BIG DATA
FOR SOCIAL GOOD

GSMA

Case Study

Utilising real-time mobile analytics to inform emergency disaster response in Turkey

TURKCELL
THE DIGITAL OPERATOR

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including; handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors.

The Big Data for Social Good initiative convenes public and private organisations to accelerate the mobile industries impact against the UN SDGs. Infectious diseases, pollution, earthquakes, floods and other disasters are among the greatest challenges the world faces today. Mobile operators can provide powerful and unique insights based on anonymised, aggregated network data to help solve these complex problems. Mobile Big Data can help public health organisations to more effectively respond to epidemics and plan targeted health interventions. It can support emergency relief agencies to more accurately and efficiently direct their resources in times of crises, whilst allowing governments to better understand the impact of pollution and climate change on citizens.

Through the GSMA, mobile operators and partners across geographies have come together to accelerate and scale the opportunity for Big Data for Social Good. The GSMA offers a unique platform to establish a common framework and best practice approaches, while respecting and protecting individuals' privacy.

Summary

In order to effectively respond to the increasing threat of natural disasters in Turkey, mobile operator Turkcell has developed a powerful real-time analytics tool 'Galata'; which combines more than 100 billion events per day to enable the governmental emergency response and aid agencies to make better-informed time-sensitive decisions before and during natural disasters.

Turkey and Natural Disasters

Each year, natural disasters such as earthquakes, tsunamis and torrential flooding claim thousands of lives; from 1994 - 2013 almost 68,000 lives on average were lost each year worldwide.[1] Earthquakes (including tsunamis) killed more people than all other types of disaster put together. The economic losses of natural disasters is staggering, averaging $137 billion globally each year in the last decade.[2]

Turkey is particularly vulnerable to natural disasters due to its location and geological structure. More than 95% of the country lies on one of the most active earthquake and landslide regions in the world. In addition, Turkey's largest city, Istanbul, is located on the North Anatolian Fault. Seismologists have already predicted that the area will be affected by a worst-case scenario earthquake of 7.6 magnitude in the coming decades.[3]

1. Centre for Research on the Epidemiology of Disasters (2015) The Human cost of Natural Disasters, Brussels
2. ibid
3. https://www.theguardian.com/world/2006/dec/09/turkey.naturaldisasters

Figure 1
Number of Earthquakes in Turkey since 1990

Earthquake Count, Years

■ **Annual Statistics**
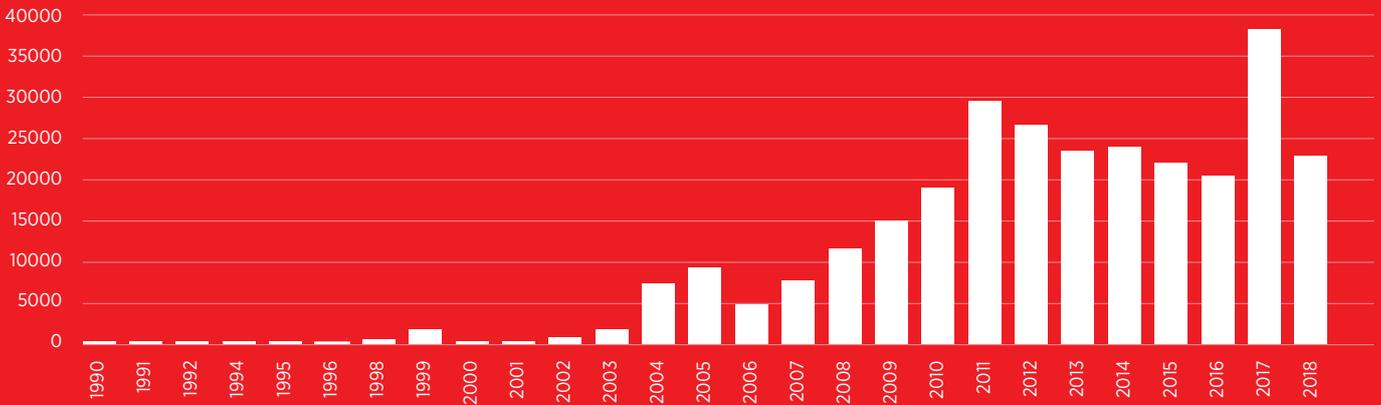
Source: AFAD [4]

Following the Marmara Earthquake in 1999, the Turkish government invested significant resources into strengthening their disaster risk assessment and response capabilities. In 2009, the Disaster and Emergency Management Presidency (AFAD) was established with the aim to transform the country's disaster risk management and co-ordination of emergency services. The Turkey National Disaster Response Plan was launched in 2015. The plan outlines the roles and responsibilities for every party involved in disaster and emergency response situations, to determine the basic principles in all three phases: before, during and after a disaster.

Figure 2
AFAD, 2018. Turkey's Earthquake Hazard Map
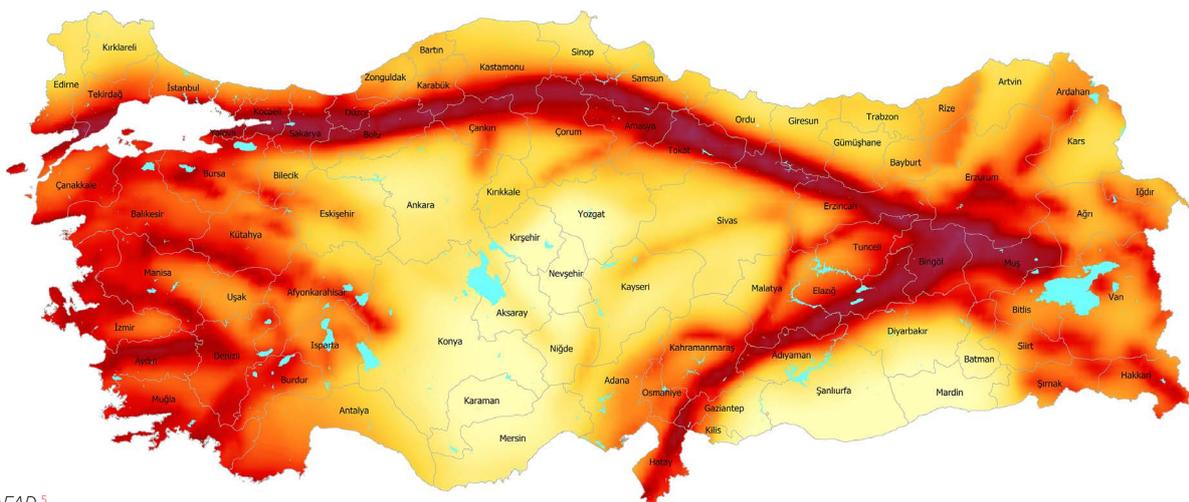
Source: AFAD [5]

This map was generated based on the results of the project entitled "Update of Turkey's Seismic Hazard Map" with code number UDAP-Ç-13-06, which is supported by the Disaster and Emergency Management Authority (AFAD) within the scope of the National Earthquake Research Program (UDAP).
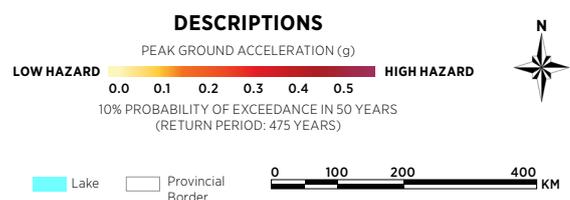
This map was prepared for a particular site condition of (Vs)30 = 760 m/sec.

It does not take hazards that may be caused by local site conditions such as liquefaction, amplification and differential settlement into consideration.

Citation: When this map is used, it should be referred to as "AFAD, 2018. Turkey's Earthquake Hazard Map".

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DESCRIPTIONS

PEAK GROUND ACCELERATION (g)

LOW HAZARD   0.0 0.1 0.2 0.3 0.4 0.5   HIGH HAZARD

10% PROBABILITY OF EXCEEDANCE IN 50 YEARS
(RETURN PERIOD: 475 YEARS)

Lake   Provincial Border

0   100   200   400 KM

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4. https://deprem.afad.gov.tr/?lang=en
5. https://deprem.afad.gov.tr/deprem-tehlike-haritasi?lang=en

Turkey's commitment to embedding disaster risk assessment and response into the fabric of their society has placed them at the forefront of disaster management response. They continue to work towards developing stronger ways to effectively assess risk and manage crises once disaster hits.

Turkcell, the leading mobile operator in Turkey has played a pivotal role in supporting the government's aims for the benefit of society. Beginning with improving the resilience of their network and supporting business infrastructure, they have expanded their efforts into the development of a real-time analytics platform called Galata.

Galata uses Turkcell's mobile signalling and network metadata from connecting users to build a pseudonymised location platform, which the Galata data analytics team transform into anonymised analytical insights for government disaster response teams.

How Mobile Data Can Help

In the foreseeable future, the number and severity of natural disasters is set to increase in Turkey.[6] Therefore, Turkey has sought innovative ways to protect citizens. In the event of emergencies, information on the worst affected areas, where people are located, where they are heading to and how many people need rescuing is a crucial element of delivering time sensitive information and resources to civilians. However, due to the nature of natural disasters and the devastating impact that it can have on infrastructure, this crucial information is often sparse.

Mobile data driven insights have transformed the Turkish government institutions' ability to take pre-emptive measures, such as notify citizens located in hard to reach areas ahead of time and plan evacuation routes and effectively respond to citizens in the midst of disasters. Turkcell's Galata application utilizes the unique insights from mobile big data to deliver real-time analytics that is available 365 days a year. Galata processes and ingests more than 100 billion events per day into a smart analytics tool that can identify how many people are affected by disasters in all areas of Turkey.

Through the use of mobile big data, which is a few TeraBytes a day, Galata enables disaster response teams to find citizens amongst the ruins of natural disasters, enabling them to save lives and ensure that the most vulnerable citizens receive timely and targeted support and resources.

The development and deployment of Galata

Turkcell developed Galata with a dedicated delivery, operations and regulatory team to ensure the application was up-to-date and fully compliant with relevant privacy regulations. The application was developed through pilot testing over a two-year period, before being implemented as a production service.

In order to ensure functionality in the event of a real disaster and measure the accuracy and speed of the application, Turkcell tests its algorithms quarterly using simulated field exercises. Turkcell select a group of employees as test subjects and use their head office as a proxy for a region, before monitoring Galata's response to what is a known number of test subjects.

The algorithms process raw signal data in real-time and are supported by an advanced, high performance specialized system running on a dedicated infrastructure, producing aggregated and anonymised insights.

In the event of a disaster, authorised members of the governmental emergency response and aid institutions can request information from security-approved members of Turkcell's limited and highly specialised operations team. This team, who are responsible for round-the-clock monitoring and maintenance, are able to provide analytical outputs in less than an hour, following a clearly defined process of internal security checks.

6. Şükrü Ersoy & Ali Koçak (2016) *Disasters and earthquake preparedness of children and schools in Istanbul, Turkey, Geomatics, Natural Hazards and Risk,* 7:4, 1307-1336, DOI: 10.1080/19475705.2015.1060637

For example, in July 2017, a 6.6 magnitude earthquake struck the tourist town of Bodrum in Southern Turkey. This caused a 2-metre-high tsunami; leaving hotels, restaurants & residences submerged in water, with the impact on people unknown. Utilizing Galata, Turkcell provided the government emergency teams with a report, enabling them to effectively plan and co-ordinate their rescue efforts.

In another example, in August 2018, heavy rains in the Northern town of Rize triggered flash flooding and landslides. Due to the mountainous nature of Rize, civilians are distributed sporadically, thus the density maps provided by Turkcell were critical to identify and prioritise areas for search and rescue efforts.

In 2018, Turkcell executed a powerful upgrade to Galata's performance capabilities, resulting in an increase to the application's processing data time; enabling Galata to process 3 billion additional events per day with the same hardware configuration. In addition the application was enhanced with smart Machine Learning models in order to detect location data anomalies and recover erroneous records.

Impact of the Mobile Data solution

The Galata application demonstrates how mobile operators and the Government are able to work together seamlessly in order to deliver a life-saving product.

- The round-the-clock analytical insights drawn from mobile big data enables the government to make pre-emptive decisions, allowing them to mitigate further risk.

- Public emergency response and aid institutions are able to make better-informed decisions regarding the allocation of resources, ensuring that civilians receive the right support when and where they need it.

- In the midst of a natural disaster timing is crucial, mobile data driven insights enable rapid decision making and response, expanding the rescue and resource allocation options available to civilians during critical moments.

Key Lesson Learned

Turkcell have taken substantial time and expertise to develop the Galata application, and it is under continuous improvement to keep it performing to the highest standard. Processing vast amounts of data in real-time proved to be a significant challenge whilst developing the application. As more data is captured through Galata and its capabilities increase, Turkcell plans to improve its processing capabilities through hardware extensions.

Next Steps

Following the successful implementation of Galata, Turkcell is currently developing internal systems that will enable them to integrate roaming data into the application and widen its geographical coverage into other countries. This will enable Turkcell to detect what city customers who have subscribed to the application are located, when travelling abroad. In order to achieve this, Turkcell are exploring how they can work with other network providers to continue to protect their consenting customers while they travel abroad.

In addition, GSMA is working with other operators to take lessons learned from developing Galata, so they can accelerate their capabilities.

Watch our video, learn about the initiative and contact us for more information: **bd4sg@gsma.com**

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