

A social experiment of a new strong-motion monitoring system (Kyoshin Monitor) with earthquake early warning

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1. Introduction

In August 2008, NIED started "Kyoshin Monitor", which is a web service providing 24 hour live shaking maps of earthquake in Japan. After the 2011 Tohoku Earthquake (M9), the access number of the Kyoshin Monitor increased surprisingly, and drew much attention of both experts and general public. The JMA's earthquake early warning system for the 2011 Tohoku earthquake was not able to issue a warning to wide areas, which actually experienced the severe shakings, due to an underestimation of the earthquake magnitude. Our purposed method for detecting mega-magnitude earthquake based on distribution of observed strong-motion data has been effectively examined as a system independent of the earthquake early warning system. The combination of the earthquake early warning system as the latest forecast, with the Kyoshin Monitor as the real observation is much important in mitigating earthquake damage. We have developed a new Kyoshin Monitor that can provide the combined information (hereafter referred to as the "Trial Version Kyoshin Monitor").

In this research, a social experiment with the general public of the Trial Version Kyoshin Monitor has been carried out from Sep. in 2012 to Feb. in 2013. Questionnaires were used to collect information on the background and motivation for using the Kyoshin Monitor, opinions on the version used, use status, usability, and other appropriate items, aiming to understand the public's needs for the delivery, use and utilization of strong-motion observation information in the future. The social experiment was implemented through a limited online publication of the Trial Version Kyoshin Monitor to experiment participants following user registration. Public participation through a social experiment website was invited three times between Sep. and Oct. in 2012, and a total of approximately 4000 participants joined.

2. New Kyoshin Monitor

Feature

- Indicates the strong motion data observed in real time and forecast information according to EEW. (Circles indicate estimated P- and S-wave fronts and estimated seismic intensities.)
- Receives observation values updated in 1-sec. intervals as numeric data via HTTP and transfers data to client sites.
- Uses Google Maps as a base map. (A fixed map version is also prepared.)

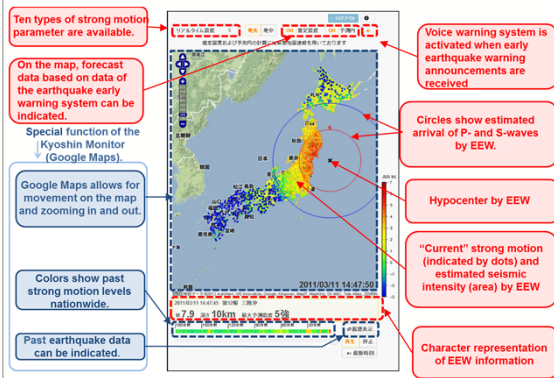


Fig. 1: Outline of the Trial Version Kyoshin Monitor. (Functions common to the fixed map version are indicated in red, those common to Google Maps the version are indicated in blue.)

3. Recruitment of participants

Public participation through a social experiment website (Fig.2) was invited three times. As a result, approx. 4,000 people participated in the experiment. All of them agreed to the experiment conditions before registering IDs (email addresses) and creating passwords.

- First group (1,000 participants): Recruitment began on September 3, 2012, and ended on the same day.
- Second group (2,000 participants): September 20 to October 7.
- Third group (1,000 participants): October 11 to November 4 (Fig. 3).

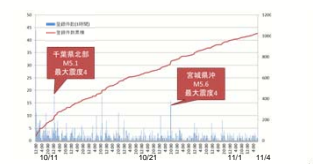


Fig. 3: Transition of participant number (group 3).

How participants learned of the experiment

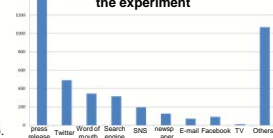


Fig. 4: How participants learned of the experiment.

User's location

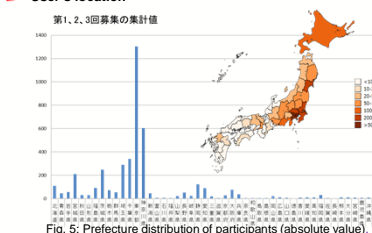


Fig. 5: Prefecture distribution of participants (absolute value).

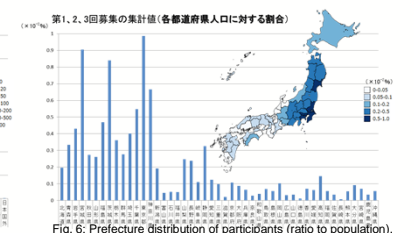


Fig. 6: Prefecture distribution of participants (ratio to population).

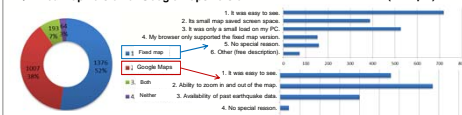
4. Questionnaire survey

- Questionnaire No. 1 (November 29 to December 21, 2012)
- Replies received: 2640 (66%)

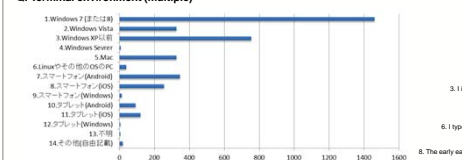
Q. Reason for participation (multiple)



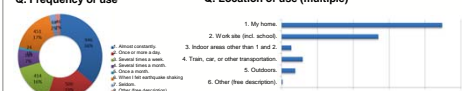
Q. Fixed map version or Google Maps version



Q. Terminal environment (multiple)



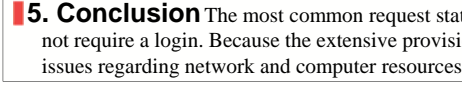
Q. Frequency of use



Q. Visibility



Q. Understandability



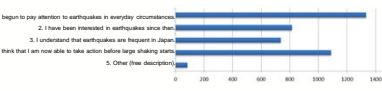
Q. Operation



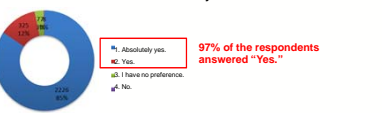
Q. Improved awareness toward disaster prevention after introduction of the Trial Version Kyoshin Monitor



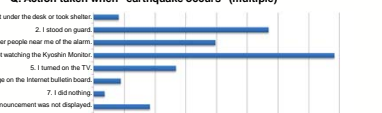
Q. Reasons (multiple)



Q. Need for service like Trial Version Kyoshin Monitor



Q. Action taken when "earthquake occurs" (multiple)



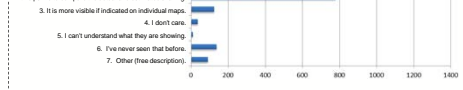
Q. User impressions of those who checked the monitor on December 7 after a large earthquake (M7.3: Seismic intensity 5 lower) in Sanriku-Oki (multiple)



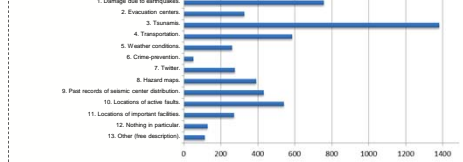
Questionnaire No. 2 (February 12 to 25, 2013)

- Replies received: 1903 (47%)

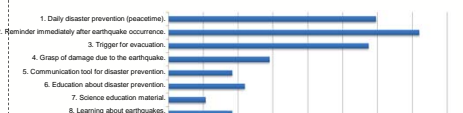
Q. Estimated seismic intensities by EEWs (multiple)



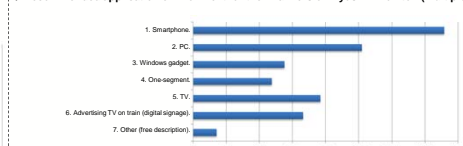
Q. Information needed in conjunction with the Trial Version Kyoshin Monitor (multiple)



Q. Application of the Trial Version Kyoshin Monitor (multiple)



Q. Recommended application environment for the Trial Version Kyoshin Monitor (multiple)



5. Conclusion The most common request stated in the free opinions was for the Trial Version Kyoshin Monitor to be available to everyone and that it not require a login. Because the extensive provisions of frequently updated and real-time earthquake information with no user limitations introduces many issues regarding network and computer resources, methods for providing adequate information under such circumstances should be examined in the future.

Acknowledgement: We would like to express our gratitude to the participants of this social experiment.