

## **Monitoring the land and built-environment in Japan, its roles for earthquake disaster mitigation, and people's perception and expectation**

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Japan is earthquake-prone, and earthquake disaster mitigation has been the national problem for centuries. The 1995 Kobe earthquake caused severe damage to the modern city of Kobe and its vicinities, and it revealed various issues that would impede a safer life and society. Two notable challenges disclosed after the earthquake were: the prompt response immediately after a severe event and the early warning before the arrival of severe shaking, aiming to reduce human loss and properties after the intense shaking. To promote the relevant actions, monitoring of our lands and built facilities became popular, and efforts continue in both the public and private sectors to install monitoring systems and services throughout the territory of Japan. This presentation introduces an overview of such monitoring systems and services available in Japan. It discusses how they have been utilized for actual practice (rather than for research) of earthquake disaster mitigation and how the Japanese public appreciates and responds to the services provided by such monitoring.

The presentation consists of four parts. First, a general atmosphere of Japanese monitoring is introduced briefly. Second, monitoring of land-shaking is touched upon, and its influence on the seismic design loads stipulated in the seismic design codes is discussed. Interestingly, the seismic design loads tend to be more uniform concerning the location (region) than the seismic hazards estimated based on the historical and monitored data on the ground shaking. Third, monitoring of buildings is argued. As of now, over 1,000 buildings have been instrumented, and the relevant monitoring systems have been used to diagnose the status of building damage and give warnings to the building occupants, owners, and managers, all within a few minutes. Most notable is that building monitoring is almost exclusively “market-driven,” and the building owners have decided and paid for the instrumentation (including maintenance). There is no funding whatsoever from the government sector. Fourth and last, described is a sentiment among the building owners and managers, which has been nurtured through building monitoring. They experience medium levels of shaking much more often than severe ones. They recognize how cumbersome and irritating it is to slow down the business even by tiny-looking damage to nonstructural elements. This sentiment stimulates the thinking of “no damage” even under the design-based earthquake load, which has traditionally allowed damage to nonstructural components and some structural members.