

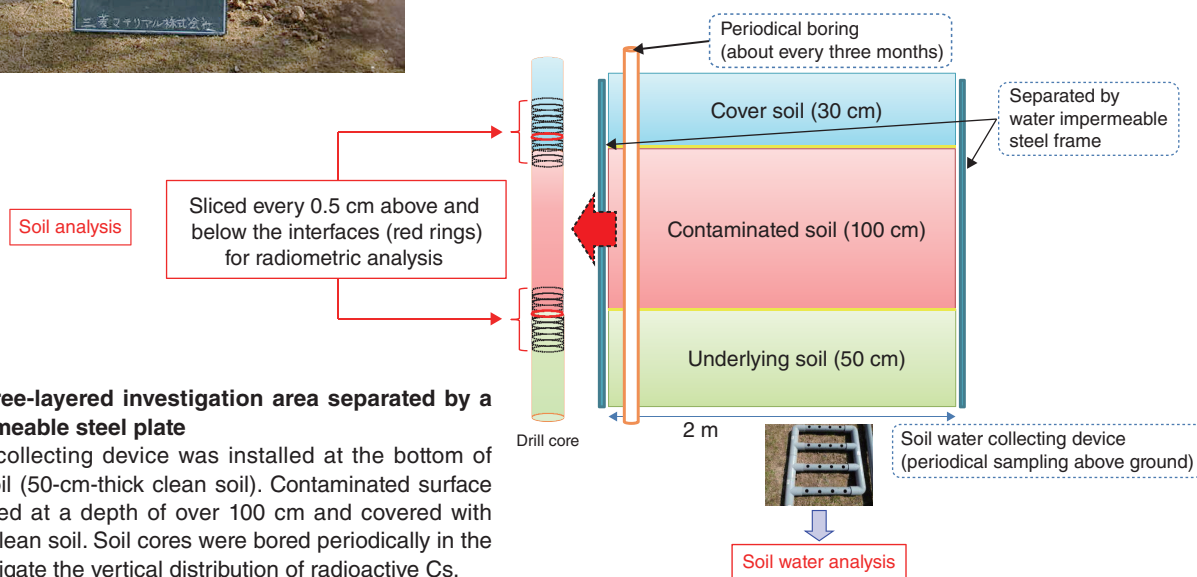
# 1-16 Safety of Burial of Contaminated Soil at Public Parks

## — In situ Experiments on the Migration of Radioactive Cesium from the Buried Soil —



**Fig.1-38 Preparation at a site in Miho village**

A trench with an area of 6 m × 6 m was dug and equipped with a 2 m × 2 m water-impermeable steel plate. Contaminated soil stripped from the surface was buried, as shown in Fig.1-39 for migration experiments.



**Fig.1-39 Three-layered investigation area separated by a water-impermeable steel plate**

A soil-water-collecting device was installed at the bottom of the underlying soil (50-cm-thick clean soil). Contaminated surface soil was buried at a depth of over 100 cm and covered with 30-cm-thick clean soil. Soil cores were bored periodically in the area to investigate the vertical distribution of radioactive Cs.

Previous field studies performed in China and Canada have predicted that radioactive cesium (Cs) would hardly migrate into surrounding soils and groundwater from soils contaminated by the accident at the TEPCO's Fukushima Daiichi NPS if they were to be buried and covered with clean local soils. This study verifies the prediction by performing *in situ* migration experiments over a year in a public park in Miho Village, Ibaraki Prefecture and in two public parks in Misato City, Saitama Prefecture.

Contaminated surface soils (to a depth of 3 cm) were gathered and buried in a 1–1.3-m-deep trench (Fig.1-38) and sprinkled with water to accelerate the radioactive Cs migration. In order to let the water flow through the contaminated soil, a 2 m × 2 m area in the burial site was separated as an investigation area by a water-impermeable steel frame. 3200–3900 mm of water was sprinkled, which is equivalent to 8–10 years of natural infiltration. Vertical borings were performed every three months to analyze the radioactive Cs distribution in the soil cores, as shown in Fig.1-39. The concentration of Cs-137 ( $^{137}\text{Cs}$ ) is 1000–3000 Bq/kg in the contaminated soil and less than 40 Bq/kg in the cover and underlying soils. The water that flowed through the contaminated soil was analyzed after sampling by a soil-water-collecting device that had been

installed at the bottom of the underlying soil. Migration of radioactive Cs was not observed from these analyses.

Laboratory column and sorption experiments using the soil samples revealed that the radioactive Cs hardly leaches out of the soil and even if does, it will be adsorbed on surrounding soils and barely migrate through the soil layer (at a rate as slow as one 7000th of the groundwater-flow rate). Although the experiments were terminated after a year, simulation of  $^{137}\text{Cs}$  migration for 100 years by an advection–diffusion model showed that  $^{137}\text{Cs}$  migrated slightly and decayed out within the contaminated soil (the maximum concentration at a distance of 10 cm from the contaminated soil will be 1% of the concentration in the contaminated soil).

These results prove that the migration rate of radioactive Cs is low in soils in Japan and that the range of migration is limited. On-site burial, by which contaminated surface soil is removed from parks and accumulated in a trench on site then being backfilled with clean local soils, is an effective method for preventing direct exposure from the contaminated soil and contamination of the groundwater. It is a candidate disposal measure for contaminated soil.

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### Reference

Yamaguchi, T. et al., Demonstrative Experiments on the Migration of Radiocesium from Buried Soil Contaminated by the Accident at Fukushima Daiichi Nuclear Power Station, Genshiryoku Bakuendo Kenkyu (Journal of Nuclear Fuel Cycle and Environment), vol.22, no.2, 2015, p.21-28.