

## Experiences and Lessons Learned from Measuring and Assessing Individual External Doses during Post-Accident Recovery in Fukushima

Wataru Naito <sup>1,\*</sup>, Motoki Uesaka <sup>1</sup>, Tadahiro Kurosawa <sup>2</sup>

<sup>1</sup> *Research Institute of Science for Safety and Sustainability (RISS), National Institute of Advanced Industrial Science and Technology (AIST), 16-1 Onogawa, Tsukuba, Ibaraki, 305-8569 Japan*

<sup>2</sup> *Research Institute for Measurement and Analytical Instrumentation (RIMA), AIST, 1-1-1 Umezono, Tsukuba, Ibaraki 305-8560 Japan*

\*Corresponding author's e-mail: w-naito@aist.go.jp

The Fukushima Daiichi Nuclear Power Plant incident occurred on 11 March 2011 released radioactive material into the atmosphere and contaminated land in Fukushima and the neighboring prefectures. As such, radiation exposure and contamination have become important social issues. Radiation exposure is one of the important elements to decide the areas for the decontamination works and the criteria for the evacuation and lifting the evacuation orders. During rehabilitation of living conditions in the affected areas, accurate information on individual external doses is needed by the government policymakers, by people providing health care and radiation dose mitigation advice, and especially by affected residents. The authors used personal dosimeter (D-shuttle), along with the Global Positioning System (GPS) and Geographic Information System (GIS) to investigate realistic individual external doses in the affected areas in Fukushima [e.g., 1, 2] and to establish a pragmatic dose estimation tool to assess, manage and communicate the individual external doses among stakeholders. To date, approximately 300 Fukushima residents participated in the study. A series of studies conducted separately by the authors and others revealed that the individual external doses measured by personal dosimeter are generally much lower than those determined using a simple model with ambient dose data [1, 2, 3]. During post-accident recovery, measurements of individual external dose could also help authorities to understand the dose distribution of the population and to aid in determining the need for additional protection measures. Although measurement of individual external dose with personal dosimeter such as D-shuttle by the local residents in the affected areas is valuable for understanding realistic radiation situations and planning effective measures during post-accident recovery, the use of personal dosimeter by the affected people could be a double-edged sword. The effective utilization of individual dose measurement data during the post-accident recovery phase requires for stakeholders to understand and share the meaning of measurement data and prepare appropriate mechanism to responding to the residents' concerns caused after communicating the measurement data.

**Keywords:** *D-shuttle, External Dose, Stakeholder Involvement, GPS, GIS*

### REFERENCES

- [1] W. Naito, M. Uesaka, C. Yamada, T. Kurosawa, T. Yasutaka and H. Ishii (2016) Relationship between individual external doses, ambient dose rates and individuals' activity-Patterns in affected areas in Fukushima following the Fukushima Daiichi nuclear power plant accident, *PloS one* 11 e0158879
- [2] W. Naito, M. Uesaka, T. Kurosawa and Y. Kuroda (2017) Measuring and assessing individual external doses during the rehabilitation phase in Iitate village after the Fukushima Daiichi nuclear power plant accident *J. Radiol. Prot.* 37 606–22
- [3] S. Nomura, M. Murakami, W. Naito, T. Yasutaka, T. Sawano and M. Tsubokura (2020). Low dose of external exposure among returnees to former evacuation areas: a cross-sectional all-municipality joint study following the 2011 Fukushima Daiichi nuclear power plant incident, *J. Radiol. Prot.*, 40(1), 1-18