

## JAPAN'S EXPERIENCE TO REDUCE DIOXINS (PCDDs, PCDFs AND CO-PLANAR PCBs) EMITTED INTO THE ENVIRONMENT

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### Abstract

Japan enacted the "Dioxins Law" in 1999 to prevent and eliminate serious impacts on the environment and human health caused by polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and co-planar polychlorinated biphenyls (co-planar PCBs or dioxin-like PCBs). Based on the law, the government formulated the plan to reduce dioxins emission by 90% compared to 1997. In 2003, the total amount of dioxins emission was estimated to be reduced by approximately 95% since 1997. The present environmental levels of dioxins monitored nationwide almost achieve Environmental Quality Standards. In the future, more progress will be expected by further research and development on dioxins risk management. Japan's experience to reduce dioxins would be useful for global risk management, if it is shared with developing countries. "Global Eco-Partnership Spirit", which is proposed by this paper, will be the key concept in order to reduce dioxins and other hazardous pollutants which are being or will be emitted from those countries.

### 1. Introduction

Japan enacted the Law Concerning Special Measures Against Dioxins ("Dioxins Law", Law No. 105 of 1999, promulgated on July 16, 1999) to prevent and eliminate serious impacts on the environment and human health caused by polychlorinated dibenzo-*p*-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), and co-planar polychlorinated biphenyls (co-planar PCBs or dioxin-like PCBs).

This paper outlines how Japan has reduced dioxins emitted into the environment, by enforcing the Dioxins Law.

### 2. Emission Reduction of Dioxins in Japan

The Dioxins Law has provided us necessary regulations or measures in order to prevent or remove environmental pollution caused by dioxins. The control standards of dioxins for the emission gas and effluent have been set, according to types of specified facilities. Furthermore, the dioxins emission inventory is created annually, pursuant to the governmental plan formulated on Paragraph 1, Article 33 of the Dioxins Law.

The reduction target for dioxins by the end of Fiscal Year (FY) 2002 was set between 843 -891 g-TEQ/year (reduction by 88.2 – 88.5% compared to the emission in 1997). In 2003, the total amount of dioxins emission was estimated to be reduced by approximately 95% since 1997, indicating that the emission target was achieved (See Table 1 and Figure 1).

Afterwards, Japan's government modified the reduction plan in June 2005, based on the fact that dioxins are extremely persistent and require long-term risk management. The revised target was set as the annual emission of dioxins in 2010 to be 315 – 343 g-TEQ/year (reduction by 95.8 - 95.9% compared to the emission in 1997). Japan's government is working continuously to tackle dioxins issues.

### **3. Environmental Levels of Dioxins in Japan**

In Japan, local governments (all prefectures and major cities) are monitoring regularly the state of pollution of air, water, bottom sediments and soil, based on Article 26 of the Dioxins Law. Under the monitoring system, it is clear that the environmental concentrations of dioxins have steadily been decreasing along with the emission reduction.

The FY 2005 monitoring result in Japan showed that average dioxins concentrations were 0.052 pg-TEQ/m<sup>3</sup> for ambient air, 0.21 pg-TEQ/L for public water, 6.4 pg-TEQ/g for bottom sediment, 0.047 pg-TEQ/L for groundwater and 5.9 pg-TEQ/g for soil (See Table 2).

Those dioxins levels in the environment almost achieved Japanese environmental quality standards, and the ratios to FY 1998 values were 23 – 91%, respectively.

### **4. Conclusion**

Japan has steadily reduced a total amount of dioxin emissions into the environment since the Dioxins Law was enacted.

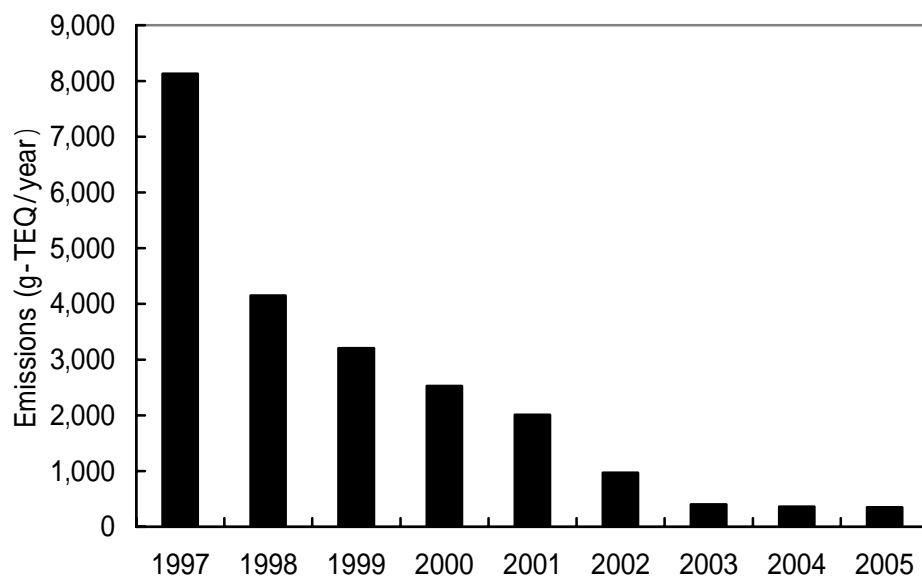
Emissions control of dioxins in the long term ensures that the environmental concentrations will never exceed current levels in Japan. More progress can be expected in the future due to research and development into technologies for further dioxins risk management.

Moreover, Japan's experience to reduce dioxins would be useful, if it is shared with developing countries. "Global eco-partnership spirit" will be the key concept in order to reduce dioxins and other serious pollutants which are being or will be emitted from those countries.

**Table 1** Estimated Amounts of Dioxin Emissions in Japan

Sources of Dioxin Emissions	Total Amount of Dioxins Emissions (g-TEQ/year)						WHO-TEF(1998)		
	1997	1998	1999	2000	2001	2002	2003	2004	2005
1 Fields of waste disposal	7,205 – 7,658	3,355– 3,808	2,562– 2,893	2,121– 2,252	1,689– 1,801	748– 771	219– 244	212– 231	209– 231
“Water”	5.3	5.3	5.3	2.5	1.5	0.87	0.60	0.65	0.36
2 Fields of industry	470	335	306	268	205	189	149	125	110
“Water”	6.3	5.8	5.8	5.0	1.8	1.2	0.93	1.0	1.0
3 Others	4.8–7.4	4.9–7.6	4.9–7.7	4.9–7.6	4.7–7.5	4.3–7.2	4.4–7.3	4.2–7.2	4.2–7.2
“Water”	1.2	1.2	1.2	1.2	1.0	0.53	0.56	0.37	0.47
Total	7,680– 8,135	3,695– 4,151	2,874– 3,208	2,394– 2,527	1,899– 2,013	941– 967	372– 400	341– 363	323– 348
“Water”	12.8	12.3	12.4	8.7	4.4	2.6	2.1	2.0	1.8

Note: “Water” in the table means amount emitted into water.



**Figure 1** National Dioxin Emissions Reduction in Japan (1997 - 2005)

Table 2 Dioxins Levels in the Environment in Japan

WHO-TEF(1998)

			FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005
<b>Ambient air</b>	Average		0.55	0.23	0.18	0.15	0.13	0.093	0.068	0.059	0.052
	No. of sites		68	458	463	920	979	966	913	892	825
<b>Public Water Bodies</b>	<b>Water</b>	Average	-	0.50	0.24	0.31	0.25	0.24	0.24	0.22	0.21
		No. of sites	-	204	568	2,116	2,213	2,207	2,126	2,057	1,912
	<b>Sediment</b>	Average	-	8.3	5.4	9.6	8.5	9.8	7.4	7.5	6.4
		No. of sites	-	205	542	1,836	1,813	1,784	1,825	1,740	1,623
<b>Groundwater</b>	Average	-	0.17	0.096	0.092	0.074	0.066	0.059	0.063	0.047	
	No. of sites	-	188	296	1,479	1,473	1,310	1,200	1,101	922	
<b>Soil</b>	Average	-	6.5	-	6.9	6.2	3.8	4.4	3.1	5.9	
	No. of sites	-	286	-	3,031	3,735	3,300	3,059	2,618	1,782	

Air : pg-TEQ/m<sup>3</sup>, Water : pg-TEQ/L, Sediment : pg-TEQ/g, Soil : pg-TEQ/g