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A REVIEW OF RISK AND VULNERABILITY OF NATIONAL BROADBAND SEISMIC NETWORK OF IRAN

Alireza GHAFOURI ZARANDI
Expert, Earthquake Risk Management Research Center, IIEES, Tehran, Iran
zarandi@iiees.ac.ir
Kambod AMINI HOSSINI
Associate Professor, Earthquake Risk Management Research Center, IIEES, Tehran, Iran
kamini@iiees.ac.ir

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The importance of seismic stations in all earthquake prone countries in terms of collecting seismic data and processing obtained information is clear. The processed data of those systems will be used normally in different fields from fundamental researches to disaster management. However, gathering accurate, reliable and in time data from seismic stations depends on several parameters (including site selection, vulnerabilities of stations and its instruments as well as the level of maintenance and support over time).

In this paper, the risk and vulnerability of Iran seismic broad band network belongs to International Institute of Earthquake Engineering and Seismology (IIEES) will be addressed. The location of those stations have been chosen based on different parameters including geographic distribution, geological and topographical conditions, access roads, noise level, possibility of data transfer by telecommunication network, land ownership, etc. However, the first item that should be addressed is the vulnerability of buildings and infrastructures. In fact, if the buildings of stations collapse during a strong earthquake, the instruments can be damaged and no data will be transferred. During the last two decades, the stations were built like a typical dome constructed above the ground surface. Although the building itself can be considered as a safe structure to earthquake, there is the risk of partial damages in some of them. In addition, in those stations, many different types of equipment are accommodated that are linked to electricity network that can be failed by earthquakes. Therefore, the buildings and its components as well as the instruments inside the buildings always need a lot of maintenance. This resulted in huge amount of annual budget to be allocated to keep those stations operational. Since 2013, a new design pattern was developed by IIEES (Figure 1).

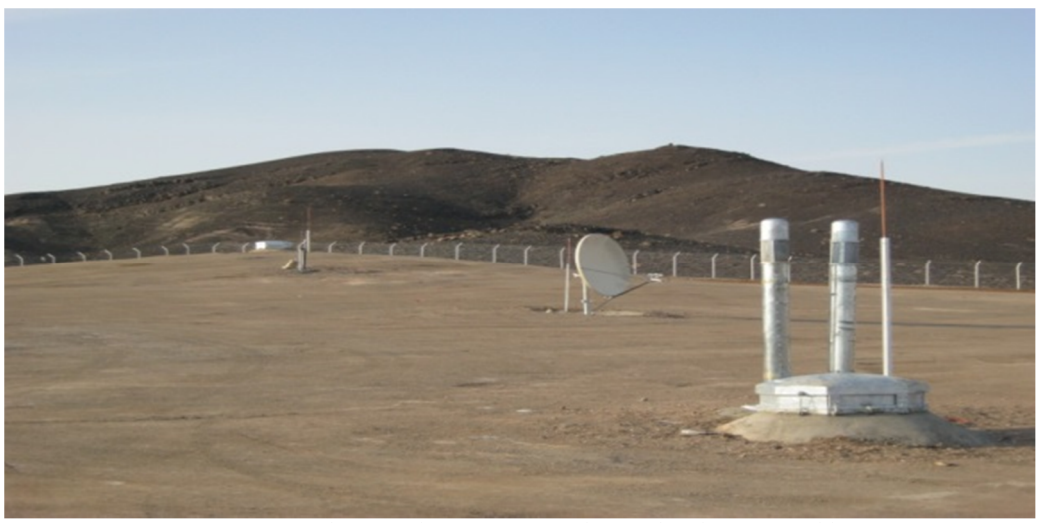

Figure 1. A new underground seismic station designed and constructed by IIEES.

The new stations are almost underground (Ansari & Amini Hosseini, 2014), include a deep well to accommodate instruments and some surface antenna and solar power systems to provide necessary energy (Trnkoczy et al., 2012). Therefore the new built stations have many advantages including lower noise level, low maintenance costs, independent energy supply, higher security of instruments to potential robbery (as most devices are buried underground), etc. The latest issue was a critical problem for the old type stations, as the stations are located out of cities and have been looted many times. This was mainly due to insufficient social, economic and cultural studies on the selected locations of those stations and neglecting the use of modern technologies to protect them.

The other issue addressed in this study is related to non-structural elements in the stations and processing room at IIEES. Although many devices in those places have been mounted properly not to be damaged by earthquake, but there are still some deficiencies that may cause interruption of data transfer as well as failure of the stations at each station. For example in Figure 2, some devices of the data acquisition room are shown, that are left without appropriate retrofitting to the ground and walls.

Figure 2. Computer rack and monitors in data acquisition center of IIEES.

In order to reduce the risk of interruption of data transferred from stations, the indicated shortages of the existing seismic stations from different aspects should be addressed and appropriate measures to improve them need to be presented. Those items will be reviewed and discussed in this paper briefly.

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