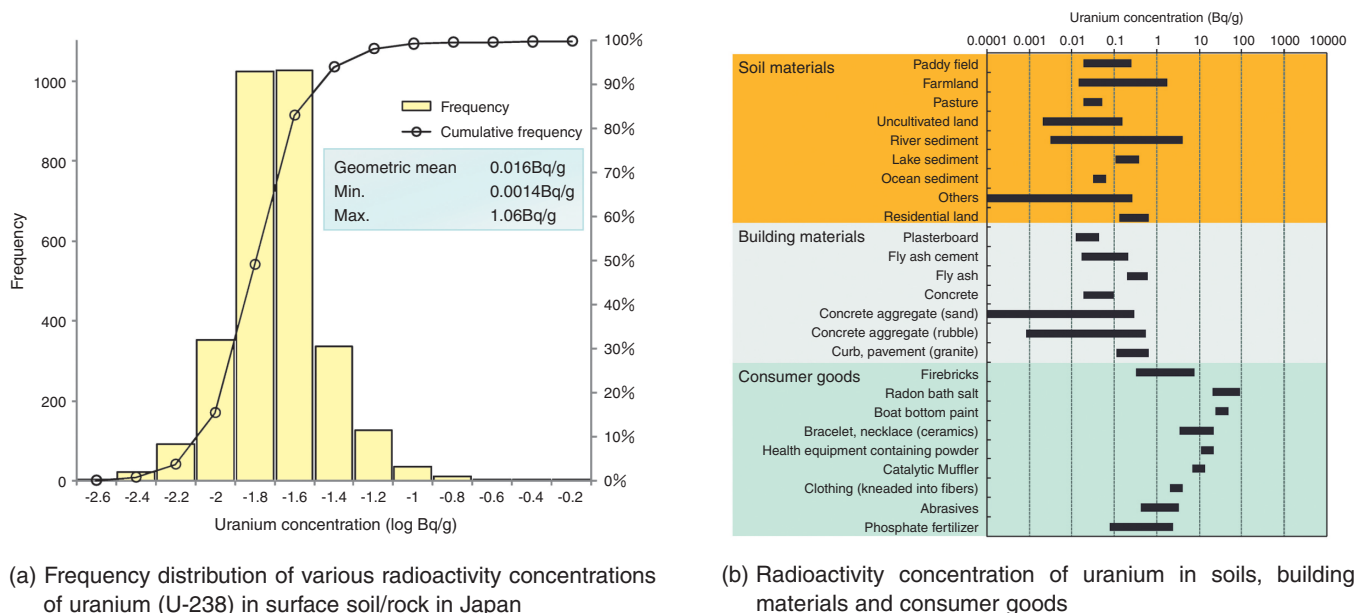


9-3 Establishing Rational Clearance and Disposal System of Uranium-Bearing Waste — Understanding Natural Uranium Contribution to Natural Background Radiation —



(a) Frequency distribution of various radioactivity concentrations of uranium (U-238) in surface soil/rock in Japan

(b) Radioactivity concentration of uranium in soils, building materials and consumer goods

Fig.9-5 Distribution of uranium in environment and artifacts in Japan

Table 9-3 Estimated dose contribution of radionuclides in U-238 series to annual dose in Japan

Source		Total dose (mSv/y)		Dose from U-238 series (mSv/y) ³⁾			
		Range	Mean	Range	Mean	Dominant nuclides	
External exposure	Cosmic ray	0.22 - 0.44 ¹⁾	0.26	-	-	-	
	Terrestrial dose	0.14 - 0.44 ²⁾	0.30	0.026 - 0.095 ²⁾	0.06	Bi-214, Pb-214	
Internal exposure	Radon inhalation	0.38 - 1.3 ¹⁾	0.59	0.38 - 1.3 ¹⁾	0.59	Rn-222 ⁴⁾	
	Food ingestion	U, Th	0.13 - 0.23	0.18	0.13 - 0.23	0.18	Po-210, Pb-210
		K, etc.	0.20	0.20	-	-	-
Total		About 1.1 - 2.6	About 1.5	0.54 - 1.7	0.83	Rn-222 ⁴⁾ , Po-210	

1) Range of mean values of each prefecture

2) Range from 10 percentile to 90 percentile

3) Dose contribution of U-235 series nuclides is small

4) Include contribution of dose from radon and its progeny

Clearance of uranium treatment facilities for uranium refining, conversion, enrichment, and fuel fabrication, and disposal of radioactive waste generated from those facilities (so-called uranium-bearing waste) has been under discussion among governments and companies.

Uranium is widely distributed in natural environmental materials such as soil, rock, river water and groundwater. Moreover, some building materials and consumer goods also contain uranium. We have carried out a review of literature to estimate uranium distribution in the environment. We also measured some samples which with high uranium concentration for confirmation of their concentration range. As a result, it was confirmed that the radioactivity concentration of uranium (U-238) in surface soil/rock in Japan ranges from 0.001Bq/g to several Bq/g (Fig.9-5(a)).

Furthermore, it was found that some consumer goods have high uranium concentration, and that concentration of uranium in building materials falls inside the range of soils (Fig.9-5(b)).

We also estimated the external and internal dose contribution of radionuclides in uranium series to annual dose caused by natural background radiation by using mean values of uranium concentration in environment (Table 9-3). It was revealed that their average contribution is about 0.8mSv/y, whereas the total annual radiation dose in Japan is about 1.5mSv/y.

These results will be useful as basic information for discussion of clearance of uranium bearing materials arising from uranium treatment facilities, and of disposal of uranium-bearing waste in Japan.

Reference

Sato, K. et al., Uranium Distribution in the Environment and Its Contribution to Environmental Radioactivity, Dekomishoningu Giho, vol.38, 2008, p.2-10 (in Japanese).