



## IGDAS NATURAL GAS NETWORK EARTHQUAKE RISK REDUCTION SYSTEM

Hikmet BIYIKOĞLU<sup>1</sup> - Dr.Veyssel TÜRKEL<sup>2</sup>

IGDAS Natural Gas Network Earthquake Risk Reduction System, constituting a significant part of the disaster management, is of vital importance in reducing the natural disaster damage on a local, regional and global scale since it enables right decisions at the right time.

IGDAS Natural Gas Network Earthquake Risk Reduction System enables information, which would reduce the earthquake risk or provide opportunity of much more effective response to earthquake, to be announced duly and efficiently through a system developed by a relevant unit.

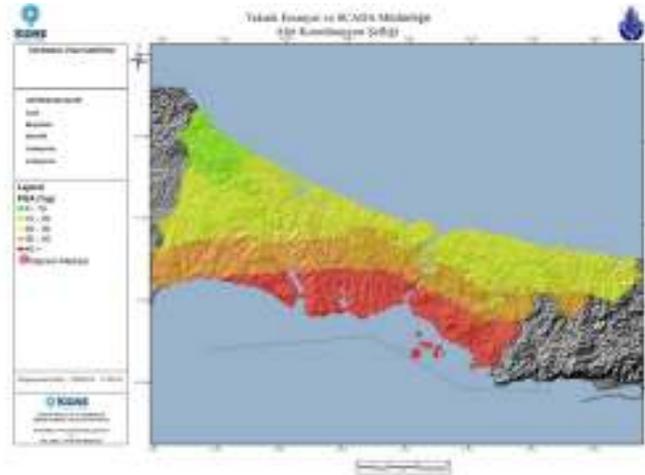


Figure 1. PGA distribution map for a scenario event in Marmara Sea

In other words, the objective of IGDAS Natural Gas Network Earthquake Risk Reduction System is to prevent injuries, deaths and economic losses resulting from natural gas in a probable earthquake.

The following 4 stages are carried out respectively within the IGDAS Natural Gas Network Earthquake Risk Reduction System.

**1. Risk Analysis:** Risky situations that instruments of the entire Istanbul Natural Gas Network, which are likely to be damaged, may experience in the event of earthquake are established. (Figure 1)

**2. Monitoring – Early Warning – Emergency Response Info Service:** Parameters relevant to earthquake and necessary for well-timed and right warnings in disaster and emergency situations are constantly monitored by IGDAS. With the early warning, the system halts gas transmission in risky

<sup>1</sup> Hikmet BIYIKOĞLU, İGDAŞ, İstanbul, [hbiyikoglu@igdas.com.tr](mailto:hbiyikoglu@igdas.com.tr)

<sup>2</sup> Dr.Veyssel Türkel, İGDAŞ, İstanbul, [vturkel@igdas.com.tr](mailto:vturkel@igdas.com.tr)

locations and informs Emergency Response Team of the probable damaged locations and size of the damage. The entire System is set up through collaboration of KRDAE, TUBITAK, IGDAS, all of which are experts in their field. Hence, IGDAS Natural Gas Network Earthquake Risk Reduction System is based on a scientific foundation.

**3. Information Exchange and Communication:** Datum is made simple and comprehensible to enable the relevant persons to give the required response. Probable damage and alert warnings are spread through intra-company, national and international communication channels.

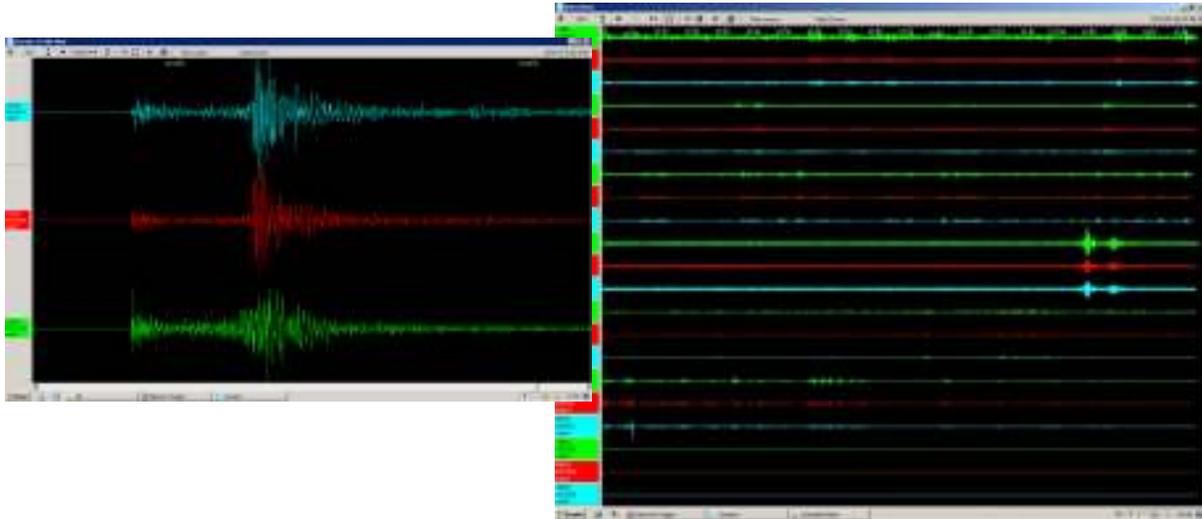


Figure 2. Real-time monitoring of IGDAS Earthquake Risk Reduction System

**4. Emergency Response Capacity:** With earthquake scenarios planned, Earthquake Risk Reduction System plays a key role in making IGDAS Emergency Response teams understand risks they would face and learn how they should respond to these risks. Once in a year preparation to earthquake programs are conducted with broad participation within the body of IGDAS.

Since the fault line off the Marmara Sea and the epicentre of the probable earthquake is pretty proximate to Istanbul, the Natural Gas Network Earthquake Risk Reduction System ensures that systems, which require response in seconds thanks to the technological equipment, are closed down and teams responding the disaster are provided with information about damage points and volume of the damage.

Thus gas transmission from the Region Regulator is halted and secondary disasters resulting from natural gas are prevented.

Scientists have recently concentrated their researches on foreseeing and assessing earthquakes and accelerated studies to assess earthquake ground motion observations within record and real time with assistance of ever-developing electronic, communication and computer technologies. Also structuring Real-Time Seismology, these studies also reveal new methods to reduce harms of earthquake. The best examples of developments in the world in this field are those in earthquake emergency response and earthquake early warning.

Earthquake early warning system is designed to detect an earthquake of a high magnitude at locations closest to the epicentre in real time and to send a warning signal.

Constant data released from 10 stations which have been installed by Kandilli Observatory and Earthquake Research Institute –5 on the land and 5 on the sea bottom– are automatically evaluated in the IGDAS headquarter.

The system continuously controls if at least 3 stations exceed the threshold within an adjustable time. As the threshold level is exceeded, the ground motion is regarded “earthquake” and the software automatically sends alarm message.

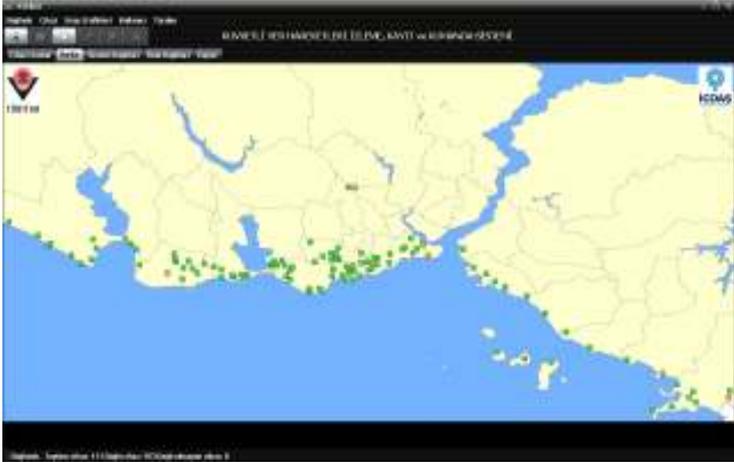


Figure 3. Strong motion stations location in IGDAS Earthquake Risk Reduction System

The signal is transferred to 110 Strong Ground Motions Record Devices and to the system of IGDAS, which computes Damage maps, and then all systems are triggered. (Figure 3)

Depending on the impact of the earthquake there are 110 Strong Ground Motions Record Devices in total belonging to IGDAS. In the event that SI value set on devices exceeds the level, each device automatically halts gas transmission from Region Regulators where the Device is built.

Probable damage information is compiled through a fast collection and analysis of information that is required during and after a destructive earthquake, with a network of strong ground motion records which are deployed in Region Regulations located in various areas of Istanbul. The objective of emergency response is to prepare damage distribution maps in natural gas infrastructure and Istanbul building stock just after earthquake takes place and to send them to the relevant IGDAS Emergency Response Teams that should respond to the disaster instantly. It would enable IGDAS field teams to respond to the disaster more quickly and effectively.

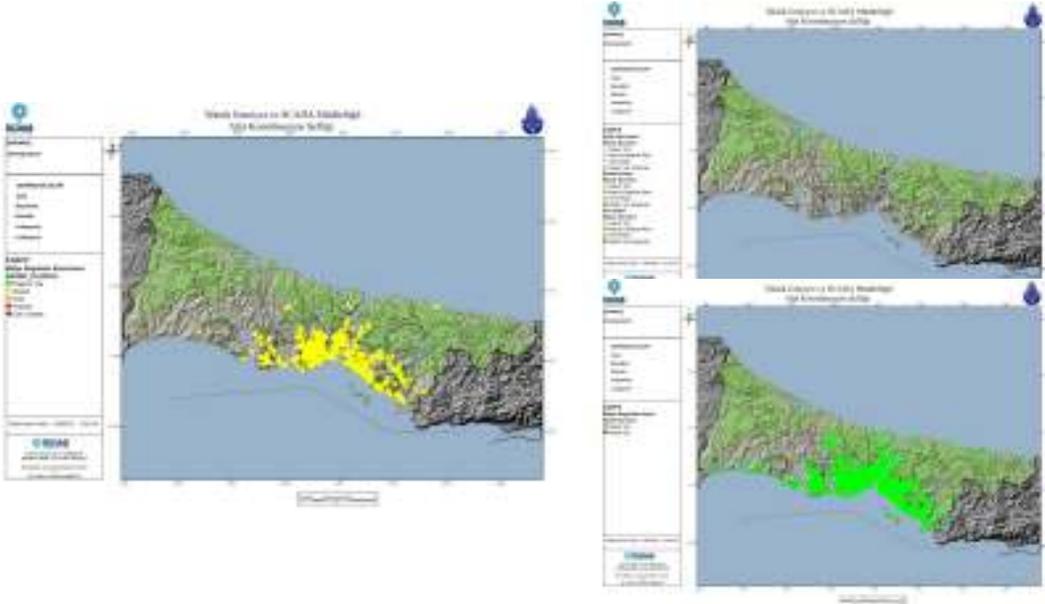


Figure 4. Scenario based damage probability map in IGDAS Network