caused excessive damages in İstanbul coastline. Simulation of tsunami effects in Istanbul was first realized in 2007 and its results started to be reflected in spatial . After this date, high resolution bathymetry and digital elevation models were produced for Marmara Sea and coastline with the national projects. In addition to such studies, new tsunami sources were put forward with MARSITE (2016) and MARDIM SATREPS (2018) projects. Moreover, as a result of new experiences gained from the 2004 Indian Ocean and the 2011 Tohoku Tsunami disasters, significant improvements have been made in both software and hardware technologies in numerical tsunami modeling tools. Based on these new findings, tsunami analyses were renewed in 2018 with high quality and resolution bathymetric data, revised coastal structure, new building stock and infrastructure data.



High Resolution Bathymetry Data

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Within the scope of the project, there are 11 different seismogenic tsunami scenarios are determined depending on the submarine landslides. From these sources, 44 different tsunami scenarios were modeled and their effects on the coasts were compared. In modelling, 42 m spatial resolution for the Marmara Sea and 5m - 7m spatial resolution for each district on the coastline are used. In coastline modelling, actual building stock, roads and infrastructure facilities are prepared within a database and used as input in spatial vulnerability and evacuation resilience analyses. The level of resolution used within the scope of the project is a first among the tsunami modeling, vulnerability and hazard analysis projects for mega-cities in the world. Wave formation and progression based on submarine landslide in the project was executed with TWO LAYER (Tohoku Univ. Imamura, Imteaz, 1995) model. Tsunami Model is calculated with NAMI DANCE software. Also, Tsunami vulnerability and risk analyses were performed with MeTHuVA method. The simulations showed that tsunami waves can reach the coasts of Istanbul in 7 minutes. According to the results of the analysis, there are water discharge areas up to 3000 m through some stream beds and tsunami flow depths reach up to 20 m in certain parts of the coastline. Within the project, it has been determined how tsunami waves affect the various assets such as schools, hospitals and public places in the flood zone.



# **TSUNAMI RESILIENT ISTANBUL-SuReIST**

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Updating of Istanbul's Tsunami Hazard and Vulnerability Analyses – (completed at 2018)

Fault (a) and Submarine Landslide (b) Resources

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**Tsunami Action Plan – (Expected by the end of 2019)**