(4) Surface Sampling Survey

The results of the surface sampling survey, aggregated by area and region, are shown in Table 3-5 (cf. Table 3-6).

Table 3-5. PCDD+PCDF+Co-PCB Concentrations in Surface Sampling

(Unit: pg-TEQ/g-dry)

	Osaka Prefecture Nose Town Regions		Saitama Prefecture Regions			Hiroshima Prefecture Fuchu City Regions	
	A region (n=8)	B region (n=7)	A1 region (n=7)	A2 region (n=5)	B region (n=6)	A region (n=5)	B region (n=5)
PCDD+PCDF							
Mean	25	0.89	49	31	6.6	0.70	0.25
Standard deviation	21	1.1	32	19	5.0	1.2	0.42
Median	25	0.22	53	30	8.1	0.17	0.064
Range	0.45– 54	0.13– 3.0	0.020– 100	11– 52	1.0– 13	0.072– 2.9	0.0012–1.0
Co-PCB							
Mean	0.82	0.39	4.4	5.6	0.51	0.45	0.13
Standard deviation	0.75	0.81	1.7	6.3	0.22	0.55	0.29
Median	0.44	0.038	4.7	3.0	0.43	0.22	0.0033
Range	0.0099– 1.9	0.0037– 2.2	0.96– 6.4	1.5– 18	0.31– 0.87	0.0038– 1.4	0.0015– 0.66
PCDD+PCDF +Co-PCB							
Mean	26	1.3	52	36	7.2	1.1	0.39
Standard deviation	21	1.8	31	18	5.3	1.3	0.73
Median	26	0.25	58	37	8.5	0.49	0.067
Range	0.46– 56	0.13– 5.2	17– 110	14– 58	1.3– 14	0.080– 3.3	0.0027– 1.7

Notes:

1 Isomers which were at levels below the lower limit of determination (ND) were assigned a zero value in calculation.

2 The lower limits of determination were as follows:
T_4CDD, T_4CDF: 1 (pg/g-dry), P_5CDD, P_5CDF: 1 (pg/g-dry)
H_6CDD, H_6CDF: 2 (pg/g-dry), H_7CDD, H_7CDF: 2 (pg/g-dry)
O_8CDD, O_8CDF: 5 (pg/g-dry), Co-planar PCB: 2 (pg/g-dry)

Table 3-6. PCDD+PCDF+Co-PCB Concentrations in Surface Sampling (for Reference)
(Unit: pg-TEQ/g-dry)

	Osaka Prefecture Nose Town Regions		Saitama Prefecture Regions			Hiroshima Prefecture Fuchu City Regions	
	A region (n=8)	B region (n=7)	A1 region (n=7)	A2 region (n=5)	B region (n=6)	A region (n=5)	B region (n=5)
PCDD+PCDF							
Mean	26	2.7	49	31	7.7	2.6	2.3
Standard deviation	20	0.81	32	19	4.6	0.86	0.31
Median	26	2.3	53	30	8.8	2.2	2.1
Range	2.5 – 55	2.2 – 4.4	16 – 100	12 – 52	2.7 – 14	2.1 – 4.1	2.1 – 2.8
Co-PCB							
Mean	0.84	0.45	4.4	5.6	0.52	0.48	0.22
Standard deviation	0.72	0.77	1.7	6.3	0.21	0.53	0.25
Median	0.44	0.15	4.7	3.0	0.44	0.23	0.11
Range	0.12 – 0.19	0.12 – 2.2	0.96 – 6.4	1.5 – 18	0.32 – 0.87	0.12 – 1.4	0.11 – 0.67
PCDD+PCDF +Co-PCB							
Mean	27	3.2	52	36	8.3	3.0	2.5
Standard deviation	21	1.6	32	18	4.9	1.0	0.57
Median	27	2.4	58	37	9.2	2.5	2.2
Range	2.6 – 57	2.3 – 6.6	17 – 110	14 – 58	3.0 – 15	2.2 – 4.5	2.2 – 3.5

Note:
When the actual measurement of an isomer was below the lower limit of determination (ND), its actual concentration was calculated by applying one-half the value of the detection limit.

Analysis and Evaluation

(a) Comparison of Regions
In all areas, the A regions had higher PCDD+PCDF concentrations in the ground surface sampling specimens and Co-PCB concentrations in the surface sampling specimens than the B regions.
Figure 3-9 shows the frequency distribution of concentrations in ground surface sampling.

(b) Correlation between Concentration of Dioxins in Ground Surface Sampling and Concentration of Dioxins in Soil
The points for surface sampling survey and the soil survey were selected to be as close together as possible. A significant correlation ($p<0.01$) was observed between the PCDD+PCDF concentrations and Co-PCB concentrations in the surface sampling specimens on the one hand, and the PCDD+PCDF concentrations and Co-PCB concentrations in the soil on the other.

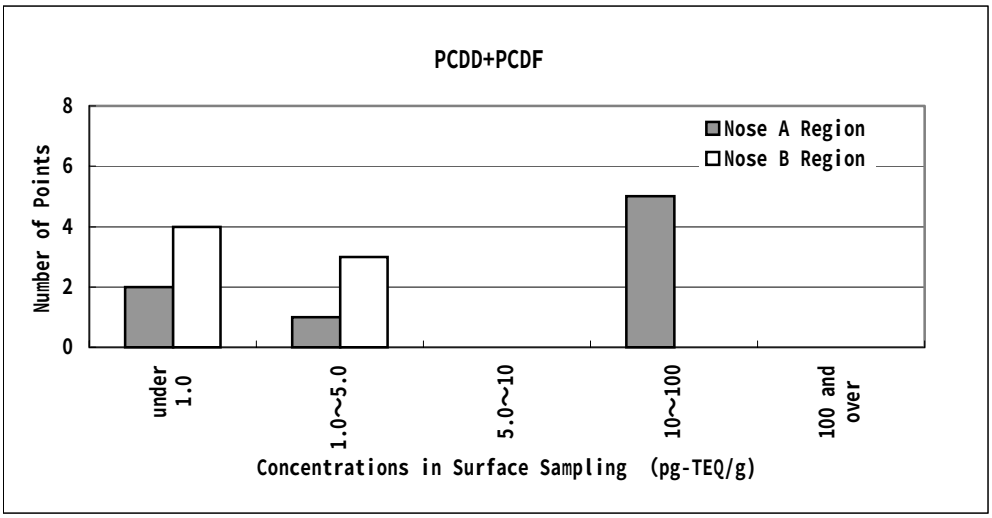


Figure 3-9-1A. Frequency Distribution of Concentrations in Surface Sampling (Nose Area･PCDD+PCDF)

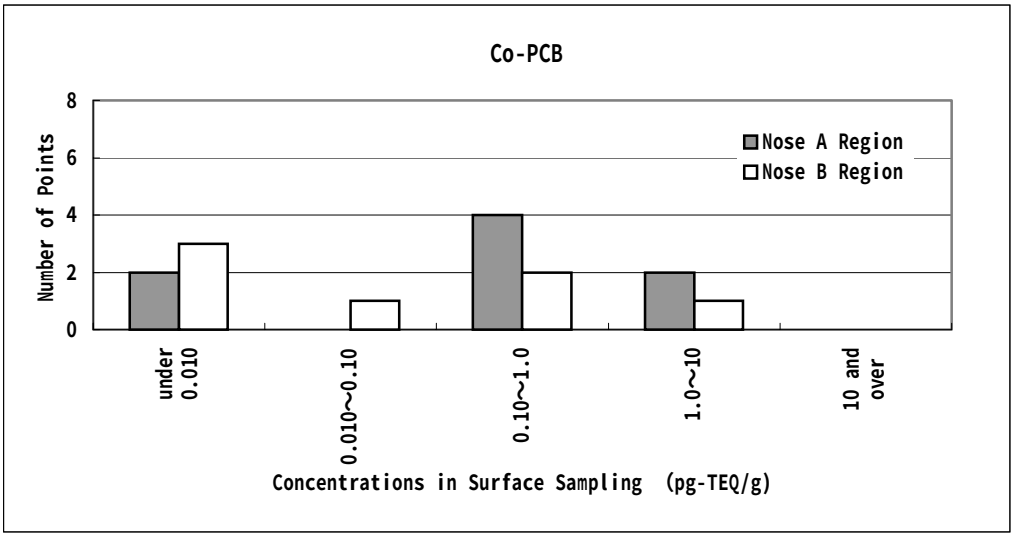


Figure 3-9-1B. Frequency Distribution of Concentrations in Surface Sampling (Nose Area･Co-PCB)

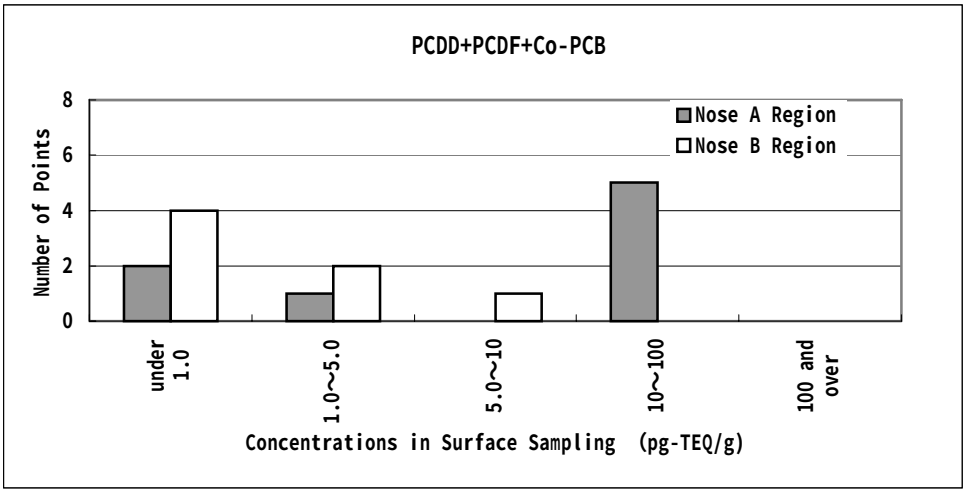


Figure 3-9-1C. Frequency Distribution of Concentrations in Surface Sampling (Nose Area･PCDD+PCDF+Co-PCB)

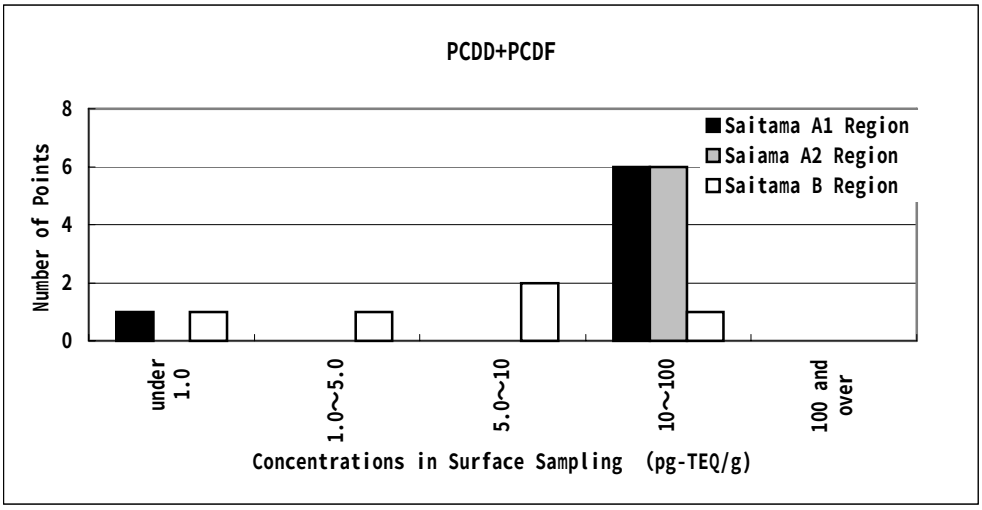


Figure 3-9-2A. Frequency Distribution of Concentrations in Surface Sampling (Saitama Area・PCDD+PCDF)

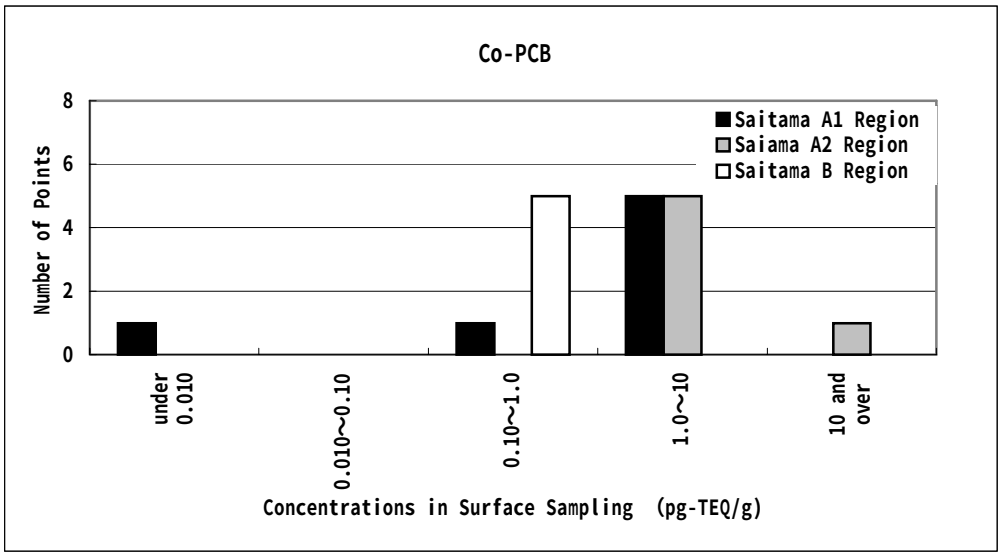


Figure 3-9-2B. Frequency Distribution of Concentrations in Surface Sampling (Saitama Area・Co-PCB)

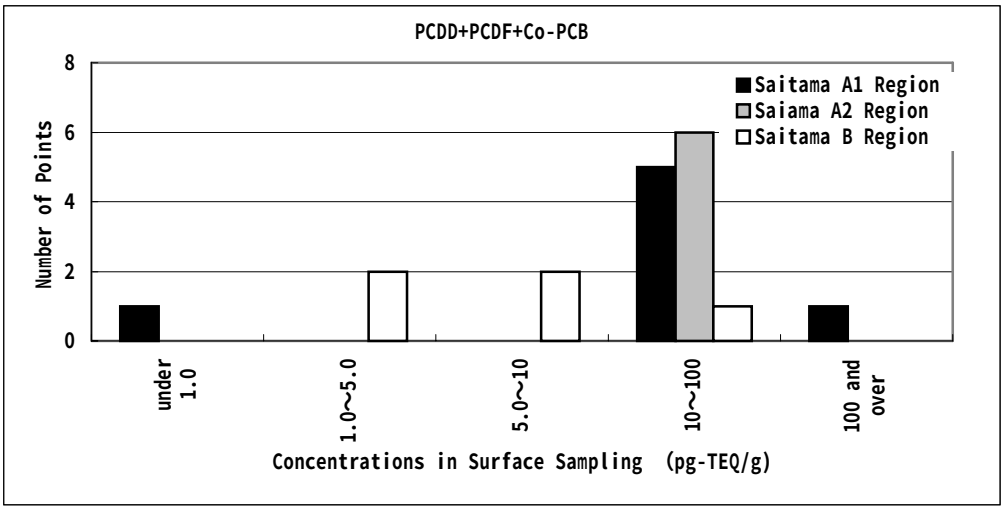


Figure 3-9-2C. Frequency Distribution of Concentrations in Surface Sampling (Saitama Area・PCDD+PCDF+Co-PCB)

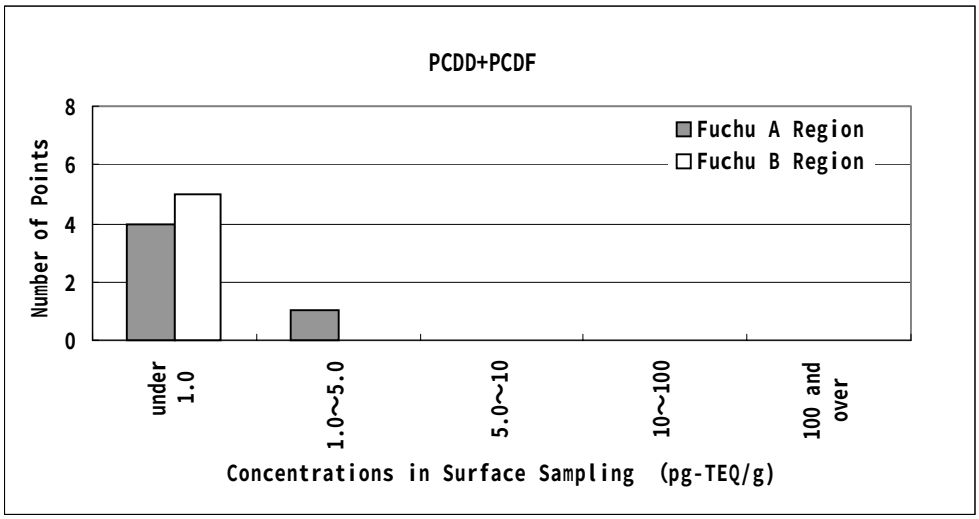


Figure 3-9-3A. Frequency Distribution of Concentrations in Surface Sampling (Fuchu Area・PCDD+PCDF)

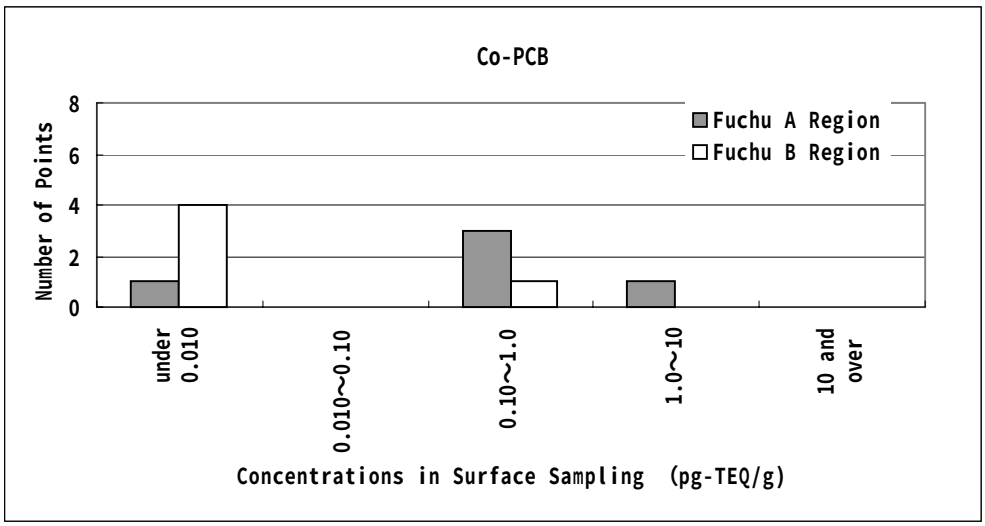


Figure 3-9-3B. Frequency Distribution of Concentrations in Surface Sampling (Fuchu Area・Co-PCB)

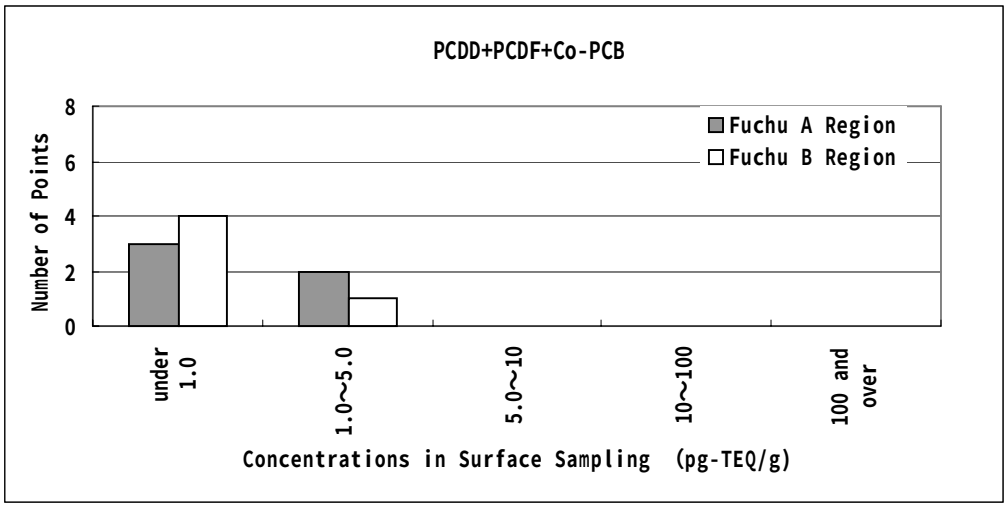
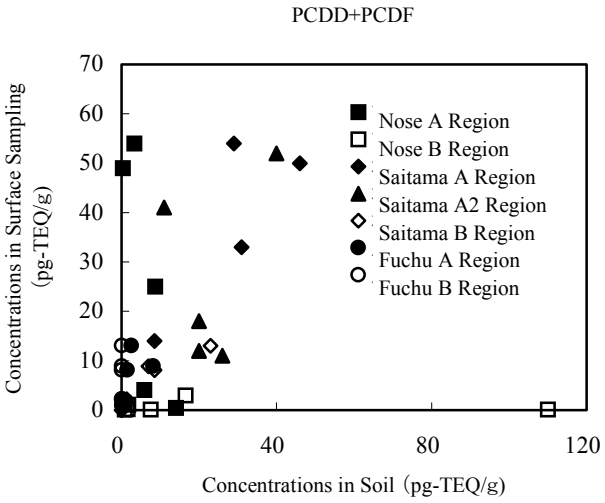
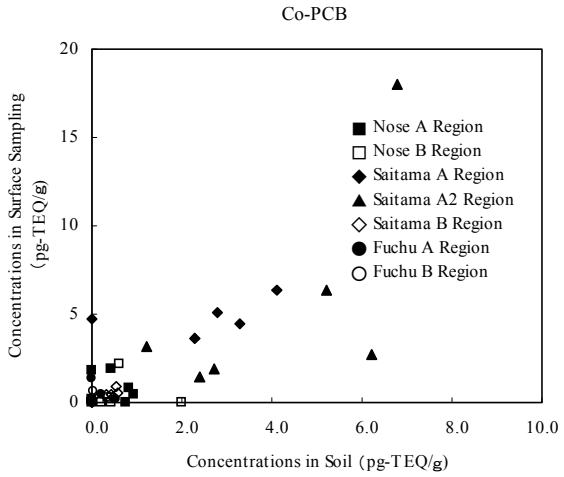


Figure 3-9-3C. Frequency Distribution of Concentrations in Surface Sampling (Fuchu Area・PCDD+PCDF+Co-PCB)





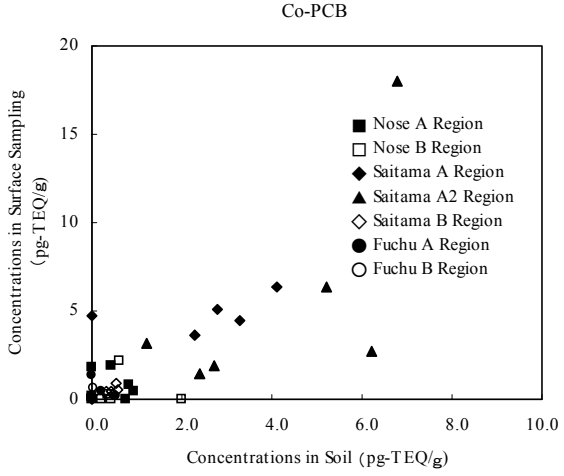


Figure 3-10. Relationship between Concentrations in Surface Sampling and Concentrations in Soil

(5) Settled Dust and Soot Survey

The results of the settled dust and soot survey are shown in Table 3-7 (cf. Table 3-8).

Table 3-7. Concerning PCDD+PCDF+Co-PCB Concentrations in Settled Dust and Soot

(Unit: pg-TEQ/m^2/day)

	Osaka Prefecture Nose Town Regions		Saitama Prefecture Regions			Hiroshima Prefecture Fuchu City Regions	
	A region (n=6)	B region (n=7)	A1 region (n=8)	A2 region (n=7)	B region (n=5)	A region (n=5)	B region (n=5)
PCDD+PCDF							
Mean	3.7	3.8	37	37	20	19	7.4
Standard deviation	0.8	1.0	18	25	2.3	6.4	0.73
Median	3.8	3.7	30	30	21	17	7.3
Range	2.6 – 4.8	2.5 – 5.3	25 – 78	17 – 91	18 – 23	13 – 30	6.4 – 8.3
Co-PCB							
Mean	0.83	0.83	3.4	3.8	2.0	1.9	0.57
Standard deviation	0.074	0.13	1.3	2.3	0.31	0.52	0.11
Median	0.82	0.82	2.9	3.2	1.9	1.7	0.55
Range	0.72 – 0.92	0.71 – 1.0	2.2 – 6.1	1.6 – 8.6	1.6 – 2.4	1.4 – 2.5	0.44 – 0.75
PCDD+PCDF +Co-PCB							
Mean	4.5	4.6	40	41	22	21	8.0
Standard deviation	0.76	1.1	20	27	2.8	6.5	0.65
Median	4.7	4.4	32	33	22	19	7.8
Range	3.5 – 5.6	3.2 – 6.3	27 – 84	19 – 99	19 – 25	15 – 32	7.2 – 8.9

Notes:

1 Isomers that were detected at levels below the lower limit of determination (ND) were assigned a zero value in calculation.

2 The lower limits of determination were as follows:

T_4CDD, T_4CDF: 0.5 (pg/m^2/day), P_5CDD, P_5CDF: 0.5 (pg/m^2/day)

H_6CDD, H_6CDF: 1 (pg/m^2/day), H_7CDD, H_7CDF: 1 (pg/m^2/day)

O_8CDD, O_8CDF: 2 (pg/m^2/day), Co-planar PCB: 1 (pg/m^2/day)

Table 3-8. Concerning PCDD+PCDF+Co-PCB Concentrations in Settled Dust and Soot (for Reference)

(Unit: pg-TEQ/m^2/day)

	Osaka Prefecture Nose Town Regions		Saitama Prefecture Regions			Hiroshima Prefecture Fuchu City Regions	
	A region (n=6)	B region (n=7)	A1 region (n=8)	A2 region (n=7)	B region (n=5)	A region (n=5)	B region (n=5)
PCDD+PCDF							
Mean	4.2	4.2	37	37	21	19	7.7
Standard deviation	0.68	0.88	18	25	2.5	6.4	0.73
Median	4.2	4.0	30	30	21	17	7.6
Range	3.3 – 5.2	3.1 – 5.6	25 – 78	17 – 91	18 – 23	13 – 30	6.7 – 8.6
Co-PCB							
Mean	0.84	0.83	3.4	3.8	2.0	1.9	0.57
Standard deviation	0.075	0.13	1.3	2.3	0.31	0.52	0.11
Median	0.83	0.82	2.9	3.2	1.9	1.7	0.55
Range	0.72 – 0.92	0.71 – 1.0	2.2 – 6.1	1.6 – 8.6	1.6 – 2.4	1.4 – 2.5	0.44 – 0.75
PCDD+PCDF +Co-PCB							
Mean	5.0	5.0	40	41	23	21	8.3
Standard deviation	0.65	0.98	20	27	2.5	6.5	0.61
Median	5.1	4.8	32	33	23	19	8.1
Range	4.2 – 6.0	3.8 – 6.6	27 – 84	19 – 99	20 – 25	15 – 32	7.5 – 9.1

Note:

When the actual measurement of an isomer was below the lower limit of determination (ND), its actual concentration was calculated by applying one-half the value of the detection limit.

Analysis and Evaluation

(a) Comparison of Regions

In the Saitama Prefecture areas and the Hiroshima Prefecture Fuchu City area, concentrations in the A regions were higher than those in the B regions. In the Nose Town area of Osaka Prefecture, the concentrations in the A regions and B regions were similar.

Figure 3-11 shows the frequency distribution of concentrations in settled dust and soot.

(b) Correlations with Each Exposure Medium

The correlations between the concentration of dioxins in settled dust and soot, the concentration of dioxins in air, and the concentration of dioxins in ground surface samples were analyzed (Figure 3-12, Figure 3-13).

Points with higher concentrations of dioxins in air also tended to have a higher concentration of dioxins in settled dust and soot. In the B regions of Saitama Prefecture, however, the concentrations of dioxins in settled dust and soot did not reach such high levels despite the fact that the concentrations in air were higher there than in the other regions.

A significant correlation ($p<0.01$) was observed between the concentration of dioxins in ground surface sampling and the concentration of dioxins in settled dust and soot.

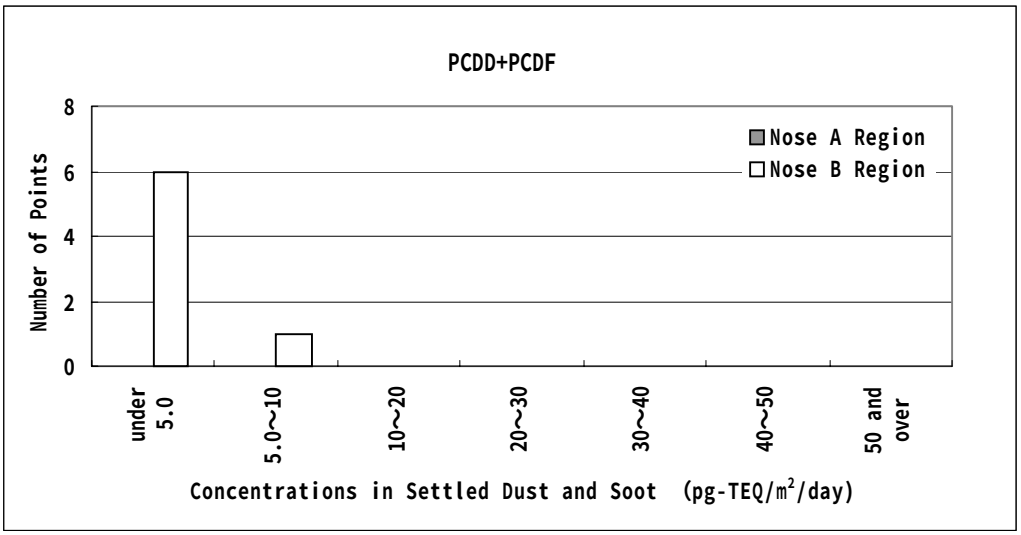


Figure 3-11-1A. Frequency Distribution of Concentrations in Settled Dust and Soot (Nose Area･PCDD+PCDF)

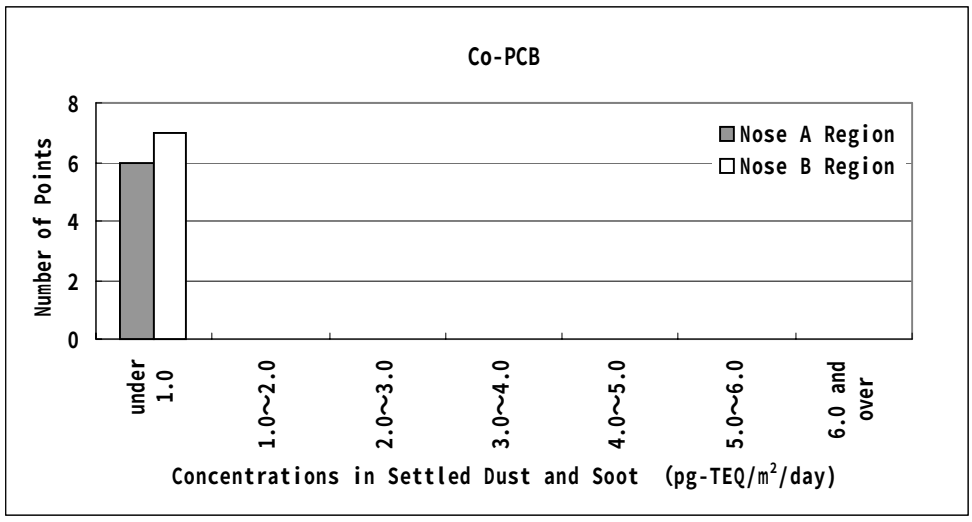


Figure 3-11-1B. Frequency Distribution of Concentrations in Settled Dust and Soot (Nose Area･Co-PCB)

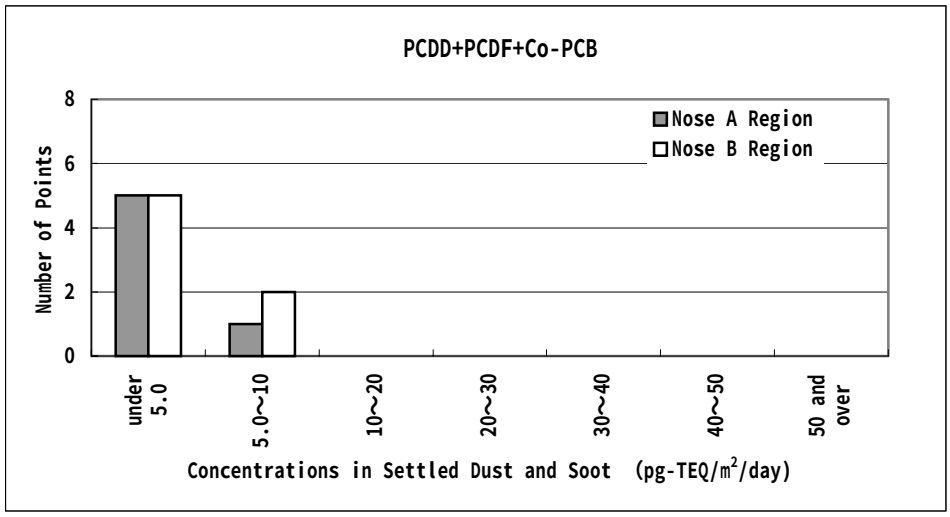


Figure 3-11-1C. Frequency Distribution of Concentrations in Settled Dust and Soot (Nose Area･PCDD+PCDF+Co-PCB)

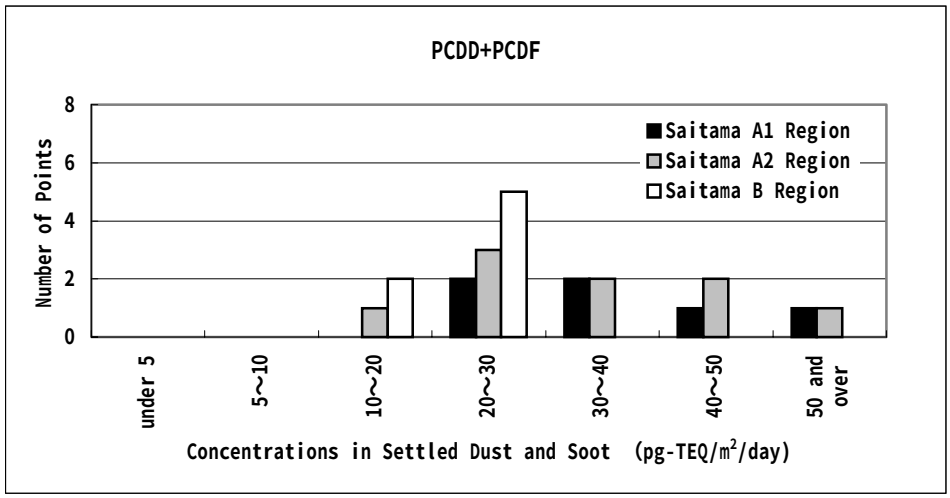


Figure 3-11-2A. Frequency Distribution of Concentrations in Settled Dust and Soot (Saitama Area・PCDD+PCDF)

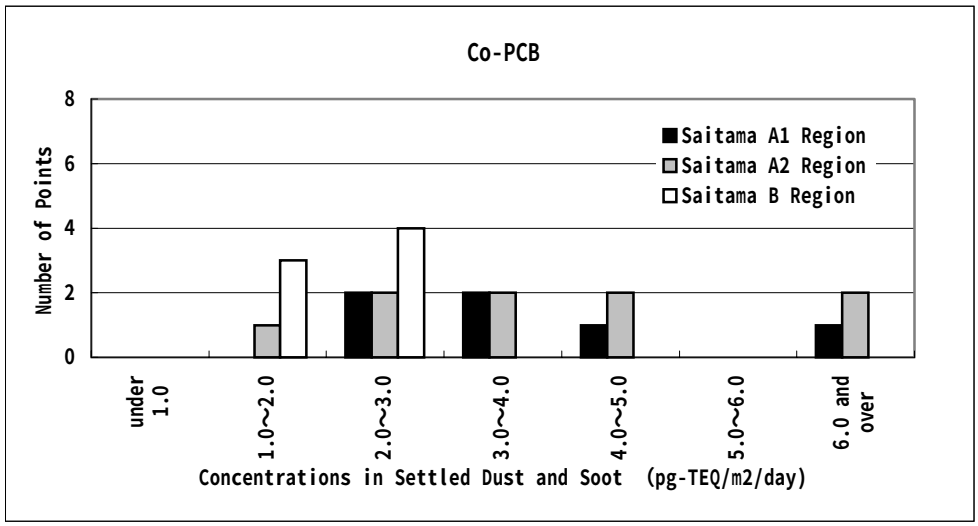


Figure 3-11-2B. Frequency Distribution of Concentrations in Settled Dust and Soot (Saitama Area・Co-PCB)

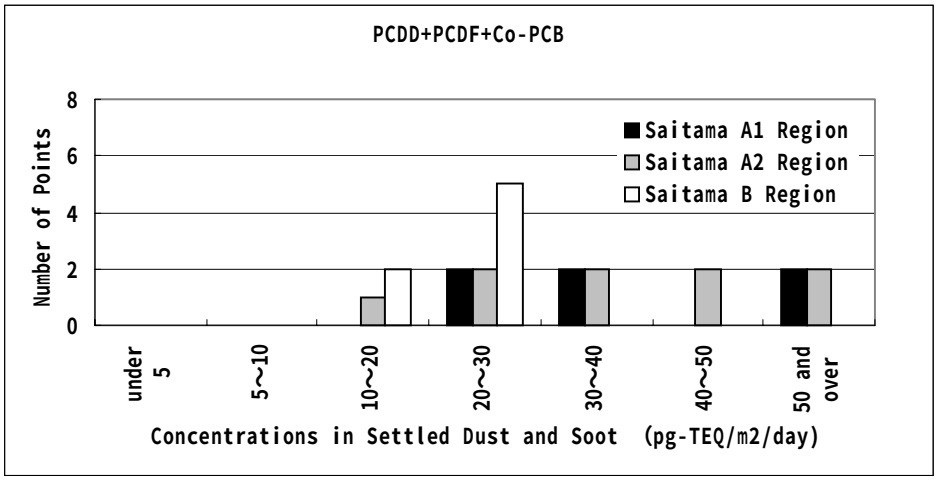


Figure 3-11-2C. Frequency Distribution of Concentrations in Settled Dust and Soot (Saitama Area・PCDD+PCDF+Co-PCB)

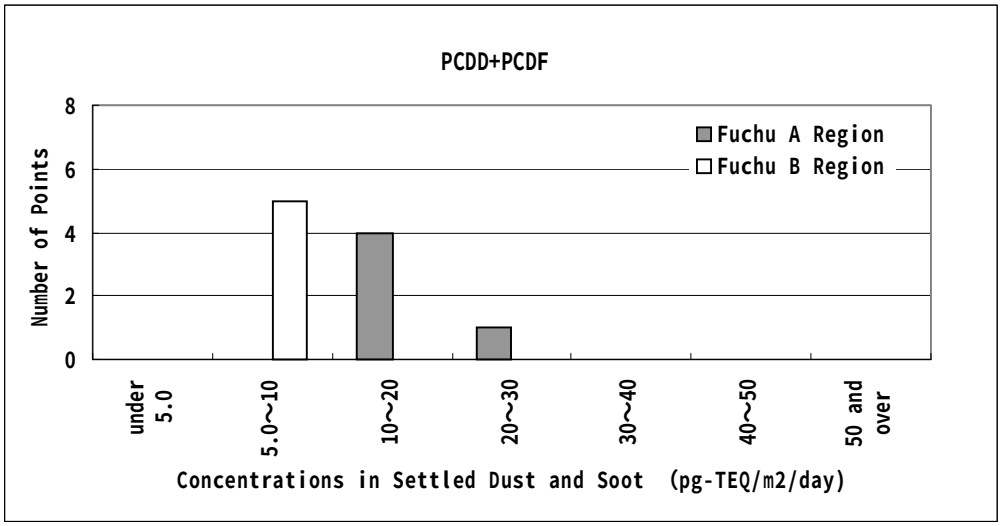


Figure 3-11-3A. Frequency Distribution of Concentrations in Settled Dust and Soot (Fuchu Area・PCDD+PCDF)

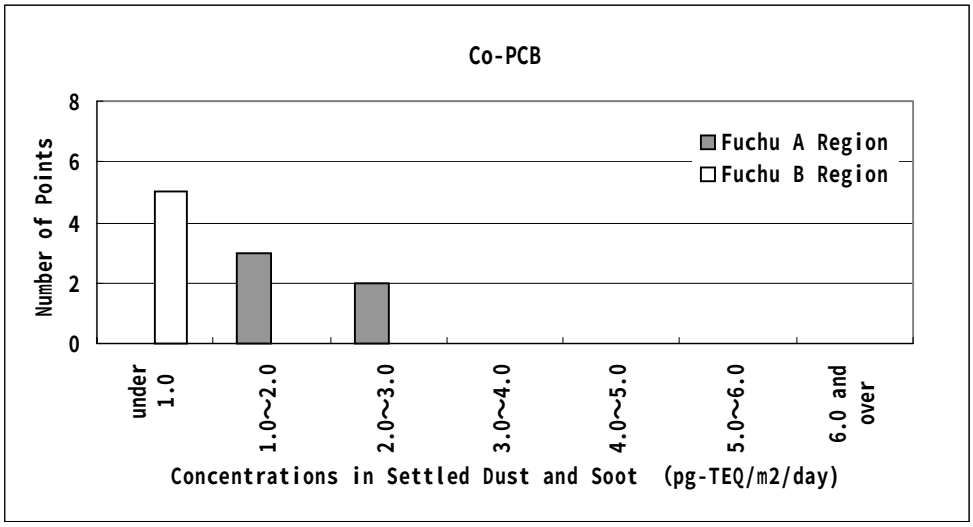


Figure 3-11-3B. Frequency Distribution of Concentrations in Settled Dust and Soot (Fuchu Area・Co-PCB)

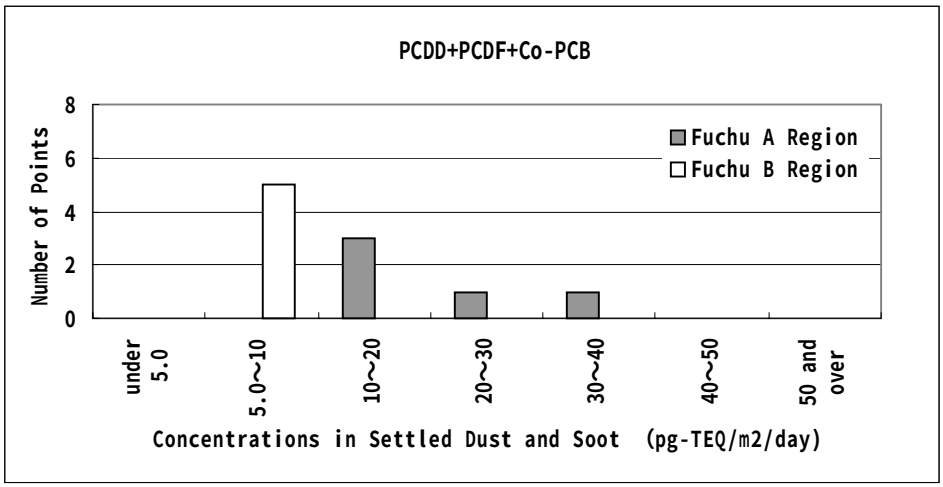


Figure 3-11-3C. Frequency Distribution of Concentrations in Settled Dust and Soot (Fuchu Area・PCDD+PCDF+Co-PCB)

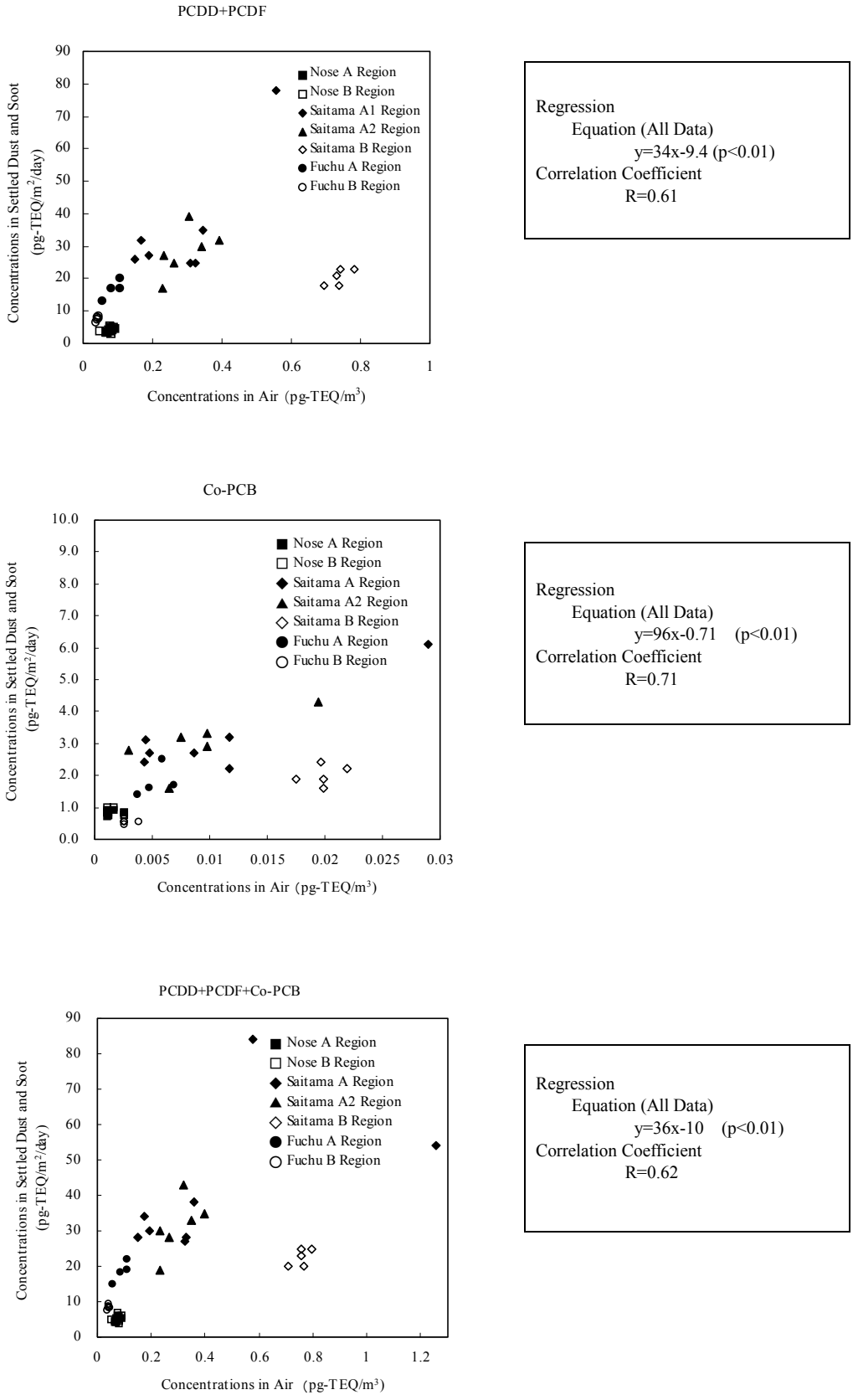


Figure 3-12. Relationship between Concentrations in Air and Concentrations in Settled Dust and Soot

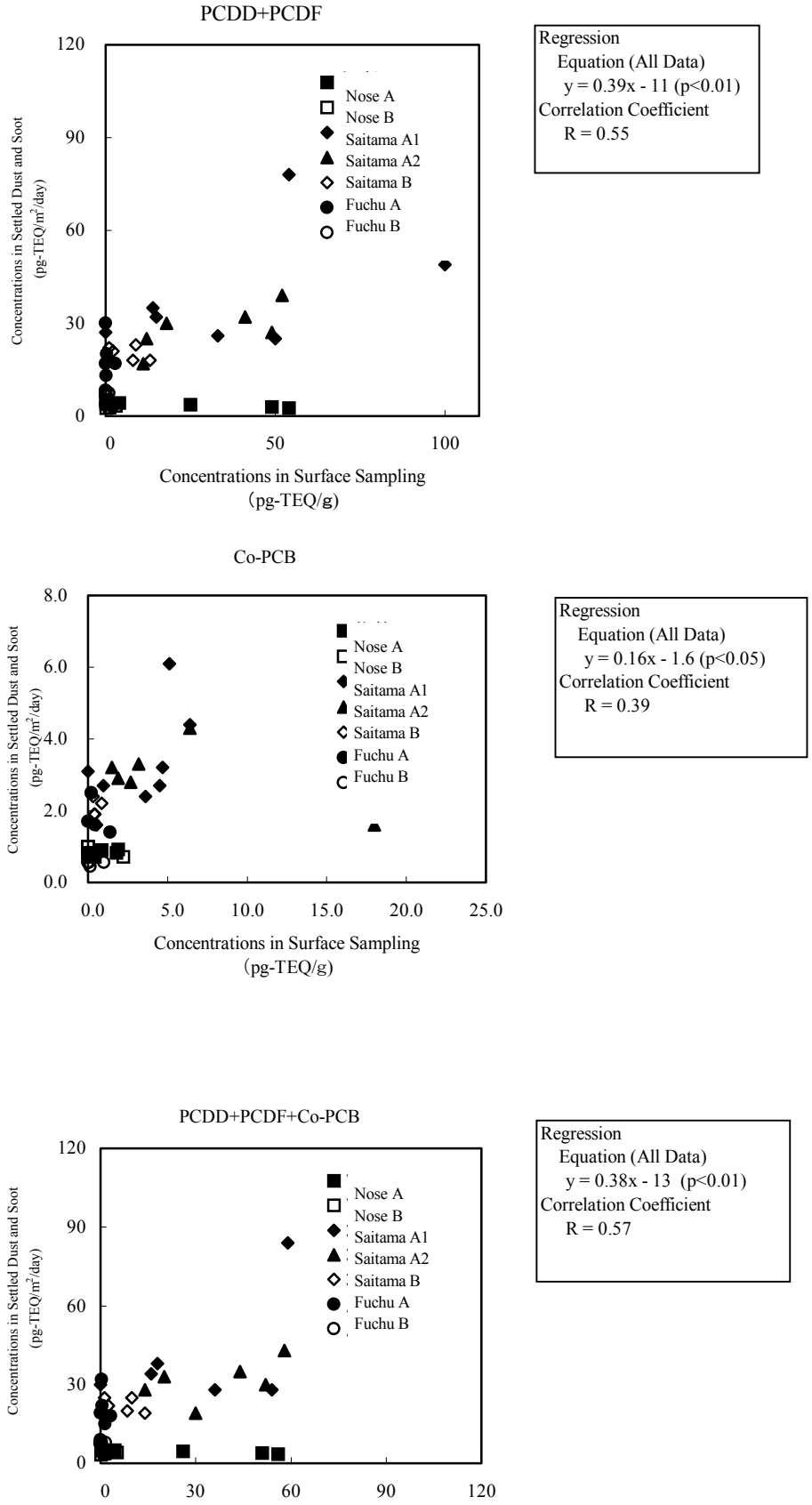


Figure 3-13. Relationship between Concentrations in Surface Sampling and Concentrations in Settled Dust and Soot

(6) House Dust Survey

The results of the house dust survey are shown in Table 3-9 (cf. Table 3-10).

Table 3-9. Concerning PCDD+PCDF+Co-PCB Concentrations in House Dust

(Unit: pg-TEQ/g)

	Osaka Prefecture Nose Town Regions		Saitama Prefecture Regions			Hiroshima Prefecture Fuchu City Regions	
	A region (n=7)	B region (n=7)	A1 region (n=8)	A2 region (n=6)	B region (n=5)	A region (n=5)	Bregion (n=5)
PCDD+PCDF							
Mean	2.3	4.5	14	16	1.4	2.1	2.6
Standard deviation	4.0	7.3	33	20	0.53	2.5	2.3
Median	0.71	0.66	2.6	7.8	1.5	1.6	2.4
Range	0.020 – 11	0.020 – 17	1.5 – 96	0.65 – 51	0.68 – 2.1	0 – 6.5	0.050 – 6.2
Co-PCB							
Mean	20	24	2.2	12	0.17	59	18
Standard deviation	30	32	5.6	12	0.11	83	23
Median	0.13	12	0.18	11	0.16	11	13
Range	0.11 – 72	0.033 – 74	0.086 – 16	0.11 – 29	0.047 – 0.34	0.068 – 190	0.16 – 55
PCDD+PCDF +Co-PCB							
Mean	23	28	17	28	1.6	61	20
Standard deviation	29	34	33	22	0.57	83	23
Median	11	13	3.2	28	1.7	13	14
Range	0.051 – 72	0.16 – 81	1.6 – 97	3.6 – 51	0.73 – 2.2	0.17 – 190	0.21 – 57

Notes:

1 Isomers which were at levels below the lower limit of determination (ND) were assigned a zero value in calculation.

2 The lower limits of determination were as follows:
T_4CDD, T_4CDF: 30 (pg-TEQ/g), P_5CDD, P_5CDF: 30 (pg-TEQ/g)
H_6CDD, H_6CDF: 60 (pg-TEQ/g), H_7CDD, H_7CDF: 60 (pg-TEQ/g)
O_8CDD, O_8CDF: 150 (pg-TEQ/g), Co-planar PCB: 60 (pg-TEQ/g)

Table 3-10. Concerning PCDD+PCDF+Co-PCB Concentrations in House Dust (for Reference)

(Unit: pg-TEQ/g)

	Osaka Prefecture Nose Town Regions		Saitama Prefecture Regions			Hiroshima Prefecture Fuchu City Regions	
	A region (n=7)	B region (n=7)	A1 region (n=8)	A2 region (n=6)	B region (n=5)	A region (n=5)	B region (n=5)
PCDD+PCDF							
Mean	63	66	74	74	63	64	64
Standard deviation	2.7	6.4	27	15	0.55	2.5	2.3
Median	62	62	64	68	63	63	64
Range	62 – 69	62 – 78	63 – 140	62 – 98	62 – 63	62 – 68	62 – 68
Co-PCB							
Mean	23	25	5.1	14	3.5	60	19
Standard deviation	29	31	4.4	11	0.11	82	21
Median	3.5	13	3.6	11	3.5	12	13
Range	3.4 – 72	3.4 – 74	3.4 – 16	3.4 – 30	3.4 – 3.7	3.4 – 190	3.5 – 55
PCDD+PCDF +Co-PCB							
Mean	86	91	78	88	66	130	83
Standard deviation	28	34	25	18	0.84	85	22
Median	72	75	68	88	66	74	76
Range	65 – 130	65 – 140	66 – 140	68 – 110	65 – 67	65 – 260	65 – 120

Note: When the actual measurement of an isomer was below the lower limit of determination (ND), its actual concentration was calculated by applying one-half the value of the detection limit.

Analysis and Evaluation

(a) Comparison of Regions

In the Saitama Prefecture areas and the Hiroshima Prefecture Fuchu City area, concentrations in the A regions were higher than those in the B regions. In the Nose Town area of Osaka Prefecture, the concentrations in the A regions and B regions were similar.

Figure 3-14 shows the frequency distribution of concentrations in house dust.

(b) Concerning Correlation with Concentrations of Dioxins in Indoor Air

The correlation between the concentration of dioxins in house dust and in indoor air was analyzed (see Figure 3-15).

No distinct correlation was observed between the concentration of dioxins in house dust and in indoor air.

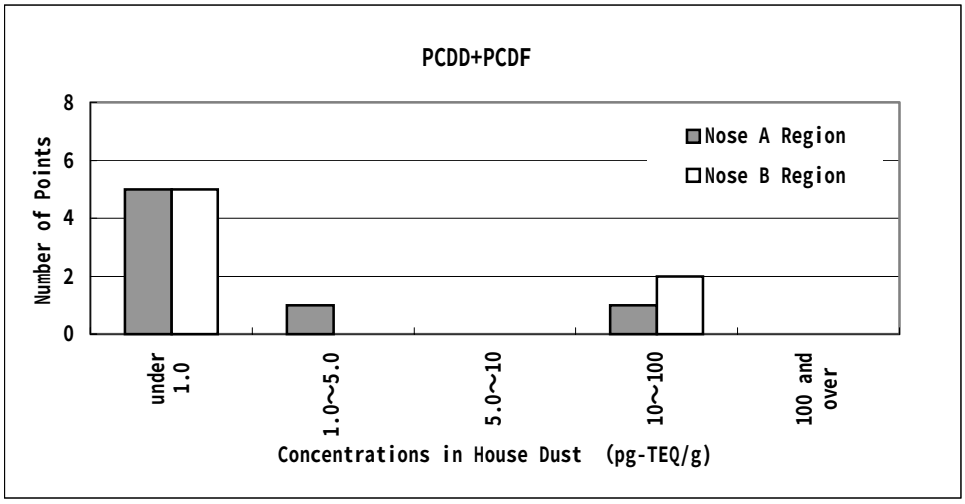


Figure 3-14-1A. Frequency Distribution of Concentrations in House Dust (Nose Area･PCDD+PCDF)

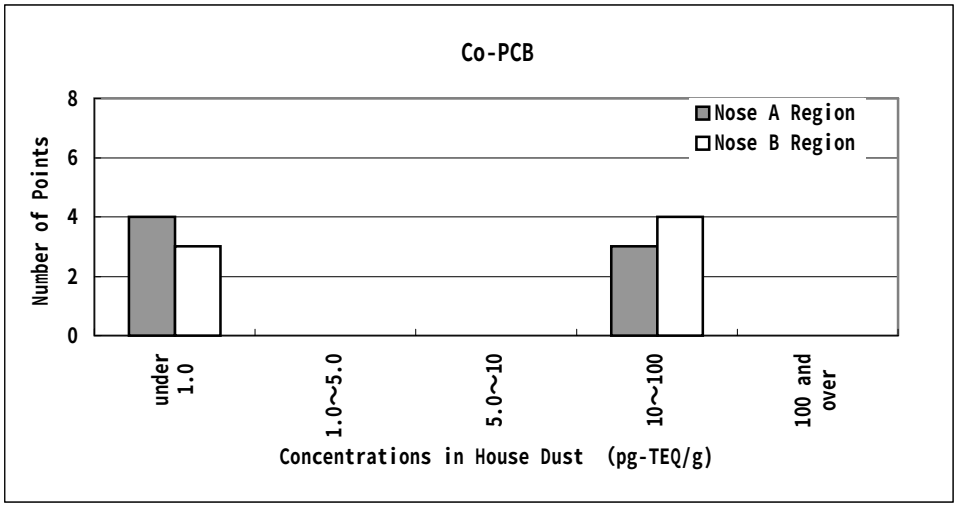


Figure 3-14-1B. Frequency Distribution of Concentrations in House Dust (Nose Area･Co-PCB)

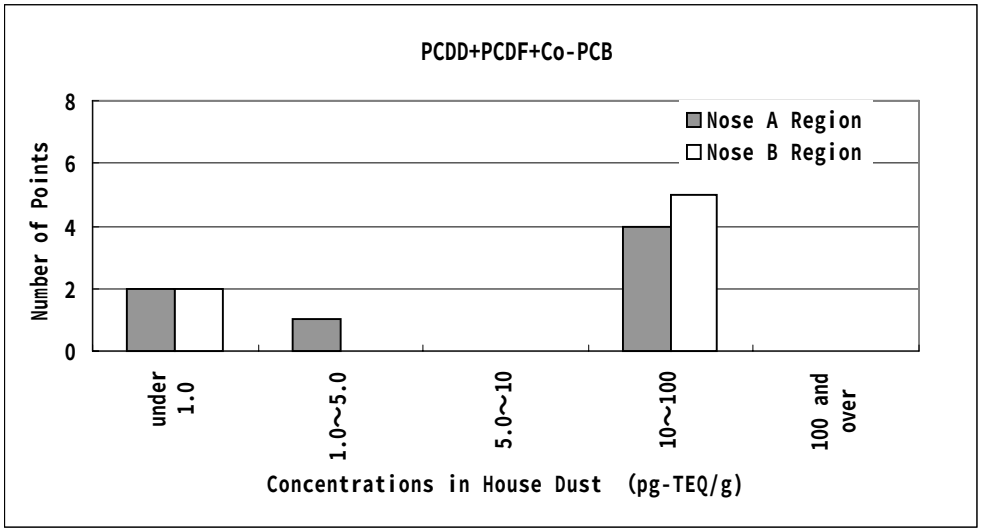


Figure 3-14-1C. Frequency Distribution of Concentrations in House Dust (Nose Area･PCDD+PCDF+Co-PCB)

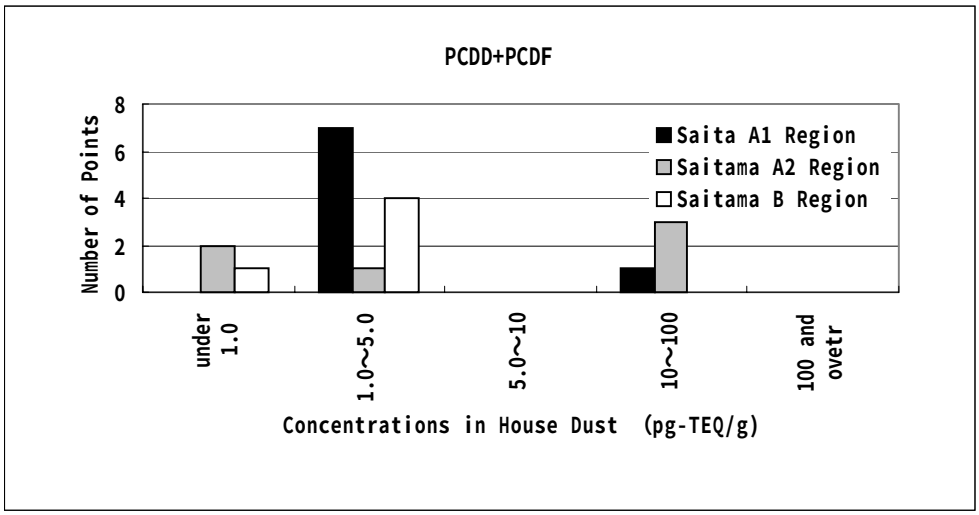


Figure 3-14-2A. Frequency Distribution of Concentrations in House Dust (Saitama Area・PCDD+PCDF)

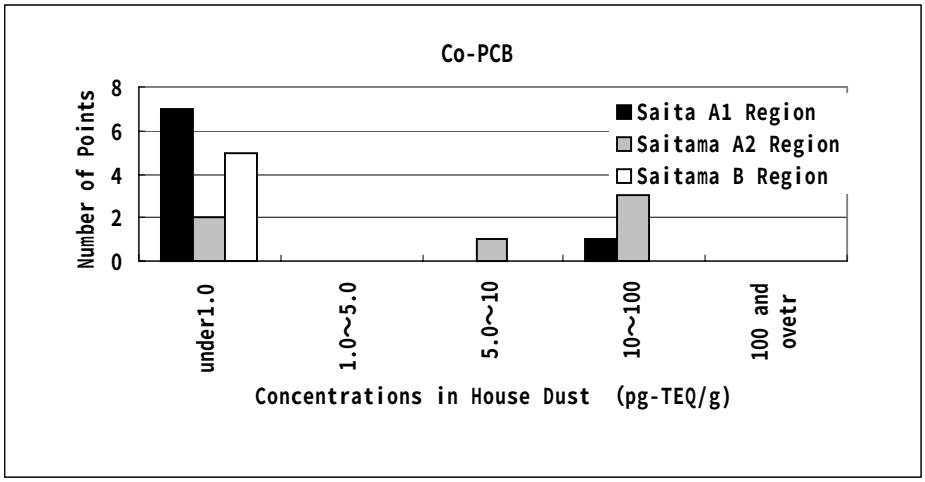


Figure 3-14-2B. Frequency Distribution of Concentrations in House Dust (Saitama Area・Co-PCB)

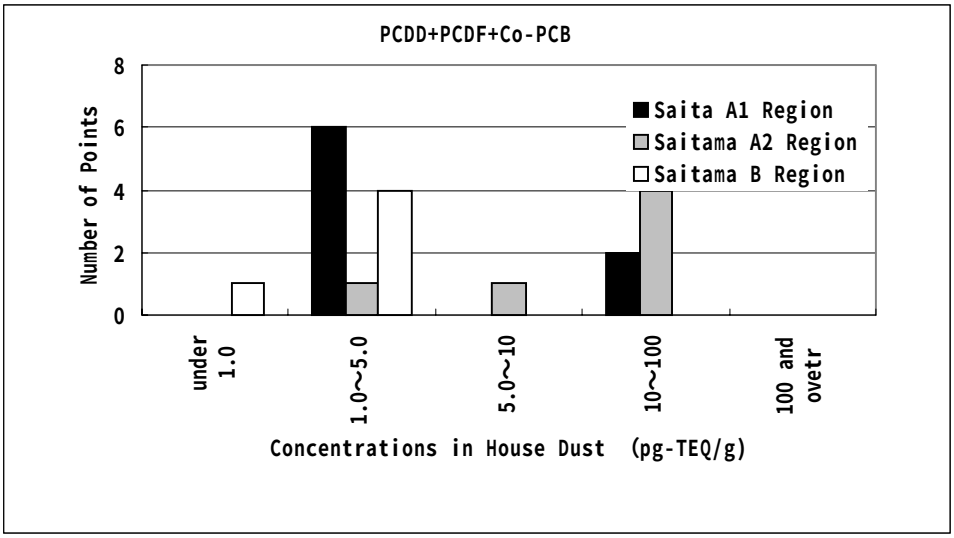


Figure 3-14-2C. Frequency Distribution of Concentrations in House Dust (Saitama Area・PCDD+PCDF+Co-PCB)

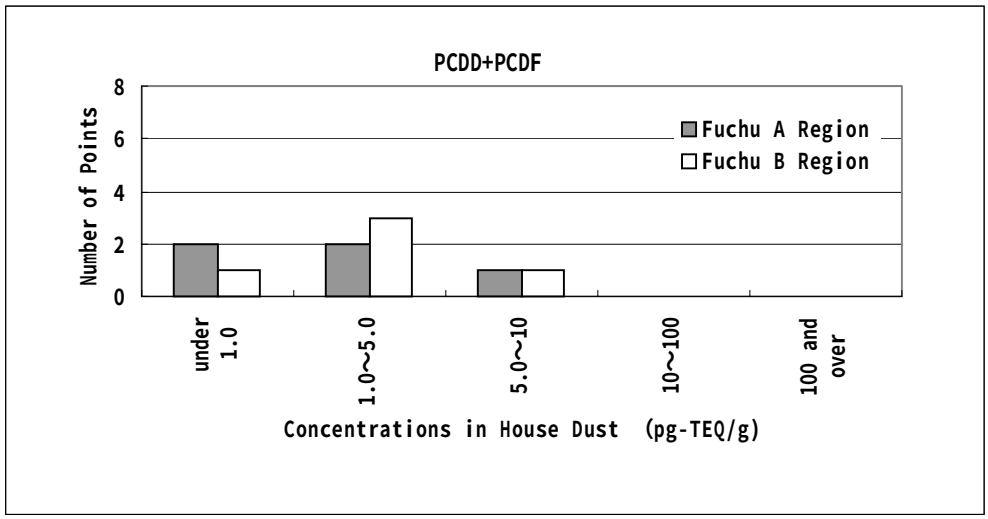


Figure 3-14-3A. Frequency Distribution of Concentrations in House Dust (Fuchu Area・PCDD+PCDF)

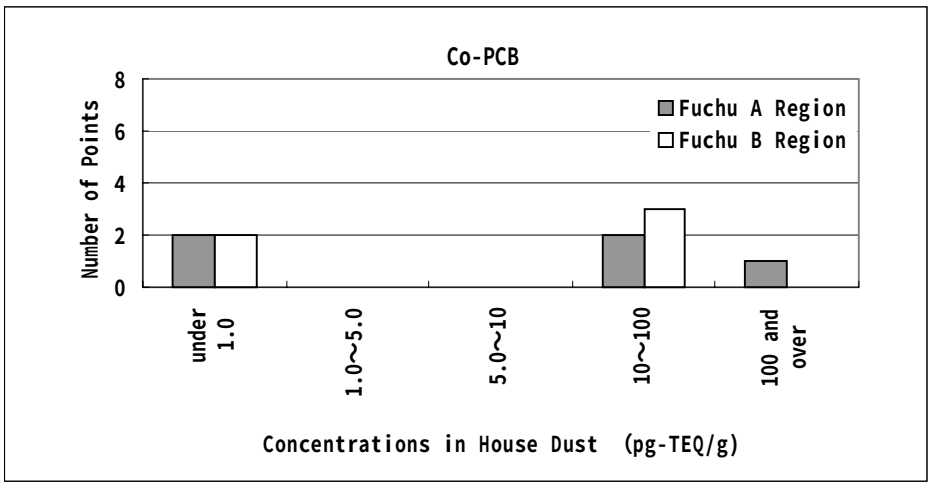


Figure 3-14-3B. Frequency Distribution of Concentrations in House Dust (Fuchu Area・Co-PCB)

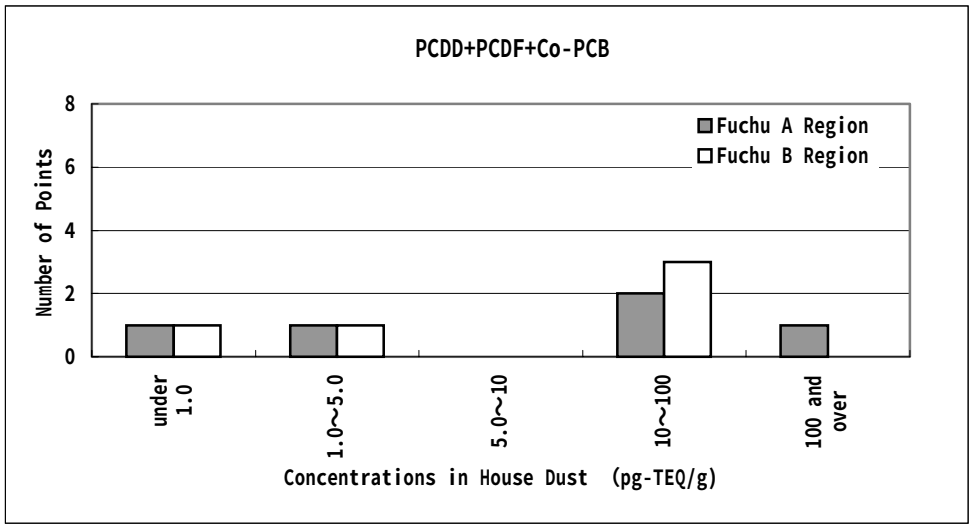


Figure 3-14-3C. Frequency Distribution of Concentrations in House Dust (Fuchu Area・PCDD+PCDF+Co-PCB)

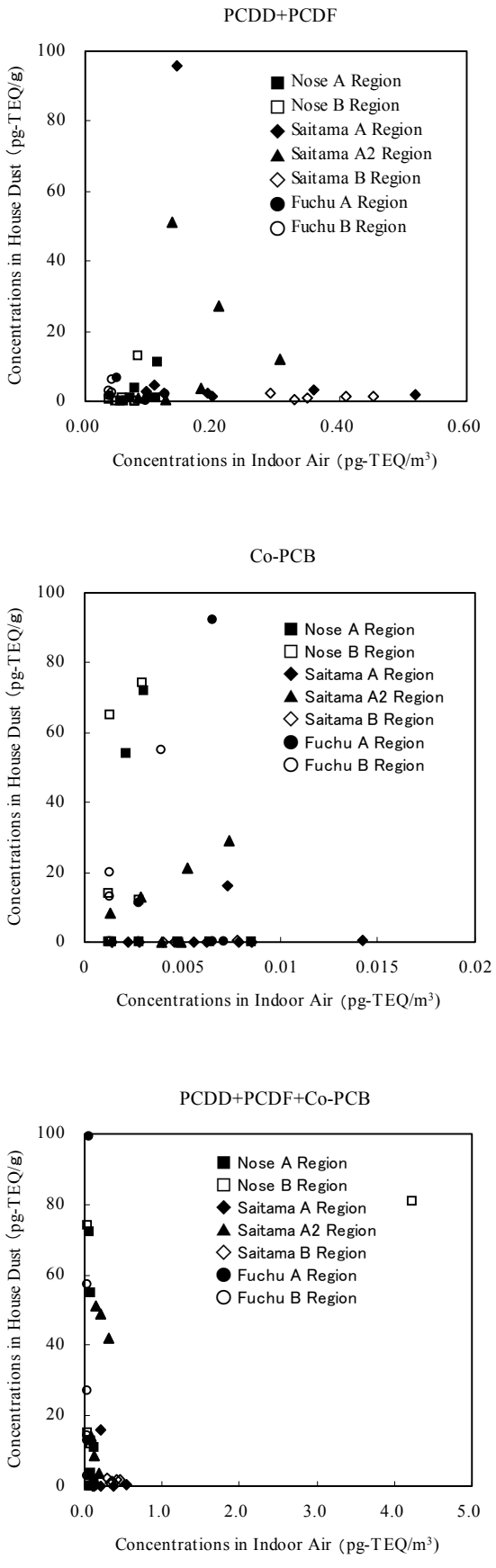


Figure 3-15. Relationship between Concentrations in Indoor Air and Concentrations in House Dust

(7) Other Surveys (Ground Water and River Water)

(a) Ground Water Survey

The results of the ground water survey carried out in the Nose Town area of Osaka Prefecture and Fuchu City in Hiroshima Prefecture are shown in Table 3-11.

Table 3-11. Concerning PCDD+PCDF+Co-PCB Concentrations in Groundwater

(Unit: pg-TEQ/L)

	Osaka Prefecture Nose Town Regions (n=7)	Hiroshima Prefecture Fuchu City Regions (n=6)
PCDD+PCDF		
Mean	0.21	0.21
Standard deviation	0	0
Median	0.21	0.21
Range	0.21	0.21
Co-PCB		
Mean	0.011	0.011
Standard deviation	0	0
Median	0.011	0.011
Range	0.011	0.011
PCDD+PCDF +Co-PCB		
Mean	0.22	0.22
Standard deviation	0	0
Median	0.22	0.22
Range	0.22	0.22

(b) Environmental Water Survey (Reference)

The results of the environmental water survey carried out in the Nose Town area of Osaka Prefecture are shown in Table 3-12.

Table 3-12. PCDD+PCDF+Co-PCB Concentrations in Environmental Water

(Unit: pg-TEQ/L)

	Osaka Prefecture Nose Town Regions (n=2)
PCDD+PCDF	
Mean	0.26
Standard deviation	0.035
Median	0.26
Range	0.23 – 0.28
Co-PCB	
Mean	0.014
Standard deviation	0.0021
Median	0.014
Range	0.012 – 0.015
PCDD+PCDF +Co-PCB	
Mean	0.27
Standard deviation	0.035
Median	0.27
Range	0.24 – 0.29

Notes:

1 When the actual measurement of an isomer was below the lower limit of determination (ND), its actual concentration was calculated by applying one-half the value of the detection limit (according to the survey manual, only the calculated results of ND×1/2 are shown).

2 The lower limits of determination were as follows:
T_4CDD, T_4CDF: 0.1 (pg/L), P_5CDD, P_5CDF: 0.1 (pg/L)
H_6CDD, H_6CDF: 0.2 (pg/L), H_7CDD, H_7CDF: 0.2 (pg/L)
O_8CDD, O_8CDF: 0.5 (pg/L), Co-planar PCB: 0.2 (pg/L)

Analysis and Evaluation

A survey of groundwater being used as drinking water was carried out in the A regions in the Nose Town area of Osaka Prefecture and in the Fuchu City area of Hiroshima Prefecture. A survey of environmental water was also carried out at two river locations in the Nose Town area of Osaka Prefecture. The dioxins detected at all these locations were in minute quantities, and none of the locations had levels that exceeded environmental standards.