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# UNISDR Scientific and Technical Advisory Group Case Studies - 2015

## Eliminating residents' concerns after the nuclear disaster in Fukushima

**The problem**

On March, 2011 a huge earthquake and tsunamis struck a nuclear power plant in Fukushima, Japan. Its explosion caused not only contamination of the environment, but also a huge social concern. Above all, lack of information on the ongoing risks fuelled anxiety among the residents on the coastal area in Fukushima (So-so Area). For example, those who evacuated outside of Fukushima couldn't decide when to return, while those who stayed didn't know whether it is safe to go out. Therefore, information of real-time air dose rate around their home and external exposure level of the residents were in urgent need.

**The science**

There are 3 types of measurements to know external radiation exposure level.

1. Monitoring posts (NaI scintillation detector)
   Due to its better durability and its large size, this type of camera is used for stationary measurements of air dose rate. (Figure 1A)
2. Radiation dosimetre (Radiophotoluminescence glass dosimeter)
   Superior in its compact size, this device is widely used to measure personal accumulation dose of radiation exposure. (Figure 1B)
3. Portable dosimetre (semiconductor detector)
   Superior in its energy- and time- resolution to the glass badge, tis device is used to detect daily fluctuation of exposure level. (Figure 1C)

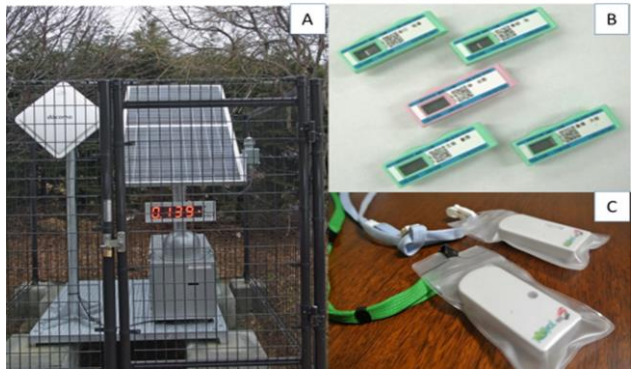


Figure 1. Devices for measurement of air dose rate. A. NaI scintillation detector B. RPL glass dosimeters (Glass Badge®, Chiyoda Technology Co.) C. Semiconductor detectors (D-shuttle®, Chiyoda Technology Co.)

**The application to policy and practice**

The local governments, in cooperation with a technology company and researchers, launched the following measurements.

1. Installation of monitoring posts.
   On April 2011, the local government started to install real-time monitoring posts, which measure air dose rate every 10 minutes, at places of concern: e.g. houses of school children, schools, community centres, and agricultural areas. The residents can check the on-site real-time air dose rate (Figure 1A) and average rate published on the webpage (1).
2. Periodical measurement of yearly external exposure levels of the residents.
   On October 2011, So-so area launched a voluntary external radiation exposure screening program using Glass dosimetre (Glass Badge GD-450, Chiyoda Technology Co.). The participants were instructed to bring it all the time for three months and yearly dose were calculated.
3. Measurement of daily fluctuation.
   The problem of Glass Badge is that it does not provide the information about when the person exposed to radiation most in daily life. Therefore, semiconductor detectors (D-shuttle, Chiyoda Technology Co.) were distributed to volunteers since 2012 so that daily fluctuation of the exposure level was clarified. (2)

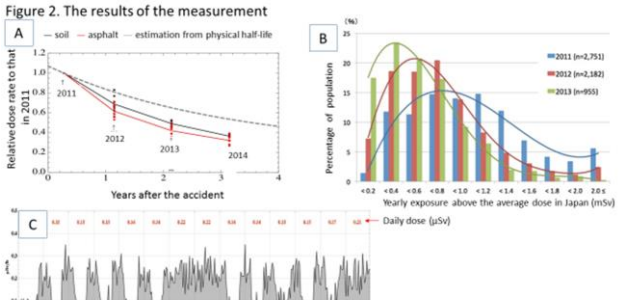


Figure 2. The results of each measurement. A. Chronological change in air dose rate. The dose is shown as relative dose rate to that in 2011. Dot line: estimation from physical half-life; Black line: dose on the soil, Red line: dose on asphalt. B. Chronological change in the yearly exposure levels among the residents in Minamisoma City. Blue line: 2011; Red line: 2012; Green line: 2013. C. Daily fluctuation of external exposure level of a worker at the municipal office of Soma City in 2012. The exposure level is lower in the daytime on weekdays, when s/he is in the building, and higher at night or weekends, when s/he is at home.

**Did it make a difference?**

From these surveillance, the following knowledge has been obtained.

- Air dose rate is decreasing more rapidly than estimated (Figure 2A).
- Most of the residents showed the excessive dose of <1mSv/year (Figure 2B).
- The determinant of external exposure level is air dose rate in the places they spend the most time. For example, for an office worker (Figure 2C), the dose decreased when s/he was working in the building, and increased when s/he was at home.

The local government currently concludes that:

- There is no fear of external radiation exposure in So-so area
- Decontamination should focus on the places people spend most of the day e.g. houses, schools, work places, etc. rather than roads or 'hot-spots'.

The feedback given by the local governments include:

- Residents' individual report of the exposure levels
- Webpages where the statistics are posted
- Guidance to those who showed relatively high levels of exposure
- Lectures provided for both adults and school children

Another key to consider was to wash off the stigmatisation against Fukushima. To spread the knowledge broadly, these findings were also spread by:

- Peer-reviewed journals (3-5) and grey literature (6)
- Mass media (7)
- Books (8)

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