May 12, 2011
Ministry of Education, Culture, Sports, Science and Technology

Results of Dust Sampling and Soil Survey at Schools, etc. and Guidelines for Future Additional Surveys

The results of Dust Sampling in Fukushima Prefecture are published periodically as "Measurement Results of Dust Sampling, Environmental Documents and Soil Monitoring, Further than 20km from Fukushima Dai-ichi NPP" by the Ministry of Education, Culture, Sports, Science and Technology. The most recent May 6 results of dust sampling were "undetected" at all sites, such as Sugitsuma-cho in Fukushima City, and Kanairo in Nihonmatsu City.

The soil survey was done on April 14 for 52 schools and the like. This has already proved useful for the investigation on contribution of internal exposure (Attachment 2), understanding of decay curves based on analysis of nuclides, etc.

On the other hand, at the May 2 Nuclear Safety Commission, it was pointed out that it would also be good to do dust sampling. Considering this, in order to understand the recent status of dust and soil in schoolyards of schools and the like., trial dust sampling and soil survey was done on May 10 at a junior high school and a day-care center in Fukushima City (Attachment 1). Based on these results, dust sampling and soil survey will be done as described in the outline below.

Guidelines

Dust Sampling

- Use a portable air sampler (70L/min) to measure once per month at the 10 schools, etc. where comparatively high values were obtained in the previous measurement of air dose rates.
- Attach a charcoal filter, to also enable detection of radioactive iodine.
- Sampling time shall be 10 minutes per location. Measurement time shall be 60 minutes.
- Measure at one point of each of the following places: gymnasium (waived if there is none), first floor classroom, entrance with shoe rack, center of schoolyard (also measure air doses as reference values).
- Measurement results shall be summarized and reported to the Nuclear Safety Commission.

Soil Survey

- Do soil sample collection and analysis at schools subject to the dust sampling described above.
- Use a standardized soil collection device, decide on two points 30cm apart in the center of school field, and collect soil 5cm below the ground surface.
- Mix soil from the two collected spots, and without drying it, use a germanium semiconductor detector to measure its contained nuclides.

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日本原子力研究開発機構

Measurement Results for Dust/Iodine in Fukushima City, Fukushima Prefecture
(Value after correcting for decay on the day the sample was taken)

Dust
Watari Junior High School- school field

Date and time when sample was taken:	5/9 14:44～14:54
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 13:23

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Dust
Watari Junior High School- gymnasium

Date and time when sample was taken:	5/9 15:14～15:24
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 14:22

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Dust
Watari Junior High School- entrance

Date and time when sample was taken:	5/9 15:21～15:31
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 14:29

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Dust
Watari day-care center- school field

Date and time when sample was taken:	5/9 15:46～15:56
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 10:29

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Dust
Watari day-care center- entrance

Date and time when sample was taken:	5/9 15:53～16:03
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 11:51

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Dust
Watari day-care center- classroom

Date and time when sample was taken:	5/9 16:06～16:16
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 11:42

Nuclide	Density (Bq/m3)	Density limit in exhaust or air (Bq/m3)
I-131	N.D.	5.0E+00
Cs-134	N.D.	2.0E+01
Cs-137	N.D.	3.0E+01

Charcoal
Watari Junior High School- school field

Date and time when sample was taken:	5/9 14:44～14:54
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 14:41

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Charcoal
Watari Junior High School- gymnasium

Date and time when sample was taken:	5/9 15:14～15:24
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 13:17

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Charcoal
Watari Junior High School- entrance

Date and time when sample was taken:	5/9 15:21～15:31
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 14:29

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Charcoal
Watari day-care center- school field

Date and time when sample was taken:	5/9 15:46～15:56
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 10:28

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Charcoal
Watari day-care center- entrance

Date and time when sample was taken:	5/9 15:53～16:03
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 11:52

Nuclide	Density (Bq/m3)
I-131	N.D.
Cs-134	N.D.
Cs-137	N.D.

Charcoal
Watari day-care center- classroom

Date and time when sample was taken:	5/9 16:06～16:16
Sample amount:	0.7 m3
Measurement time:	3600sec
Date and time when measurement began:	5/10 11:32

Nuclide	Density (Bq/m3)	Density limit in exhaust or air (Bq/m3)
I-131	N.D.	5.0E+00
Cs-134	N.D.	2.0E+01
Cs-137	N.D.	3.0E+01

N.D.: I-131 0.5 Bq/m^3
Cs-134 2 Bq/m^3
Cs-137 3 Bq/m^3

Soil Analysis

May 10, 2011
Japan Atomic Energy Agency

Examination date: sample taken on May 9, 2011, measured on May 10, 2011

Downward limit for detection (DL)	I-131:	8	Bq/Kg･moist
	Cs-134:	10	Bq/Kg･moist
	Cs-137	8	Bq/Kg･moist

No.	Location	Examination subject school nam	Soil radiation (Bq/Kg･moist)			Measurement time (sec)	Sample weight (g)	Note
			I-131	Cs				
				Cs-134	Cs-137			
49	Fukushima City	Watari Junior High School	5.3E+02 ± 1.0E+01	4.9E+03 ± 2.2E+01	6.2E+03 ± 2.7E+01	3600	110.84	
47	Fukushima City	Watari day-care center	4.7E+02 ± 7.8E+00	2.3E+03 ± 1.4E+01	2.9E+03 ± 1.7E+01	3600	116.07	

《1 Year Period》With Corrections for Decay

■Dosage Calculation Result

Condition	ID			47	49
	School Name			Watari day-care center	Watari Junior High School, Fukushima
	Dates Subject to calculation			2011/5/9-2012/5/9	2011/5/9-2012/5/9
	Period			1 year	1 year
Effective dose (Sv/y)	External	External	School field	1.1E-03	2.4E-03
	Internal	Inhaled	School field	2.5E-06	1.7E-05
		Oral	School field	4.0E-06	5.9E-06
		Wound	School field	1.0E-08	2.2E-08
	External + Interna	**Total**		1.1E-03	2.4E-03
Contribution of dose (%)	External	External	School field	**99.4%**	**99.0%**
	Internal	Inhaled	School field	0.2%	0.7%
		Oral	School field	0.3%	0.2%
		Wound	School field	0.0%	0.0%
		Inhaled + Oral + Wound	School field	**0.6%**	**1.0%**

Each dose: Value including BG

Inhaled dose: Dust inhaled from floating soil particles

Oral dose: Assuming that the hand is always (including when in classrooms or inside the house) contaminated by the soil of the school field (exposure itself can occur in classrooms or inside the house)

Wound dose: Assuming that the body is always (including when in classrooms or inside the house) contaminated by the soil of the school field (exposure itself can occur in classrooms or inside the house)

Attachment 2

Results of Nuclide Analysis of Schoolyards in Fukushima Prefecture

Results of soil analysis 20 schools in Fukushima Prefecture were obtained.

As a result, the following new information was obtained.

- This found each nuclide's percent of contribution to the air dose rate, and enables forecasts of future decay of air dose rates.
  By correcting for decay, more realistic air dose assessments are now possible.
  The total dose at 20 measured sites in the first academic period (April 7 to July 31) ranged from 0.06 mSv to 1.2 mSv.

- This enabled estimates of internal exposure dose due to inhalation of floating soil particles and oral ingestion of soil. Its contribution to total dosage of internal exposure in the first academic period ranged from 0% to 5.6% (average 2.2%).

Table-1

Fukushima Prefecture Elementary School Environment Radiation Soil Dust Monitoring Results (Soil)
Collection Dates: April 5 to April 6

No.	Measurement site name	Name	Collection date	Air dose rate		Ground surface strength multiple	Soil radiation (Bq/kg)					Note
				1m above ground	Ground surface		I-131	Cs			Total I + Cs	
				(μSv/hr)	(μSv/hr)	(-)		Cs-134	Cs-137	Total		
1	Prefecture North 1	Fukushima City First Elementary School	April 6	3.4	4.3	1.26	8,193	2,952	3,598	6,550	14,743	
2	Prefecture North 2	Fukushima City Okubo Elementary School	April 6	3.6	4.5	1.25	5,945	3,523	4,104	7,627	13,572	
3	Prefecture North 3	Nihonmatsu City Takeshita Elementary School	April 6	3.1	5.0	1.61	6,216	5,300	6,726	12,026	18,242	
4	Prefecture North 4	Date City Hobara Elementary School	April 6	2.9	3.3	1.14	5,653	3,894	4,392	8,286	13,939	
5	Prefecture North 5	Kawamata Town Yamakiya Elementary School	April 5	6.1	7.9	1.30	29,944	12,994	16,121	29,115	59,059	
6	Prefecture Middle 1	Koriyama City Kinto Elementary School	April 6	2.6	2.7	1.04	3,096	2,648	3,106	5,754	8,850	

7	Prefecture Middle 2	Koriyama City Atami Elementary School	April 6	0.90	1.2	1.33	1,700	1,202	1,486	2,688	4,388	
8	Prefecture Middle 3	Sukagawa City Second Elementary School	April 6	0.54	0.68	1.26	1,236	2,287	2,746	5,033	6,269	
9	Prefecture Middle 4	Tamura City Funehiki Elementary School	April 6	0.54	0.65	1.20	1,573	777	898	1,675	3,248	
10	Prefecture Middle 5	Hirata Village Yomogida Elementary School	April 6	0.39	0.49	1.26	597	741	947	1,688	2,285	
11	Prefecture South 1	Shirakawa City Shirakawa First Elementary School	April 6	1.2	1.6	1.33	717	358	401	759	1,476	
12	Aizu 1	Aizu Wakamatsu City Kakujo Elementary School	April 6	0.30	0.38	1.27	497	445	535	980	1,477	
13	Aizu 2	Kitakata 1st. Elementary School	April 6	0.27	0.31	1.15	259	264	351	615	874	

14	Minami Aizu 1	Minami Aizu Town Tajima Elementary School	April 6	0.082	0.10	1.22	N.D.	N.D.	N.D.	N.D.	N.D.	
15	Soso 1	Minami Soma City Haramachi First Elementary School	April 5	1.2	1.6	1.33	2,822	2,054	2,261	4,315	7,137	
16	Soso 2	Soma City Nakamura First Elementary School	April 5	0.69	1.3	1.88	1,588	1,274	1,259	2,533	4,121	
17	Soso 3	Namie Town Tsushima Elementary School	April 5	21	30	1.43	20,391	8,505	10,040	18,545	38,936	
18	Iwaki 1	Iwaki City Taira First Elementary School	April 5	1.2	1.4	1.17	4,850	451	462	913	5,763	
19	Iwaki 2	Iwaki City Nakoso First Elementary School	April 5	0.84	1.2	1.43	1,255	272	287	559	1,814	
20	Iwaki 3	Iwaki City Yotsukura Elementary School	April 5	1.4	1.7	1.21	6,183	637	770	1,407	7,590	
Average				2.6	3.5	1.30	5,136	2,529	3,025	5,553	10,689	

* Air dose rates are rounded to two significant digits.

Table-2

Fukushima Prefecture Elementary School Environment Radiation Soil Dust Monitoring Results (Floating dust in Air)
Collection Dates: April 5 to April 6

No.	Measurement site name	Name	Collection date	Air dose rate		Ground surface strength multiple	Air radiation density (Bq/kg)					Note
				1m above ground	Ground surface		I-131	Cs			Total I + Cs	
				(μSv/hr)	(μSv/hr)	(-)		Cs-134	Cs-137	Total		
1	Prefecture North 1	Fukushima City First Elementary School	April 6	3.4	4.3	1.26	1.044	1.830	2.192	4.022	5.066	
2	Prefecture North 2	Fukushima City Okubo Elementary School	April 6	3.6	4.5	1.25	N.D.	N.D.	N.D.	N.D.	N.D.	
3	Prefecture North 3	Nihonmatsu City Takeshita Elementary School	April 6	3.1	5.0	1.61	2.941	N.D.	N.D.	N.D.	2.941	
4	Prefecture North 4	Date City Hobara Elementary School	April 6	2.9	3.3	1.14	N.D.	N.D.	N.D.	N.D.	N.D.	
5	Prefecture North 5	Kawamata Town Yamakiya Elementary School	April 5	6.1	7.9	1.30	N.D.	N.D.	N.D.	N.D.	N.D.	Moist ground surface
6	Prefecture Middle 1	Koriyama City Kinto Elementary School	April 6	2.6	2.7	1.04	1.977	N.D.	N.D.	N.D.	1.977	

7	Prefecture Middle 2	Koriyama City Atami Elementary School	April 6	0.90	1.2	1.33	N.D.	N.D.	N.D.	N.D.	N.D.	
8	Prefecture Middle 3	Sukagawa City Second Elementary School	April 6	0.54	0.68	1.26	N.D.	N.D.	N.D.	N.D.	N.D.	
9	Prefecture Middle 4	Tamura City Funehiki Elementary School	April 6	0.54	0.65	1.20	1.394	N.D.	N.D.	N.D.	1.394	
10	Prefecture Middle 5	Hirata Village Yomogida Elementary School	April 6	0.39	0.49	1.26	N.D.	N.D.	N.D.	N.D.	N.D.	
11	Prefecture South 1	Shirakawa City Shirakawa First Elementary School	April 6	1.2	1.6	1.33	N.D.	N.D.	N.D.	N.D.	N.D.	
12	Aizu 1	Aizu Wakamatsu City Kakujo Elementary School	April 6	0.30	0.38	1.27	N.D.	N.D.	N.D.	N.D.	N.D.	
13	Aizu 2	Kitakata 1st. Elementary School	April 6	0.27	0.31	1.15	N.D.	N.D.	N.D.	N.D.	N.D.	

14	Minami Aizu 1	Minami Aizu Town Tajima Elementary School	April 6	0.082	0.10	1.22	N.D.	N.D.	N.D.	N.D.	N.D.	Moist ground surface
15	Soso 1	Minami Soma City Haramachi First Elementary School	April 5	1.2	1.6	1.33	8.796	1.056	N.D.	1.056	9.852	
16	Soso 2	Soma City Nakamura First Elementary School	April 5	0.69	1.3	1.88	N.D.	N.D.	N.D.	N.D.	N.D.	
17	Soso 3	Namie Town Tsushima Elementary School	April 5	21	30	1.43	2.610	4.597	5.446	10.043	12.653	
18	Iwaki 1	Iwaki City Taira First Elementary School	April 5	1.2	1.4	1.17	4.041	N.D.	N.D.	N.D.	4.041	
19	Iwaki 2	Iwaki City Nakoso First Elementary School	April 5	0.84	1.2	1.43	4.713	N.D.	N.D.	N.D.	4.713	
20	Iwaki 3	Iwaki City Yotsukura Elementary School	April 5	1.4	1.7	1.21	4.664	N.D.	N.D.	N.D.	4.664	
Average				2.6	3.5	1.30	1.609	0.374	0.382	0.756	2.365	

* Air dose rates are rounded to two significant digits. Air radiation density is the value after correcting for decay