

## **Designing efficient earthquake early warning systems: case study of Almaty, Kazakhstan**

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Tectonic location of Central Asia places it in a high earthquake risk zone. Rapidly expanding urban areas in the region are becoming increasingly vulnerable to seismic risk, but at present no Earthquake Early Warning (EEW) systems exist in the region, despite their successful implementation in other earthquake prone areas. Such systems aim to provide short (seconds to tens of seconds) warnings of impending disaster, enabling the first risk mitigation and damage control steps to be taken. This study presents the feasibility of such a system for Almaty, Kazakhstan. Genetic algorithms are used to design efficient EEW networks, computing optimal station locations and trigger thresholds in recorded ground acceleration. Factors like the possibility of station failure, elevation and access difficulty to a potential site, and the potential usefulness of existing stations in the region are considered. We present a large set of possible efficient networks, to which further selection criteria can be applied by both the installation teams and the end user, such as authorities in Almaty.