Chapter 3 Results of the Environmental Monitoring in FY 2012

1. Purpose of the monitoring

Environmental Monitoring provides annual surveys of the environmental persistence of target chemicals as listed in the Stockholm Convention, chemicals that while undesignated are still subject to review for potential risk, and/or highly persistent chemicals annotated as Specified Chemical Substances and Monitored Chemical Substances under the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances (aka, the Chemical Substances Control Law), all target chemicals whose year to year changes in persistence in the environment must be understood.

*POPs: persistent organic pollutants

2. Target chemicals

In the FY 2012 Environmental Monitoring, usual 10 chemicals (groups) which added Hexachlorohexanes*, Chlordecone, Hexabromobiphenyls, Polybromodiphenyl ethers (Br_4～Br_{10}) **, Perfluorooctane sulfonic acid (PFOS) , Pentachlorobenzene which were adopted to be POPs in the Stockholm Convention at fourth meeting of the Conference of the Parties held from 4 to 8 May 2009 and Endosulfans which was adopted to be POPs in the Stockholm Convention at fifth meeting of the Conference of the Parties held from 25 to 29 April 2011, to initial 7 chemicals*** (groups), namely, Polychlorinated biphenyls (PCBs), Hexachlorobenzene, Dieldrin, Endrin, Chlordanes, Heptachlors and Mirex included in the Stockholm Convention (hereafter, POPs), and 3 chemicals (groups), namely, Perfluorooctane sulfonic acid (PFOS), Perfluorooctanoic acid (PFOA), 1,2,5,6,9,10-Hexabromocyclododecanes were designated as target chemicals. The combinations of target chemicals and the monitoring media are given below.

* In the COP4, α-HCH, β-HCH and γ-HCH (synonym:Lindane) were adopted to be POPs among HCHs, but in this Environmental Monitoring, HCHs which were able to include δ-HCH were designated as target chemicals.

** In the COP4, Tetrabromodiphenyl ethers, Pentabromodiphenyl ethers, Hexabromodiphenyl ethers and Heptabromodiphenyl ethers were adopted to be POPs among Polybromodiphenyl ethers but in this Environmental Monitoring, Polybromodiphenyl ethers(Br_4 ～ Br_{10}) which were able to include Octabromodiphenyl ethers Nonabromodiphenyl ethers and Decabromodiphenyl ether were designated as target chemicals.

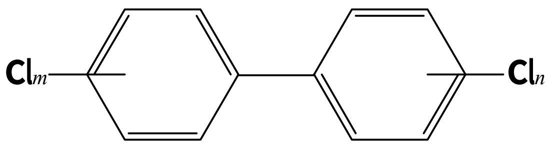
*** Up to FY 2009, the ten (10) target substance groups of pollutants annotated in the Stockholm Convention text with the exceptions of Polybrominated dibenzo-p-dioxin (PCDDs) and Polybrominated dibenzofurans (PCDFs) were monitored each fiscal year. As of FY 2010, the scope of monitoring had been reviewed and adjustments made to implementation frequency; as some target substances were re-designated for bi-annual monitoring, the scope did not include three (3)substances (groups): Aldrin, DDTs, and Toxaphenes. In this vein, the FY 2009 or FY2010 findings for these three (3) target substances not specifically monitored in FY 2011 have been included in this report for purpose of reference.

No	Name	Monitored media			
		Surface water	Sediment	Wildlife	Air
[1]	Polychlorinated biphenyls (PCBs) [1-1] Monochlorobiphenyls [1-2] Dichlorobiphenyls [1-3] Trichlorobiphenyls [1-4] Tetrachlorobiphenyls [1-4-1] 3,3',4,4'-Tetrachlorobiphenyl (#77) [1-4-2] 3,4,4',5-Tetrachlorobiphenyl (#81) [1-5] Pentachlorobiphenyls [1-5-1] 2,3,3',4,4'-Pentachlorobiphenyl (#105) [1-5-2] 2,3,4,4',5-Pentachlorobiphenyl (#114) [1-5-3] 2,3',4,4'-5-Pentachlorobiphenyl (#118) [1-5-4] 2',3,4,4',5-Pentachlorobiphenyl (#123) [1-5-5] 3,3',4,4',5-Pentachlorobiphenyl (#126) [1-6] Hexachlorobiphenyls [1-6-1] 2,3,3',4,4',5-Hexachlorobiphenyl (#156) [1-6-2] 2,3,3',4,4',5'-Hexachlorobiphenyl (#157) [1-6-3] 2,3',4,4',5,5'-Hexachlorobiphenyl (#167) [1-6-4] 3,3',4,4',5,5'-Hexachlorobiphenyl (#169) [1-7] Heptachlorobiphenyls [1-7-1] 2,2',3,3',4,4',5-Heptachlorobiphenyl (#170) [1-7-2] 2,2',3,4,4',5,5'-Heptachlorobiphenyl (#180) [1-7-3] 2,3,3',4,4',5,5'-Heptachlorobiphenyl (#189) [1-8] Octachlorobiphenyls [1-9] Nonachlorobiphenyls [1-10] Decachlorobiphenyl	○	○	○	○
[2]	Hexachlorobenzene	○	○	○	○
[3]	Aldrin (reference)				
[4]	Dieldrin (reference)				
[5]	Endrin (reference)				
[6]	DDTs (reference) [6-1] *p,p'*-DDT (reference) [6-2] *p,p'*-DDE (reference) [6-3] *p,p'*-DDD (reference) [6-4] *o,p'*-DDT (reference) [6-5] *o,p'*-DDE (reference) [6-6] *o,p'*-DDD (reference)				
[7]	Chlordanes [7-1] *cis*-Chlordane [7-2] *trans*-Chlordane [7-3] Oxychlordane [7-4] *cis*-Nonachlor [7-5] *trans*-Nonachlor	○	○	○	○
[8]	Heptachlors [8-1] Heptachlor [8-2] *cis*-Heptachlor epoxide [8-3] *trans*-Heptachlor epoxide			○	○
[9]	Toxaphenes (reference) [9-1] 2-endo,3-exo,5-endo,6-exo,8,8,10,10-octachlorobornane (Parlar-26) (reference) [9-2] 2-endo,3-exo,5-endo,6-exo,8,8,9,10,10-nonachlorobornane (Parlar-50) (reference) [9-3] 2,2,5,5,8,9,9,10,10-Nonachlorobornane (Parlar-62) (reference)				
[10]	Mirex (reference)				
[11]	HCHs (Hexachlorohexanes) [11-1] *α*-HCH [11-2] *β*-HCH [11-3] *γ*-HCH (synonym:Lindane) [11-4] *δ*-HCH	○	○	○	○
[12]	Chlordecone (reference)				

No	Name	Monitored media			
		Surface water	Sediment	Wildlife	Air
[13]	Hexabromobiphenyls (reference) [13-1] 2,2',4,4',5,5'-Hexabromobiphenyl (#153) (reference) [13-2] 2,2',4,4',5,6'-Hexabromobiphenyl (#154) (reference) [13-3] 2,2',4,4',6,6'-Hexabromobiphenyl (#155) (reference) [13-4] 2,3,3',4,4',5 -Hexabromobiphenyl (#156) (reference) [13-5] 3,3',4,4',5,5'-Hexabromobiphenyl (#169) (reference)				
[14]	Polybromodiphenyl ethers(Br_4～Br_{10}) [14-1] Tetrabromodiphenyl ethers [14-1-1] 2,2',4,4'-Tetrabromodiphenyl ether (#47) [14-2] Pentabromodiphenyl ethers [14-2-1] 2,2',4,4',5-Pentabromodiphenyl ether (#99) [14-3] Hexabromodiphenyl ethers [14-3-1] 2,2',4,4',5,5'-Pentabromodiphenyl ether (#153) [14-3-2] 2,2',4,4',5,6'-Pentabromodiphenyl ether (#154) [14-4] Heptabromodiphenyl ethers [14-4-1] 2,2',3,3',4,5',6'-Pentabromodiphenyl ether (#175) [14-4-2] 2,2',3,4,4',5',6'-Pentabromodiphenyl ether (#183) [14-5] Octabromodiphenyl ethers [14-6] Nonabromodiphenyl ethers [14-7] Decabromodiphenyl ether	○	○	○	○
[15]	Perfluorooctane sulfonic acid (PFOS)	○	○	○	○
[16]	Perfluorooctanoic acid (PFOA)	○	○	○	○
[17]	Pentachlorobenzene	○	○	○	○
[18]	Endosulfans [18-1] *α*-Endosulfan [18-2] *β*-Endosulfan	○	○	○	○
[19]	1,2,5,6,9,10-Hexabromocyclododecanes [19-1] *α*-1,2,5,6,9,10-Hexabromocyclododecane [19-2] *β*-1,2,5,6,9,10-Hexabromocyclododecane [19-3] *γ*-1,2,5,6,9,10-Hexabromocyclododecane [19-4] *δ*-1,2,5,6,9,10-Hexabromocyclododecane [19-5] *ε*-1,2,5,6,9,10-Hexabromocyclododecane		○	○	○
[20]	2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol	○	○	○	

Chemical and physical properties of target chemicals of the Environmental Monitoring are as follows.

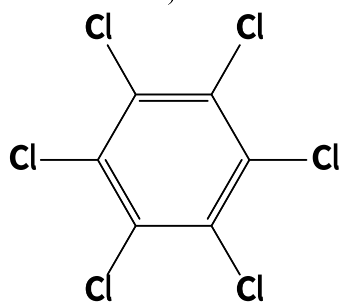
[1] Polychlorinated biphenyls (PCBs)



i = m+n =1〜10

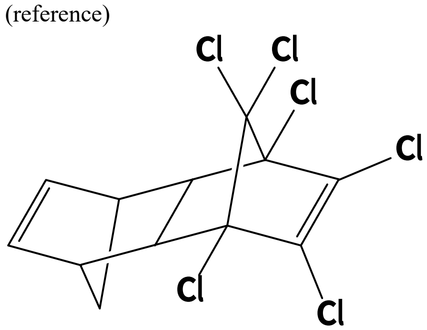
Molecular formula:	$C_{12}H_{(10-i)}Cl_i$(i = m+n =1〜10)
CAS:	27323-18-8 (Cl_1), 22512-42-9 (Cl_2), 25323-68-6 (Cl_3), 26914-33-0 (Cl_4), 25429-29-2 (Cl_5), 26601-64-9 (Cl_6), 28655-71-2 (Cl_7), 31472-83-0 (Cl_8), 53742-07-7 (Cl_9), 5051-24-3 (Cl_{10})
ENCS:	No pertinence
MW:	188.65〜498.66
mp:	Not specified
bp:	Not specified
SW:	Not specified
Specific gravity:	Not specified
logPow:	Not specified

[2] HCB (Hexachlorobenzene)



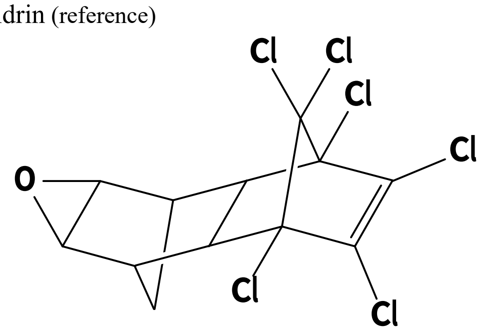
Molecular formula:	C_6Cl_6
CAS:	118-74-1
ENCS:	3-0076
MW:	284.78
mp:	231.8°C [1)]
bp:	323〜326°C [1)]
SW:	0.0000096g/kg (25°C) [2)]
Specific gravity:	2.044 (23°C) [1)]
logPow:	5.73 [3)]

[3] Aldrin (reference)



Molecular formula:	$C_{12}H_8Cl_6$
CAS:	309-00-2
ENCS:	4-0303
MW:	364.91
mp:	104°C[1)]
bp:	145°C (0.27kPa) [4)]
SW:	0.0002g/kg (25°C) [2)]
Specific gravity:	1.6g/cm^3 [5)]
logPow:	6.50 [3)]

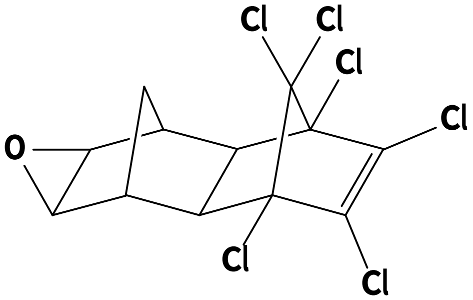
[4] Dieldrin (reference)



Molecular formula:	$C_{12}H_8Cl_6O$
CAS:	60-57-1
ENCS:	4-0299
MW:	380.91
mp:	176〜177°C [1)]
bp:	330°C [5)]
SW:	0.00020g/kg (25°C) [2)]
Specific gravity:	1.75 (25°C) [2)]
logPow:	5.40 [3)]

(Abbreviations) CAS: CAS registry number, ENCS: registry number in the Existing and New Chemical Substances List, MW: molecular weight, mp: melting point, bp: boiling point, SW: solubility in water, logPow: *n*-octanol-water partition coefficient, kPa: kilopascal (1 atom 101.3kPa).

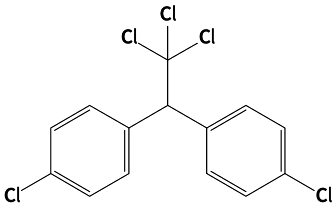
[5] Endrin (reference)



Molecular formula: $C_{12}H_8Cl_6O$
CAS: 72-20-8
ENCS: 4-0299
MW: 380.91
mp: 200°C[6]
bp: 245°C (Decomposition)[6]
SW: 0.00025g/kg[2]
Specific gravity: 1.7g/cm^3[6]
logPow: 5.20[3]

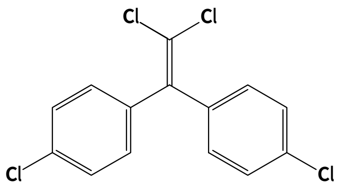
[6] DDTs (reference)

[6-1] *p,p'*-DDT (reference)



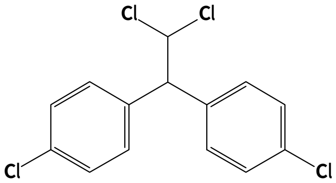
Molecular formula: $C_{14}H_9Cl_5$
CAS: 50-29-3
ENCS: 4-0910
MW: 354.49
mp: 108.5°C[2]
bp: 260°C[2]
SW: Insoluble[1]
Specific gravity: 1.6g/cm^3[7]
logPow: 6.91[3]

[6-2] *p,p'*-DDE (reference)



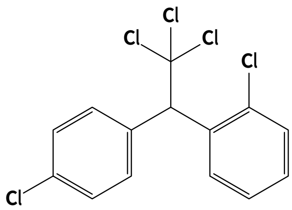
Molecular formula: $C_{14}H_8Cl_4$
CAS: 72-55-9
ENCS: No pertinence
MW: 318.03
mp: 89°C[2]
bp: 336°C[5]
SW: 0.12mg/L (25°C)[5]
Specific gravity: Uncertain
logPow: 6.51[3]

[6-3] *p,p'*-DDD (reference)



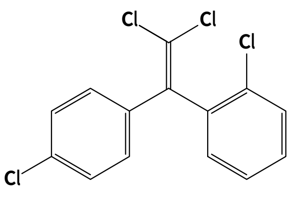
Molecular formula: $C_{14}H_{10}Cl_4$
CAS: 72-54-8
ENCS: No pertinence
MW: 320.04
mp: 109～110°C[1]
bp: 193°C (1mmHg)[2]
SW: 0.09mg/L (25°C)[5]
Specific gravity: Uncertain
logPow: 6.02[3]

[6-4] *o,p'*-DDT (reference)



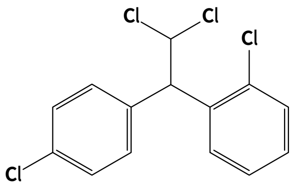
Molecular formula: $C_{14}H_9Cl_5$
CAS: 789-02-6
ENCS: No pertinence
MW: 354.49
mp: Uncertain
bp: Uncertain
SW: Uncertain
Specific gravity: Uncertain
logPow: Uncertain

[6-5] *o,p'*-DDE (reference)



Molecular formula: $C_{14}H_8Cl_4$
CAS: 3424-82-6
ENCS: No pertinence
MW: 318.03
mp: Uncertain
bp: Uncertain
SW: Uncertain
Specific gravity: Uncertain
logPow: Uncertain

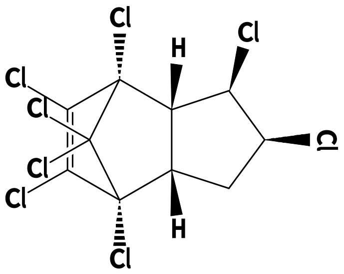
[6-6] *o,p'*-DDD (reference)



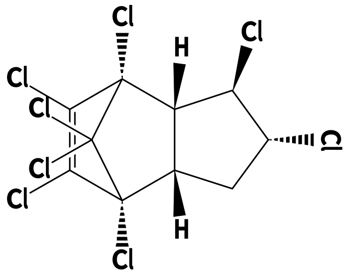
Molecular formula: $C_{14}H_{10}Cl_4$
CAS: 53-19-0
ENCS: No pertinence
MW: 320.04
mp: 76～78°C[1]
bp: Uncertain
SW: Uncertain
Specific gravity: Uncertain
logPow: Uncertain

[7] Chlordanes

[7-1] *cis*-Chlordane



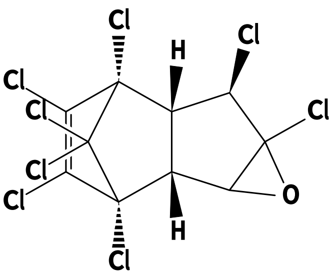
[7-2] *trans*-Chlordane



The following data are for both [7-1] and [7-2].

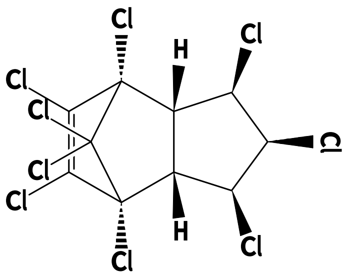
Molecular formula:	$C_{10}H_6Cl_8$
CAS:	5103-71-9 (*cis*), 5103-74-2 (*trans*)
ENCS:	4-637
MW:	409.78
mp:	106°C [1]
bp:	175°C (1mmHg) [1]
SW:	0.0006g/kg (25°C) [1]
Specific gravity:	1.59～1.63 (25°C) [2]
logPow:	6.16 [3]

[7-3] Oxychlordane



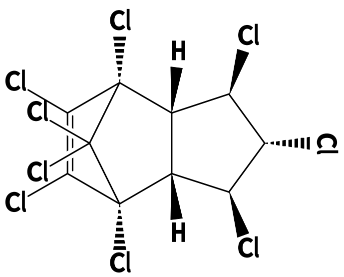
Molecular formula:	$C_{10}H_4Cl_8O$
CAS:	26880-48-8
ENCS:	No pertinence
MW:	423.76
mp:	100°C [1]
bp:	Uncertain
SW:	Uncertain
Specific gravity:	Uncertain
logPow:	4.76[3]

[7-4] *cis*-Nonachlor



Molecular formula:	$C_{10}H_5Cl_9$
CAS:	5103-73-1
ENCS:	No pertinence
MW:	444.22
mp:	Uncertain
bp:	Uncertain
SW:	Uncertain
Specific gravity:	Uncertain
logPow:	5.21[3]

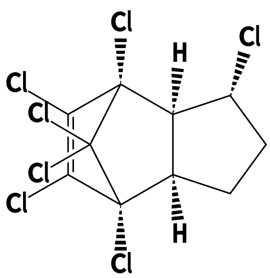
[7-5] *trans*-Nonachlor



Molecular formula:	$C_{10}H_5Cl_9$
CAS:	39765-80-5
ENCS:	No pertinence
MW:	444.22
mp:	Uncertain
bp:	Uncertain
SW:	Uncertain
Specific gravity:	Uncertain
logPow:	5.08[3]

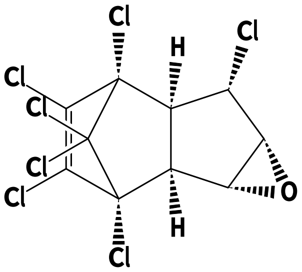
[8] Heptachlors

[8-1] Heptachlor

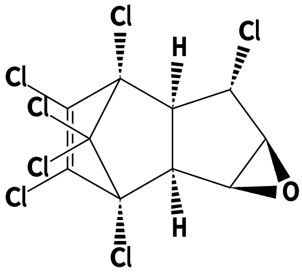


Molecular formula:	$C_{10}H_5Cl_7$
CAS:	76-44-8
ENCS:	4-637, 9-1646
MW:	373.32
mp:	95～96°C[2]
bp:	Uncertain
SW:	0.00018g/kg (25°C) [1]
Specific gravity:	1.57 (9°C) [1]
logPow:	6.10 [3]

[8-2] *cis*-Heptachlor epoxide



[8-3] *trans*-Heptachlor epoxide

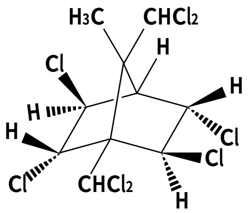


The following data are for both [8-2] and [8-3].

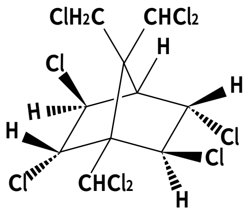
Molecular formula:	$C_{10}H_5Cl_7O$
CAS:	1024-57-3
ENCS:	No pertinence
MW:	389.32
mp:	160°C[1]
bp:	Uncertain
SW:	Uncertain
Specific gravity:	Uncertain
logPow:	5.40[3]

[9] Toxaphenes (reference)

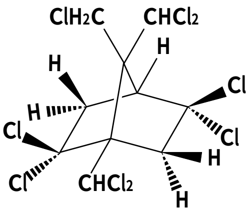
[9-1]
2-Endo,3-exo,5-endo,6-exo,8,8,10,10-octachlorobornane (Parlar-26)



[9-2]
2-Endo,3-exo,5-endo,6-exo,8,8,9,10,10-nonachlorobornane (Parlar-50)

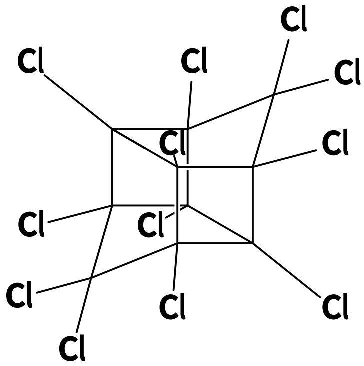


[9-3]
2,2,5,5,8,9,9,10,10-nonachlorobornane (Parlar-62)



Molecular formula: $C_{10}H_{10}Cl_8$([9-1]), $C_{10}H_9Cl_9$([9-2], [9-3])
CAS: 8001-35-2
ENCS: No pertinence
MW: 413.81 (Cl_8), 448.26 (Cl_9)
mp: 65～90°C [2)]
bp: Uncertain
SW: 3mg/L [2)]
Specific gravity: 1.630 (25°C) [2)]
logPow: 6.44 [2)]

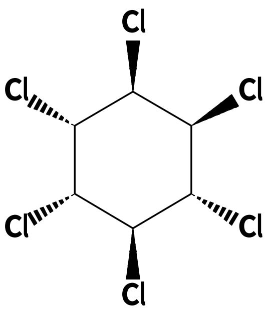
[10] Mirex (reference)



Molecular formula: $C_{10}Cl_{12}$
CAS: 2385-85-5
ENCS: No pertinence
MW: 545.54
mp: 485°C (Decomposition) [2)]
bp: Uncertain
SW: 0.000085g/kg (25°C) [1)]
Specific gravity: Uncertain
Molecular formula: 5.28 [3)]

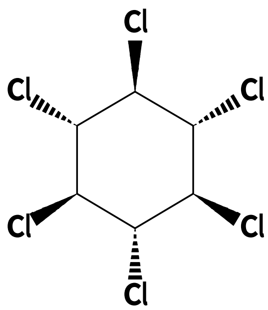
[11] HCHs(Hexachlorohexanes)

[11-1] *α*-HCH



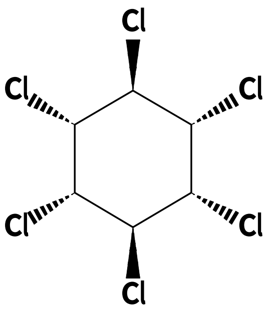
Molecular formula: $C_6H_6Cl_6$
CAS: 319-84-6
ENCS: 3-2250, 9-1652
MW: 290.83
mp: 158°C [1)]
bp: 288°C [9)]
SW: 0.00018g/kg (25°C) [2)]
Specific gravity: 1.87 (20°C) [10)]
Molecular formula: 3.80 [3)]

[11-2] *β*-HCH



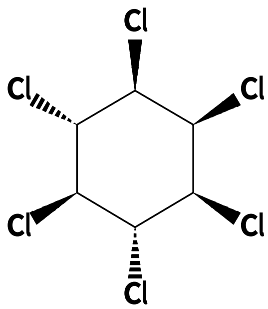
Molecular formula: $C_6H_6Cl_6$
CAS: 319-85-7
ENCS: 3-2250, 9-1652
MW: 290.83
mp: 309°C[11)]
bp: 60°C (0.50mmHg) [1)]
SW: 0.0002g/kg (25°C) [2)]
Specific gravity: 1.87 (20°C) [10)]
Molecular formula: 3.78 [1)]

[11-3] *γ*-HCH (synonym:Lindane)



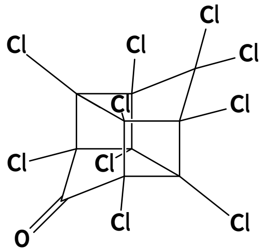
Molecular formula: $C_6H_6Cl_6$
CAS: 58-89-9
ENCS: 3-2250, 9-1652
MW: 290.83
mp: 112.5°C [1)]
bp: 323.4°C [1)]
SW: 0.0078g/kg (25°C) [1)]
Specific gravity: 1.85 (20°C) [10)]
Molecular formula: 3.72 [3)]

[11-4] *δ*-HCH



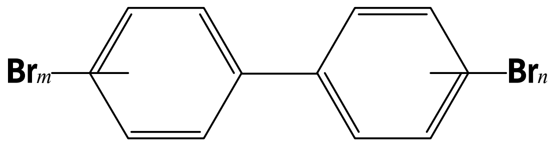
Molecular formula: $C_6H_6Cl_6$
CAS: 319-86-8
ENCS: 3-2250, 9-1652
MW: 290.83
mp: 141.5°C [1)]
bp: 60°C (0.36mmHg) [1)]
SW: Uncertain
Specific gravity: 1.87 (20°C) [10)]
Molecular formula: 4.14 [3)]

[12] Chlordecone (reference)



Molecular formula: $C_{10}Cl_{10}O$
CAS: 143-50-0
ENCS: No pertinence
MW: 490.64
mp: 350°C[2)]
bp: Not specified
sw: 7.6mg/L (24°C) [5)]
Specific gravity: 1.61 (25°C) [1)]
logPow: 3.45 [12)]

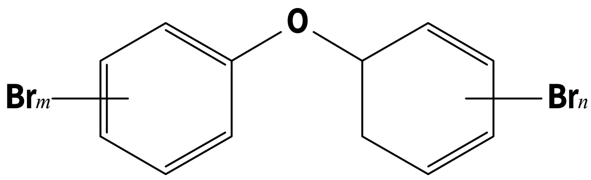
[13] Hexabromobiphenyls (reference)



m+n =6

Molecular formula: $C_{12}H_4Br_6$
CAS: 36355-01-8
ENCS: No pertinence
MW: 627.58
mp: Not specified
bp: Not specified
sw: Not specified
Specific gravity: Not specified
logPow: Not specified

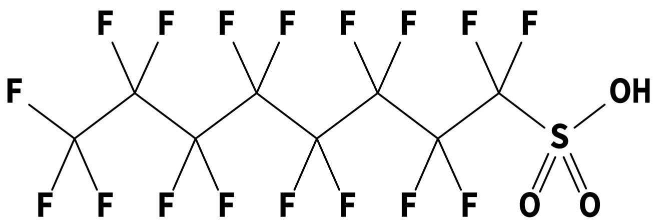
[14] Polybromodiphenyl ethers（Br_4～Br_{10}）



i = m+n =4～10

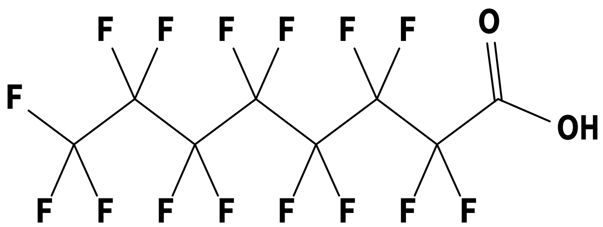
Molecular formula: $C_{12}H_{(10-i)}Br_iO$ (i = m+n =4～10)
CAS: 40088-47-9 (Br_4), 32534-81-9 (Br_5), 36483-60-0 (Br_6), 68928-80-3 (Br_7), 32536-52-0 (Br_8), 63936-56-1 (Br_9), 1163-19-5 (Br_{10})
ENCS: 3-61 (Br_4), 3-2845 (Br_6)
MW: 485.79～959.17
mp: Not specified
bp: Not specified
sw: Not specified
Specific gravity: Not specified
logPow: Not specified

[15] Perfluorooctane sulfonic acid (PFOS)



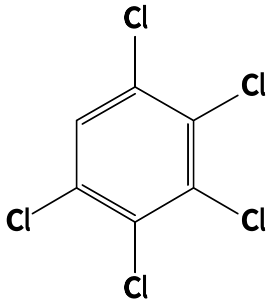
Molecular formula: $C_8HF_{17}O_3S$
CAS: 1763-23-1
ENCS: 2-1595
MW: 500.13
mp: >400°C (potassium salt) [13)]
bp: Uncertain
sw: 519mg/L (20°C, potassium salt) [13)]
Specific gravity: Uncertain
logPow: Uncertain

[16] Perfluorooctanoic acid(PFOA)



Molecular formula: $C_8HF_{15}O_2$
CAS: 335-67-1
ENCS: 2-1182, 2-2659
MW: 414.07
mp: 54.3°C [1)]
bp: 192.4°C [1)]
sw: 9.5g/L (20°C) [14)]
Specific gravity: 1.79g/cm^3 [15)]
logPow: 6.3[15)]

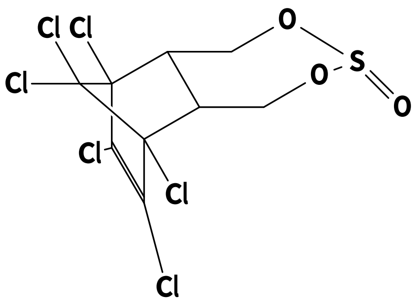
[17] Pentachlorobenzene



Molecular formula:	C_6HCl_5
CAS:	608-93-5
ENCS:	3-76
MW:	250.34
mp:	86°C [1]
bp:	277°C [1]
sw:	0.00050g/kg (25°C) [1]
Specific gravity:	1.8342g/cm^3 (16°C) [1]
logPow:	5.17[3]

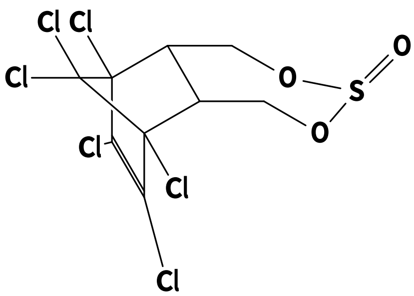
[18] Endosulfans

[18-1] α-Endosulfan



Molecular formula:	$C_9H_6Cl_6O_3S$
CAS:	959-98-8
ENCS:	No pertinence
MW:	406.93
mp:	109.2°C [16]
bp:	Uncertain
sw:	0.33mg/L (25°C) [16]
Specific gravity:	Uncertain
logPow:	4.7 [16]

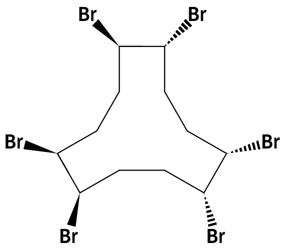
[18-2] β-Endosulfan



Molecular formula:	$C_9H_6Cl_6O_3S$
CAS:	33213-65-9
ENCS:	No pertinence
MW:	406.93
mp:	213.3°C [16]
bp:	Uncertain
sw:	0.32mg/L (25°C) [16]
Specific gravity:	Uncertain
logPow:	4.7 [16]

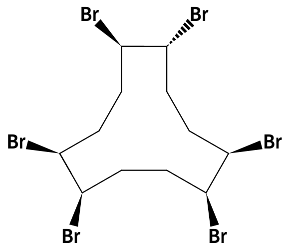
[19] 1,2,5,6,9,10-Hexabromocyclododecanes

[19-1] α-1,2,5,6,9,10-Hexabromocyclododecane



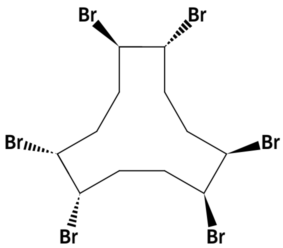
Molecular formula:	$C_{12}H_{18}Br_6$
CAS:	134237-50-6
ENCS:	3-2254
MW:	641.70
mp:	179～181°C [17]
bp:	Uncertain
SW:	48.8μg/L [17]
Specific gravity:	Uncertain
Molecular formula:	5.07 [17]

[19-2] β-1,2,5,6,9,10-Hexabromocyclododecane



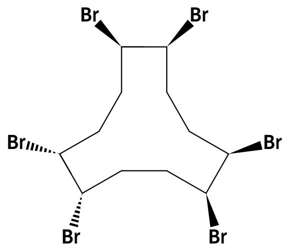
Molecular formula:	$C_{12}H_{18}Br_6$
CAS:	134237-51-7
ENCS:	3-2254
MW:	641.70
mp:	170～172°C [17]
bp:	Uncertain
SW:	14.7μg/L [17]
Specific gravity:	Uncertain
Molecular formula:	5.12 [17]

[19-3] γ-1,2,5,6,9,10-Hexabromocyclododecane



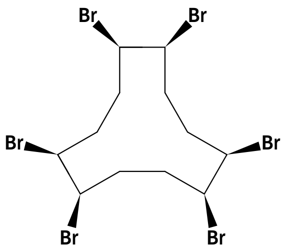
Molecular formula:	$C_{12}H_{18}Br_6$
CAS:	134237-52-8
ENCS:	3-2254
MW:	641.70
mp:	207～209°C [17]
bp:	Uncertain
SW:	2.1μg/L [17]
Specific gravity:	Uncertain
Molecular formula:	5.47 [17]

[19-4] δ-1,2,5,6,9,10-Hexabromocyclododecane



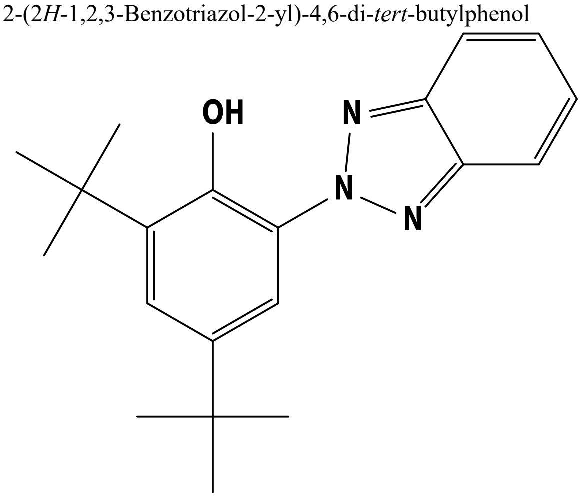
Molecular formula:	$C_{12}H_{18}Br_6$
CAS:	Uncertain
ENCS:	3-2254
MW:	641.70
mp:	Uncertain
bp:	Uncertain
SW:	Uncertain
Specific gravity:	Uncertain
Molecular formula:	Uncertain

[19-5] ε-1,2,5,6,9,10-Hexabromocyclododecane



Molecular formula:	$C_{12}H_{18}Br_6$
CAS:	Uncertain
ENCS:	3-2254
MW:	641.70
mp:	Uncertain
bp:	Uncertain
sw:	Uncertain
Specific gravity:	Uncertain
logPow:	Uncertain

[20] 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol



Molecular formula:	$C_{20}H_{25}N_3O$
CAS:	3846-71-7
ENCS:	5-3580、5-3604
MW:	323.43
mp:	153～155°C [18]
bp:	Uncertain
sw:	不詳
Specific gravity:	Uncertain
logPow:	Uncertain

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16) UNEP, Stockholm Convention on Persistent Organic Pollutants, Risk profile on endosulfan, Report of the Persistent Organic Pollutants Review Committee on the work of its fifth meeting (2009)
17) UNEP, Stockholm Convention on Persistent Organic Pollutants, Risk profile on hexabromocyclododecane, Report of the Persistent Organic Pollutants Review Committee on the work of its sixth meeting (2010)
18) Judi Rosevear et al., Australian Journal of Chemistry, 38, 8, 1163-1176 (1985)

3. Monitored site and procedure

In the Environmental Monitoring (of surface water, sediment, wildlife, and air), the sampling of specimens was entrusted to prefectural governments and government-designated cities across Japan and the specimens sampled were analysed by private analytical laboratories.

(1) Organisations responsible for sampling

Local communities	Organisations responsible for sampling	Monitored media			
		Surface water	Sediment	Wildlife	Air
Hokkaido	Hokkaido Research Organization Environmental and Geological Research Department Institute of Environmental Sciences	○	○	○	○
Sapporo City	Sapporo City Institute of Public Health				○
Aomori Pref.	Aomori Prefectural Government Sanpachi District Administration Office Management and Local Coordination Division Hachinohe Environmental Management Office			○*	
Iwate Pref.	Research Institute for Environmental Sciences and Public Health of Iwate Prefecture	○	○	○	○
Miyagi Pref.	Miyagi Prefectural Institute of Public Health and Environment	○	○	○	○
Sendai City	Sendai City Institute of Public Health		○		
Akita Pref.	Akita Research Center for Public Health and Environment	○	○		
Yamagata Pref.	Yamagata Institute of Environmental Sciences	○	○		
Fukushima Pref.	Fukushima Prefectural Institute of Environmental Research	○	○		
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center	○	○	○	○
Tochigi Pref.	Tochigi Prefectural Institute of Public Health and Environmental Science	○	○		
Gunma Pref.	Gunma Prefectural Institute of Public Health and Environmental Sciences				○
Saitama Pref.	Center for Environmental Science in Saitama	○			
Chiba Pref.	Chiba Prefectural Environmental Research Center		○		○
Chiba City	Chiba City Institute of Health and Environment	○	○		
Tokyo Met.	Tokyo Metropolitan Research Institute for Environmental Protection	○	○	○	○
Kanagawa Pref.	Kanagawa Environmental Research Center				○
Yokohama City	Yokohama Environmental Science Research Institute	○	○	○	○
Kawasaki City	Kawasaki Environmental Research Institute	○	○	○	
Niigata Pref.	Niigata Prefectural Institute of Public Health and Environmental Sciences	○	○		○
Toyama Pref.	Toyama Prefectural Environmental Science Research Center	○	○		○
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science	○	○	○	○
Fukui Pref.	Fukui Prefectural Institute of Public Health and Environmental Science	○	○		
Yamanashi Pref.	Yamanashi Prefectural Institute of Public Health and Environment		○		○
Nagano Pref.	Nagano Environmental Conservation Research Institute	○	○		○
Gifu Pref.	Gifu Prefectural Research Institute for Health and Environmental Sciences				○
Shizuoka Pref.	Shizuoka Institute of Environment and Hygiene	○	○		
Aichi Pref.	Aichi Environmental Research Center	○	○		
Nagoya City	Nagoya City Environmental Science Research Institute			○	○
Mie Pref.	Mie Prefecture Health and Environment Research Institute	○	○		○
Shiga Pref.	Lake Biwa Environmental Research Institute	○	○	○	
Kyoto Pref.	Kyoto Prefectural Institute of Public Health and Environment	○	○		
Kyoto City	Kyoto City Prefectural Institute of Public Health and Environment	○	○		
Osaka Pref.	Research Institute of Environment, Agriculture and Fisheries, Osaka Prefectural Government	○	○	○	○
Osaka City	Osaka City Institute of Public Health and Environmental Sciences	○	○		
Hyogo Pref.	Hyogo Prefectural Agricultural Administration and Environment Division, Environment Bureau	○	○		○
Kobe City	Environmental Conservation and Guidance Division, Environment Bureau	○	○		○
Nara Pref.	Nara Prefectural Institute for Hygiene and Environment		○		○
Wakayama Pref.	Wakayama Prefectural Research Center of Environment and Public Health	○	○		
Tottori Pref.	Tottori Prefectural Institute of Public Health and Environment			○	

Local communities	Organisations responsible for sampling	Monitored media			
		Surface water	Sediment	Wildlife	Air
Shimane Pref.	Shimane Prefectural Institute of Public Health and Environmental Science			○	○
Okayama Pref.	Okayama Prefectural Institute for Environmental Science and Public Health	○	○		
Hiroshima Pref.	Hiroshima Prefectural Technology Research Institute Health and Environment Center	○	○		
Hiroshima City	Hiroshima City Institute of Public Health			○	○
Yamaguchi Pref.	Yamaguchi Prefectural Public Health and Environment	○	○		○
Tokushima Pref.	Tokushima Prefectural Pablic Health, Pharmaceutical and Environmental Science Center	○	○		○
Kagawa Pref.	Kagawa Prefectural Research Institute for Environmental Sciences and Public Health	○	○	○	○
Ehime Pref.	Ehime Prefectural Institute of Public Health and Environmental Science		○		○
Kochi Pref.	Kochi Prefectural Environmental Research Center	○	○	○	
Fukuoka Pref.	Fukuoka Institute of Health and Environmental Science				○
Kitakyushu City	Kitakyushu City Institute of Environmental Sciences	○	○	○	
Fukuoka City	Fukuoka City Institute for Hygiene and the Environment		○		
Saga Pref.	Saga Prefectural Environmental Research Center	○	○		○
Nagasaki Pref.	Public Relations and Public Hearing Division, Policy Planning and Coordination Bureau, Nagasaki Prefecture	○	○		
Kumamoto Pref.	Kumamoto Prefectural Institute of Public Health and Environmental Science	○			○
Oita Pref.	Oita Prefectural Environmental Preservation Division, Life and Environment Department		○	○	
Miyazaki Pref.	Miyazaki Prefectural Institute for Public Health and Environment	○	○		○
Kagoshima Pref.	Kagoshima Prefectural Institute for Environmental Research and Public Health	○	○	○	○
Okinawa Pref.	Okinawa Prefectural Institute of Health and Environment	○	○	○	○

(Note1) Organisations responsible for sampling are described by their official names in FY 2012.

(Note2) "*" : A public interest incorporated foundation collected specimens because local public organizations could not take samples .

(2) Monitored sites (areas)

Monitored sites (areas) are shown in Table 3-1-1 and Figure 3-1-1 for surface water, Table 3-1-2 and Figure 3-1-2 for sediment, Table 3-1-3 and Figure 3-1-3 for wildlife and Table 3-1-4 and Figure 3-1-4 for air. The breakdown is summarized as follows.

Monitored media	Numbers of local communities	Numbers of target chemicals (groups)	Numbers of monitored sites (or areas)	Numbers of samples at a monitored site (or area)
Surface water	42	10	48	1
Sediment	47	11	63	1 or 3 *
Wildlife (bivalves)	5	12	5	1 or 3 **
Wildlife (fish)	17	12	19	1 or 3 **
Wildlife (birds)	2	12	2	1 or 3 **
Air (warm season)	34	11	36	1
Air (cold season)	34	11	36	1
All media	59	12	119	

(Note 1) "*" : For bottom/sediment cover, t at each monitoring point, three(3) specimen samples were collected. The target substances [20] 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol were analysed with the three(3) specimen samples for each place. The other substances were analysed for each place with one(1) specimen sample that is a mixture of equal parts of the three(3) specimen samples.

(Note 2) "**" : For biological species, at each monitoring point, three(3) specimen samples were collected. The target substance 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol was analysed with the three(3) specimen samples for each place. The other substances were analysed for each place with one(1) specimen sample that is a mixture of equal parts of the three(3) specimen samples.

Table 3-1-1 List of monitored sites (surface water) in the Environmental Monitoring in FY 2012

Local communities	Monitored sites	Sampling dates
Hokkaido	Suzuran-ohashi Bridge, Riv Tokachi(Obihiro City)	October 19, 2012
	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City)	November 16, 2012
Iwate Pref.	Riv. Toyosawa(Hanamaki City)	October 10, 2012
Miyagi Pref.	Sendai Bay(Matsushima Bay)	November 1, 2012
Akita Pref.	Lake Hachiro	October 17, 2012
Yamagata Pref.	Mouth of Riv. Mogami(Sakata City)	October 18, 2012
Fukushima Pref.	Onahama Port	October 31, 2012
Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City)	November 14, 2012
Tochigi Pref.	Riv. Tagawa(Utsunomiya City)	November 1, 2012
Saitama Pref.	Akigaseshusui of Riv. Arakawa	November 18, 2012
Chiba City	Mouth of Riv. Hanami(Chiba City)	October 30, 2012
Tokyo Met.	Mouth of Riv. Arakawa(Koto Ward)	November 5, 2012
	Mouth of Riv. Sumida(Minato Ward)	November 5, 2012
Yokohama City	Yokohama Port	October 22, 2012
Kawasaki City	Keihin Canal, Port of Kawasaki	November 7, 2012
Niigata Pref.	Lower Riv. Shinano(Niigata City)	October 25, 2012
Toyama Pref.	Hagiura-bashi Bridge, Mouth of Riv. Jintsu(Toyama City)	November 8, 2012
Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)	October 31, 2012
Fukui Pref.	Mishima-bashi Bridge, Riv. Shono(Tsuruga City)	November 1, 2012
Nagano Pref.	Lake Suwa(center)	November 1, 2012
Shizuoka Pref.	Riv. Tenryu(Iwata City)	October 16, 2012
Aichi Pref.	Nagoya Port	October 29, 2012
Mie Pref.	Yokkaichi Port	October 24, 2012
Shiga Pref.	Lake Biwa(center, offshore of Karasaki)	November 13, 2012
Kyoto Pref.	Miyazu Port	October 31, 2012
Kyoto City	Miyamae-bashi Bridge, Riv. Katsura(Kyoto City)	November 1, 2012
Osaka Pref.	Mouth of Riv. Yamato(Sakai City)	November 28, 2012
Osaka City	Osaka Port	October 30, 2012
Hyogo Pref.	Offshore of Himeji	October 17, 2012
Kobe City	Kobe Port(center)	October 30, 2012
Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa(Wakayama City)	October 31, 2012
Okayama Pref.	Offshore of Mizushima	October 10, 2012
Hiroshima Pref.	Kure Port	November 7, 2012
	Hiroshima Bay	November 7, 2012
Yamaguchi Pref.	Tokuyama Bay	November 15, 2012
	Offshore of Ube	November 19, 2012
	Offshore of Hagi	October 25, 2012
Tokushima Pref.	Mouth of Riv. Yoshino(Tokushima City)	October 31, 2012
Kagawa Pref.	Takamatsu Port	October 2, 2012
Kochi Pref.	Mouth of Riv. Shimanto(Shimanto City)	November 25, 2012
Kitakyushu City	Dokai Bay	October 29, 2012
Saga Pref.	Imari Bay	October 9, 2012
Nagasaki Pref.	Omura Bay	November 19, 2012
Kumamoto Pref.	Hiraki-bashi Bridge, Riv. Midori(Uto City)	October 10, 2012
Miyazaki Pref.	Mouth of Riv. Oyodo(Miyazaki City)	October 31, 2012
Kagoshima Pref.	Riv. Amori(Kirishima City)	November 13, 2012
	Gotanda-bashi Bridge, Riv. Gotanda(Ichikikushikino City)	November 12, 2012
Okinawa Pref.	Naha Port	November 20, 2012

Figure 3-1-1 Monitored sites (surface water) in the Environmental Monitoring in FY 2012

Table 3-1-2 List of monitored sites (sediment) in the Environmental Monitoring in FY 2012

Local communities	Monitored sites	Sampling dates
Hokkaido	Onnenai-ohashi Bridge, Riv. Teshio(Bifuka Town)	October 16, 2012
	Suzuran-ohashi Bridge, Riv Tokachi(Obihiro City)	October 19, 2012
	Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City)	November 6, 2012
	Tomakomai Port	September 20, 2012
Iwate Pref.	Riv. Toyosawa(Hanamaki City)	October 10, 2012
Miyagi Pref.	Sendai Bay(Matsushima Bay)	November 1, 2012
Sendai City	Hirose-ohashi Bridge, Riv. Hirose(Sendai City)	November 19, 2012
Akita Pref.	Lake Hachiro	October 17, 2012
Yamagata Pref.	Mouth of Riv. Mogami(Sakata City)	October 18, 2012
Fukushima Pref.	Onahama Port	October 31, 2012
Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City)	November 14, 2012
Tochigi Pref.	Riv. Tagawa(Utsunomiya City)	November 1, 2012
Chiba Pref.	Coast of Ichihara and Anegasaki	October 25, 2012
Chiba City	Mouth of Riv. Hanami(Chiba City)	October 30, 2012
Tokyo Met.	Mouth of Riv. Arakawa(Koto Ward)	November 5, 2012
	Mouth of Riv. Sumida(Minato Ward)	November 5, 2012
Yokohama City	Yokohama Port	October 22, 2012
Kawasaki City	Mouth of Riv. Tama(Kawasaki City)	November 7, 2012
	Keihin Canal, Port of Kawasaki	November 7, 2012
Niigata Pref.	Lower Riv. Shinano(Niigata City)	October 25, 2012
Toyama Pref.	Hagiura-bashi Bridge, Mouth of Riv. Jintsu(Toyama City)	November 1, 2012
Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)	October 31, 2012
Fukui Pref.	Mishima-bashi Bridge, Riv. Shono(Tsuruga City)	November 1, 2012
Yamanashi Pref.	Senshu-bashi Bridge, Riv. Arakawa(Kofu City)	October 25, 2012
Nagano Pref.	Lake Suwa(center)	November 1, 2012
Shizuoka Pref.	Shimizu Port	October 10, 2012
	Riv. Tenryu(Iwata City)	October 16, 2012
Aichi Pref.	Kinuura Port	October 29, 2012
	Nagoya Port	October 29, 2012
Mie Pref.	Yokkaichi Port	October 24, 2012
	Toba Port	October 16, 2012
Shiga Pref.	Lake Biwa(center, offshore of Minamihira)	November 13, 2012
	Lake Biwa(center, offshore of Karasaki)	November 13, 2012
Kyoto Pref.	Miyazu Port	October 31, 2012
Kyoto City	Miyamae-bashi Bridge, Riv. Katsura(Kyoto City)	December 1, 2012
Osaka Pref.	Mouth of Riv. Yamato(Sakai City)	December 28, 2012
Osaka City	Osaka Port	October 30, 2012
	Outside Osaka Port	October 30, 2012
	Mouth of Riv. Yodo(Osaka City)	October 30, 2012
	Riv. Yodo(Osaka City)	October 31, 2012
Hyogo Pref.	Offshore of Himeji	October 17, 2012
Kobe City	Kobe Port(center)	October 30, 2012
Nara Pref.	Riv. Yamato(Ooji Town)	November 13, 2012
Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa(Wakayama City)	October 31, 2012
Okayama Pref.	Offshore of Mizushima	October 10, 2012
Hiroshima Pref.	Kure Port	November 7, 2012
	Hiroshima Bay	November 7, 2012
Yamaguchi Pref.	Tokuyama Bay	November 15, 2012
	Offshore of Ube	November 19, 2012
	Offshore of Hagi	October 25, 2012
Tokushima Pref.	Mouth of Riv. Yoshino(Tokushima City)	October 31, 2012
Kagawa Pref.	Takamatsu Port	October 2, 2012
Ehime Pref.	Niihama Port	October 29, 2012
Kochi Pref.	Mouth of Riv. Shimanto(Shimanto City)	November 25, 2012
Kitakyushu City	Dokai Bay	October 29, 2012
Fukuoka City	Hakata Bay	October 16, 2012
Saga Pref.	Imari Bay	October 9, 2012
Nagasaki Pref.	Omura Bay	November 19, 2012
Oita Pref.	Mouth of Riv. Oita(Oita City)	December 10, 2012
Miyazaki Pref.	Mouth of Riv. Oyodo(Miyazaki City)	October 31, 2012
Kagoshima Pref.	Riv. Amori(Kirishima City)	November 13, 2012
	Gotanda-bashi Bridge, Riv. Gotanda(Ichikikushikino City)	November 12, 2012
Okinawa Pref.	Naha Port	November 20, 2012

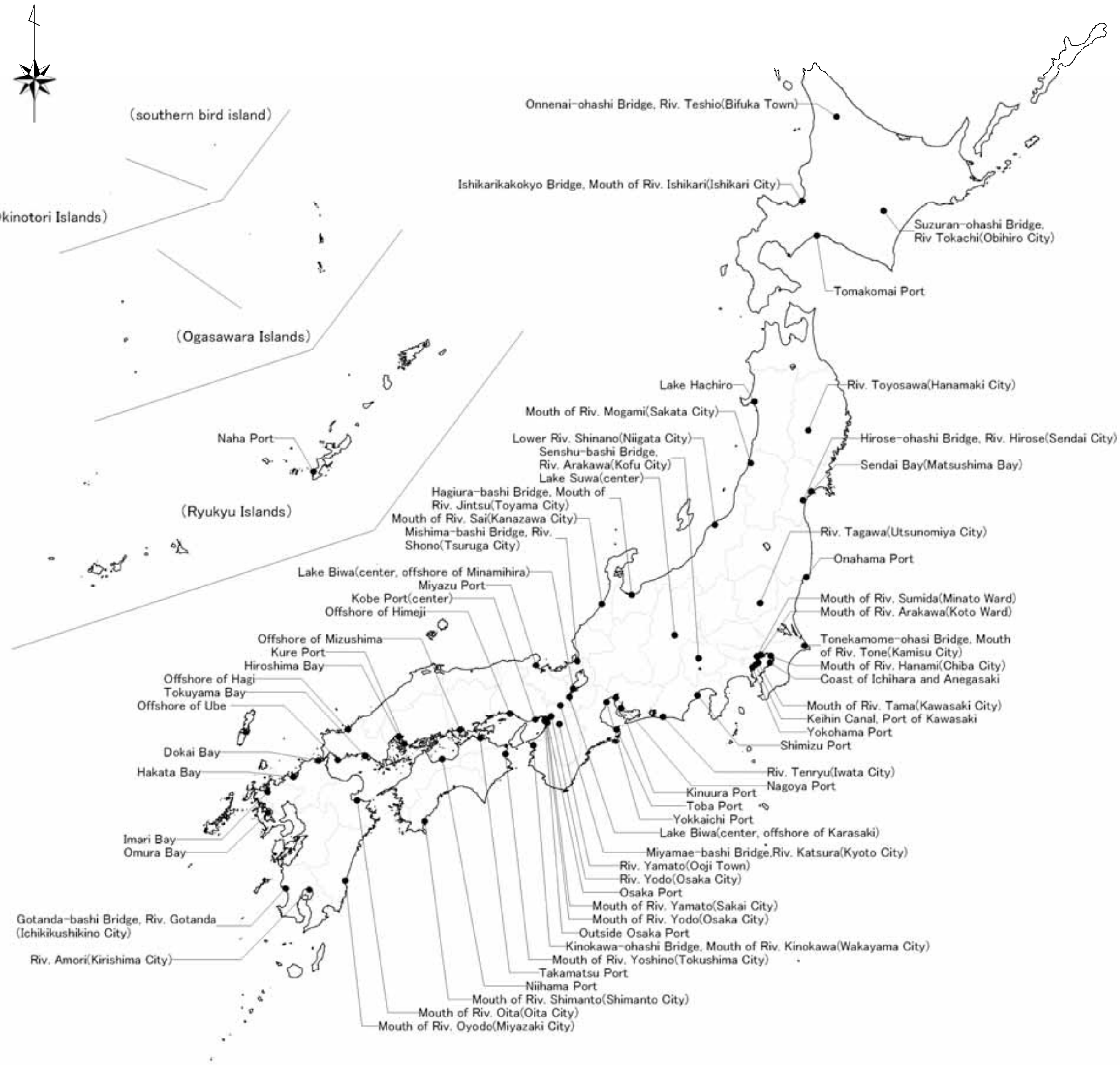

Figure 3-1-2 Monitored sites (sediment) in the Environmental Monitoring in FY 2012

Table 3-1-3 List of monitored areas (wildlife) in the Environmental Monitoring in FY 2012

Local communities	Monitored sites	Sampling dates	Wildlife species	
Hokkaido	Offshore of Kushiro	October 27, 2012	Fish	Rock greenling (*Hexagrammos lagocephalus*)
	Offshore of Kushiro	October 31, 2012	Fish	Chum salmon (*Oncorhynchus keta*)
	Offshore of Japan Sea (offshore of Iwanai)	October 26, 2012	Fish	Greenling (*Hexagrammos otakii*)
Aomori Pref.	Kabu Is.(Hachinohe City)	June 4~ July 14, 2012	Birds	Black-taild gull (*Larus crassirostris*)
Iwate Pref.	Yamada Bay	October 3 and November 4, 2012	Bibalves	Blue mussel (*Mytilus galloprovincialis*)
	Yamada Bay	October 29~ November 1, 2012	Fish	Greenling (*Hexagrammos otakii*)
	Suburb of Morioka City	August 10~ September 24, 2012	Birds	Gray starling (*Sturnus cineraceus*)
Miyagi Pref.	Sendai Bay(Matsushima Bay)	December 10, 2012	Fish	Greenling (*Hexagrammos otakii*)
Ibaraki Pref.	Offshore of Joban	November 28, 2012	Fish	Pacific saury (*Cololabis saira*)
Tokyo Met.	Tokyo Bay	August 30, 2012	Fish	Sea bass (*Lateolabrax japonicus*)
Yokohama City	Yokohama Port	November 12, 2012	Bibalves	Blue mussel (*Mytilus galloprovincialis*)
Kawasaki City	Offshore of Ogishima Island, Port of Kawasaki	October 9, 2012	Fish	Sea bass (*Lateolabrax japonicus*)
Ishikawa Pref.	Coast of Noto Peninsula	January 8, 2013	Bibalves	Blue mussel (*Mytilus galloprovincialis*)
Nagoya City	Nagoya Port	September 3, 2012	Fish	Striped mullet (*Mugil cephalus*)
Shiga Pref.	Lake Biwa, Riv. Azumi (Takashima City)	April 5, 2012	Fish	Dace (*Tribolodon hakonensis*)
Osaka Pref.	Osaka Bay	October 30, 2012	Fish	Sea bass (*Lateolabrax japonicus*)
Hyogo Pref.	Offshore of Himeji	November 22, 2012	Fish	Sea bass (*Lateolabrax japonicus*)
Tottori Pref.	Nakaumi	October 22, 2012	Fish	Sea bass (*Lateolabrax japonicus*)
Shimane Pref.	Shichirui Bay, Shimane Peninsula	September 23, 2012	Bibalves	Blue mussel (*Mytilus galloprovincialis*)
Hiroshima City	Hiroshima Bay	November 20, 2012	Fish	Sea bass (*Lateolabrax japonicus*)
Kagawa Pref.	Takamatsu Port	October 25, 2012	Fish	Striped mullet (*Mugil cephalus*)
Kochi Pref.	Mouth of Riv. Shimanto (Shimanto City)	October ~ November, 2012*	Fish	Sea bass (*Lateolabrax aponicas*)
Kitakyushu City	Dokai Bay	July 2, 2012	Bibalves	Blue mussel (*Mytilus galloprovincialis*)
Oita Pref.	Mouth of Riv. Oita(Oita City)	December 20, 2012	Fish	Sea bass (*Lateolabrax aponicas*)
Kagoshima Pref.	West Coast of Satsuma Peninsula	November 16 and 28, 2012	Fish	Sea bass (*Lateolabrax aponicas*)
Okinawa Pref.	Nakagusuku Bay	January 17, 2013	Fish	Okinawa seabeam (*Acanthopagrus sivicolus*)

(Note 1) "*" means details of the sampling date unknown.

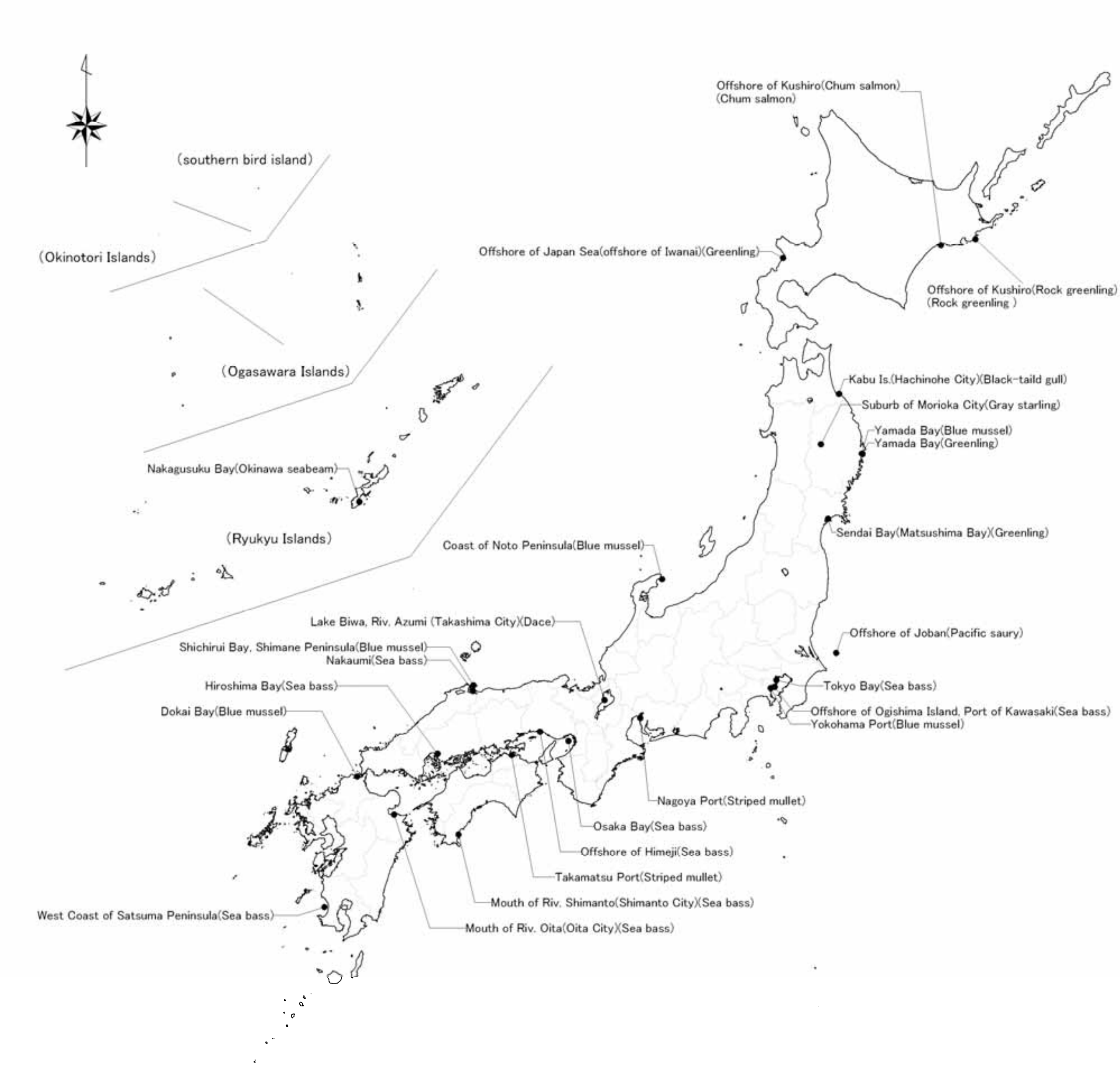

Figure 3-1-3 Monitored areas (wildlife) in the Environmental Monitoring in FY 2012

Table 3-1-4 List of monitored sites (air) in the Environmental Monitoring in FY 2012

Local communities	Monitored sites	Sampling dates (Warm season)	Sampling dates (Cold season)
Hokkaido	Oshima Subprefectural Office Building (Hakodate City)	October 16～23, 2012	December 10～17, 2012
Sapporo City	Sapporo Art Park(Sapporo City)	September 24～27, 2012	November 19～22, 2012
Iwate Pref.	Amihari Ski Area(Shizukuishi Town)	September 4～7, 2012	November 5～8, 2012
Miyagi Pref.	Miyagi Prefectural Fire Fighting Academy(Sendai City)	September 20～27, 2012	November 29 ～ December 6, 2012
Ibaraki Pref.	Ibaraki Kasumigaura Environmental Science Center(Tsuchiura City)	October 5～12, 2012	December 6～13, 2012
Gunma Pref.	Gunma Prefectural Institute of Public Health and Environmental Sciences(Maebashi City)	September 19～26, 2012	November 6～13, 2012
Chiba Pref.	Ichihara-Matsuzaki Air Quality Monitoring Station(Ichihara City)	September 24～27, 2012	December 4～7, 2012
Tokyo Met.	Tokyo Metropolitan Research Institute for Environmental Protection(Koto Ward)	September 5～12, 2012	December 6～13, 2012
	Chichijima Island	September 23～30, 2012	November 22～29, 2012
Kanagawa Pref.	Kanagawa Environmental Research Center(Hiratsuka City)	September 10～13, 2012	November 12～15, 2012
Yokohama City	Yokohama Environmental Science Research Institute(Yokohama City)	September 7～14, 2012	November 15～22, 2012
Niigata Pref.	Oyama Air Quality Monitoring Station(Niigata City)	September 25～28, 2012	December 10～13, 2012
Toyama Pref.	Tonami Air Quality Monitoring Station(Tonami City)	September 24～27, 2012	November 26～29, 2012
Ishikawa Pref.	Ishikawa Prefectural Institute of Public Health and Environmental Science(Kanazawa City)	September 11～14, 2012	December 4～7, 2012
Yamanashi Pref.	Yamanashi Prefectural Institute of Public Health and Environment(Kofu City)	September 18～21, 2012	November 26～29, 2012
Nagano Pref.	Nagano Environmental Conservation Research Institute(Nagano City)	September 26～October 3, 2012	December 3～10, 2012
Gifu Pref.	Gifu Prefectural Research Institute for Health and Environmental Sciences(Kakamigahara City)	September 24～27, 2012	December 11～14, 2012
Nagoya City	Chikusa Ward Heiwa Park(Nagoya City)	September 18～25, 2012	December 4～11, 2012
Mie Pref.	Mie Prefecture Health and Environment Research Institute(Yokkaichi City)	September 3～6, 2012	December 10～13, 2012
Osaka Pref.	Research Institute of Environment, Agriculture and Fisheries, Osaka Prefectural Government(Osaka City)	September 10～13, 2012	December 10～13, 2012
Hyogo Pref.	Hyogo Prefectural Environmental Research Center(Kobe City)	September 10～13, 2012	November 19～22, 2012
Kobe City	Kobe City Government Building (Kobe City)	September 24～27, 2012	November 26～29, 2012
Nara Pref.	Tenri Air Quality Monitoring Station(Tenri City)	September 24～27, 2012	November 26～29, 2012
Shimane Pref.	Oki National Acid Rain Observatory(Okinoshima Town)	September 25～28, 2012	November 27～30, 2012
Hiroshima City	Hiroshima City Kokutaiji Junior High School(Hiroshima City)	September 10～13, 2012	November 12～15, 2012
Yamaguchi Pref.	Yamaguchi Prefectural Public Health and Environment(Yamaguchi City)	September 6～13, 2012	November 14～21, 2012
	Mishima Community Center(Hagi City)	September 6～13, 2012	November 21～28, 2012
Tokushima Pref.	Tokushima Prefectural Pablic Health, Pharmaceutical and Environmental Science Center(Tokushima City)	September 10～13, 2012	November 5～8, 2012
Kagawa Pref.	Takamatsu Joint Prefectural Government Building(Takamatsu City)	September 26～October 3, 2012	November 7～14, 2012
	Kagawa Prefectural Public Swimming Pool(Takamatsu City) as a reference site		
Ehime Pref.	Ehime Prefectural Government Nanyo Regional Office(Uwajima City)	September 3～6, 2012	December 3～6, 2012
Fukuoka Pref.	Omuta City Government Building(Omuta City)	September 24～27, 2012	November 26～29, 2012

Local communities	Monitored sites	Sampling dates (Warm season)	Sampling dates (Cold season)
Saga Pref.	Saga Prefectural Environmental Research Center(Saga City)	September 10～17, 2012	November 6～13, 2012
Kumamoto Pref.	Kumamoto Prefectural Institute of Public Health and Environmental Science(Udo City)	September 24～27, 2012	December 17～20, 2012
Miyazaki Pref.	Miyazaki Prefectural Institute for Public Healthand Environment(Miyazaki City)	September 11～18, 2012	November 28 ～ December 5, 2012
Kagoshima Pref.	Kagoshima Prefectural Institute forEnvironmental Research and Public Health(Kagoshima City)	September 3～6, 2012	November 19～22, 2012
Okinawa Pref.	Cape Hedo(Kunigami Village)	September 24～27, 2012	December 17～20, 2012

Figure 3-1-4 Monitored sites (air) in the Environmental Monitoring in FY 2012

(3) Target species

The species to be monitored among the wildlife media were selected considering the possibility of international comparison, as well as their significance and practicality as indicators: 1 bivalve (blue mussel), 8 fishes (predominantly sea bass), and 2 bird, namely, 11 species in total.

The properties of the species determined as targets in the FY 2012 monitoring are shown in Table 3-2. Moreover, Table 3-3 summarizes the outline of the samples used for analysis.

(4) Sampling method of specimens

The sampling of specimens and the preparation of samples were carried out following the "Environmental Monitoring Instruction Manual" (No. 040309001, published on March 9th, 2004) by the Environment Health and Safety Division, Environmental Health Department, Ministry of the Environment of Japan (MOE).

Table 3-2 Properties of target species

Species		Properties	Monitored areas	Aim of monitoring	Notes
Bibalves	Blue mussel (*Mytilus galloprovincialis*)	Distributed worldwide, excluding tropical zones Adheres to rocks in inner bays and to bridge piers	・Yokohama port ・Coast of Noto Peninsula ・Shitirui Bay • Dokai Bay	Follow-up of the environmental fate and persistency in specific areas	Monitored in the 4 areas with different levels of persistency
Fish	Greenling (*Hexagrammos otakki*)	Distributed from Hokkaido to southern Japan, the Korean Peninsula, and China Lives in shallow seas of 5-50 m depth from sea level	・Offshore of Iwanai ・Sendai Bay	Follow-up of the environmental fate and persistency in specific areas	
	Rock greenling (*Hexagrammos lagocephalus*)	Lives in cold-current areas of Hidaka and eastward (Hokkaido) Larger than the greenling and eats fish smaller than its mouth size at the sea bottom	・Offshore of Kushiro	Follow-up of the environmental fate and persistency in specific areas	
	Pacific saury (*Cololabis saira*)	Distributed widely in northern Pacific Ocean Migrates around Japanese Archipelago; in Chishima in autumn and northern Kyushu in winter Bioaccumulation of chemicals is said to be moderate	・Offshore of Joban	Follow-up of the environmental fate and persistency around the Japanese archipelago	
	Chum salmon (*Oncorhynchus keta*)	Distributed in northern Pacific Ocean, Sea of Japan, Bering Sea, Sea of Okhotsk, the whole of the Gulf of Alaska, and part of the Arctic Ocean Runs the Tone River on the Pacific Ocean side and rivers in Yamaguchi Prefecture and northward on the Sea of Japan side in Japan Bioaccumulation of chemicals is said to be moderate	・Offshore of Kushiro	Follow-up of the environmental fate and persistency on a global scale	
	Sea bass (*Lateolabrax japonicus*)	Distributed around the shores of various areas in Japan, the Korean Peninsula, and the coastal areas of China Sometimes lives in a freshwater environment and brackish-water regions during its life cycle Bioaccumulation of chemicals is said to be high	・Tokyo Bay ・Kawasaki Port ・Osaka Bay ・Offshore of Himeji ・Nakaumi ・Hiroshima Bay ・Mouth of Riv. Shimanto ・Mouth of Riv. Oita ・West Coast of Satsuma Peninsula	Follow-up of the environmental fate and persistency in specific areas	Monitored in the 9 areas with different levels of persistency
	Striped mullet (M*ugil cephalus*)	Distributed widely in the worldwide tropical zones and subtropical zones Sometimes lives in a freshwater environment and brackish-water regions during its life cycle	・Nagoya Port ・Takamatsu Port	Follow-up of the environmental fate and persistency in specific areas	
	Okinawa seabeam (*Acanthopagrus sivicolus*)	Distributed around Nansei Shoto (Ryukyu Islands) Lives in coral reefs and in bays into which rivers flow	・Kanagusuku Bay	Follow-up of the environmental fate and persistency in specific areas	
	Dace (*Tribolodon hakonensis*)	Distributed widely in freshwater environments throughout Japan Preys mainly on insects	・Lake Biwa, Riv. Azumi (Takashima City)	Follow-up of the environmental fate and persistency in specific areas	
Birds	Gray starling (*Sturnus cineraceus*)	Distributed widely in the Far East (Related species are distributed worldwide) Eats primarily insects	・Morioka City	Follow-up of the environmental fate and persistency in northern Japan	
	Black-taild gull (*Larus crassirostris*)	Breeds mainly in the Sea of Japan Breeds in groups at shore reefs and in grassy fields	・Kabu Is.(Hachinohe City)	Follow-up of the environmental fate and persistency in specific areas	

Table 3-3-1 Basic data of specimens (bivalves as wildlife) in the Environmental Monitoring in FY 2012

Bivalve species (Area)	No.	Sampling month	Sex	Number of animals	Weight (g) (Average)	Length (cm) (Average)	Water content %	Lipid content %
Blue mussel (*Mytilus galloprovincialis*) Yamada Bay	1	November ~ December, 2012	Uncertain	284	6.6～ 7.8 (7.2)	19.4～ 37.4 (27.2)	84.2	1.9
	2		Uncertain	397	6.2～ 7.1 (6.6)	14.4～ 24.0 (20.7)	84.6	1.9
	3		Uncertain	316	6.0～ 7.8 (6.7)	11.3～ 40.5 (24.2)	85.8	1.6
Blue mussel (*Mytilus galloprovincialis*) Yokohama Port	1	November, 2012	Mixed	445	2.7～ 4.0 (3.1)	1.6～ 4.3 (2.5)	90	0.7
	2		Mixed	408	2.4～ 3.7 (2.9)	1.3～ 4.6 (2.7)	90	0.8
	3		Mixed	535	2.4～ 3.3 (2.8)	1.4～ 3.9 (2.3)	89	0.8
Blue mussel (*Mytilus galloprovincialis*) Coast of Noto Peninsula	1	January, 2013	Uncertain	35	3.7～ 10.6 (6.7)	5.9～ 167 (41.8)	75.7	1.4
Blue mussel (*Mytilus galloprovincialis*) Shichirui Bay, Shimane Peninsula	1	September, 2012	Uncertain	290	5.2～ 11.7 (7.0)	13.9～ 121 (36.3)	77.4	2.2
	2		Uncertain	400	4.4～ 6.8 (5.1)	8.6～ 19.5 (11.9)	78.1	2.6
	3		Uncertain	450	4.4～ 5.6 (5.1)	8.3～ 14.1 (11.6)	79.5	2.4
Blue mussel (*Mytilus galloprovincialis*) Dokai Bay	1	July, 2012	Uncertain	253	3.9～ 8.0 (5.4)	6.0～ 46.0 (17.0)	50	2.8

Table 3-3-2 Basic data of specimens (fish as wildlife) in the Environmental Monitoring in FY 2012 (Part 1)

Fish species (Area)	No.	Sampling month	Sex	Number of animals	Weight (g) (Average)	Length (cm) (Average)	Water content %	Lipid content %
Rock greenling (*Hexagrammos lagocephalus*) Offshore of Kushiro	1	October, 2012	Mixed	6	36 ～ 43 (40)	580 ～ 940 (820)	76.1	2.3
	2		Mixed	6	36 ～ 41 (39)	600 ～ 930 (780)	75.8	2.3
	3		Mixed	6	38 ～ 43 (41)	780 ～ 1,040 (900)	75.2	1.7
Chum salmon (*Oncorhynchus keta*) Offshore of Kushiro	1	October, 2012	Female	1	73	3,400	74.8	1.3
	2		Male	1	72	3,300	74.0	1.5
	3		Male	1	72	3,300	73.7	1.7
Greenling (*Hexagrammos otakii*) Offshore of Japan Sea(offshore of Iwanai)	1	October, 2012	Mixed	6	38 ～ 41 (40)	720 ～ 950 (870)	76.2	1.6
	2		Mixed	6	40 ～ 73 (41)	800 ～ 1,140 (900)	75.2	1.4
	3		Mixed	6	38 ～ 45 (41)	740 ～ 1,200 (880)	76.9	1.8
Greenling (*Hexagrammos otakii*) Yamada Bay	1	October, 2012	Uncertain	11	25.6～ 35.9 (31.5)	208 ～ 688 (444)	73.2	3.8
	2		Uncertain	6	36.5～ 40.2 (38.4)	643 ～ 862 (783)	71.6	4.3
	3		Female	4	37.8～ 41.2 (39.8)	816 ～ 1,033 (963)	72.4	5.4
Greenling (*Hexagrammos otakii*) Sendai Bay (Matsushima Bay)	1	December, 2012	Mixed	11	15.1～ 19.5 (17.4)	58.4～ 125 (88.9)	-	-
	2		Mixed	6	19.8～ 22.2 (21.6)	150 ～ 182 (171)		
	3		Mixed	4	23.0～ 25.4 (24.2)	229 ～ 286 (252)		
Pacific saury (*Cololabis saira*) Offshore of Joban	1	November, 2012	Uncertain	68	17 ～ 26 (23)	29.5～ 74.7 (59.9)	71	6.0
	2		Uncertain	45	23 ～ 27 (26)	76.0～ 90.0 (83.5)	69	6.9
	3		Uncertain	58	26 ～ 30 (27)	90.1～ 146 (108)	67	9.0
Sea bass (*Lateolabrax japonicus*) Tokyo Bay	1	August, 2012	Mixed	4	51.0～ 66.0 (57.1)	2,055 ～ 3,525 (2,525)	75.2	4.5
	2		Mixed	7	45.6～ 55.1 (49.4)	1,370 ～ 2,030 (1,616)	75.6	3.8
	3		Mixed	9	39.0～ 46.1 (42.9)	960 ～ 1,305 (1,157)	72.8	2.6
Sea bass (*Lateolabrax japonicus*) Offshore of Ogishima Island, Port of Kawasaki	1	October, 2012	Female	14	30.0～ 33.5 (30.9)	324 ～ 444 (391)	-	-
	2		Male	15	28.9～ 30.2 (29.7)	344 ～ 405 (367)		
	3		Female	16	28.4～ 29.8 (29.2)	315 ～ 382 (345)		
Striped mullet (*Mugil cephalus*) Nagoya Port	1	September, 2012	Female	10	45.5～ 50.0 (47.6)	935 ～ 1,208 (1,084)	-	-
	2		Male	10	46.1～ 53.3 (48.7)	954 ～ 1,697 (1,164)		
	3		Female	10	45.5～ 52.3 (48.3)	965 ～ 1,719 (1,135)		
Dace (*Tribolodon hakonensis*) Lake Biwa, Riv. Azumi (Takashima City)	1	April, 2012	Female	21	23.0～ 27.2 (24.5)	162 ～ 277 (204)	73.5	3.7
	2		Male	23	23.0～ 25.3 (24.3)	161 ～ 232 (194)	72.8	4.0
	3		Female	23	23.2～ 25.7 (24.8)	168 ～ 244 (208)	73.2	4.1
Sea bass (*Lateolabrax japonicus*) Osaka Bay	1	October, 2012	Uncertain	12	36 ～ 41 (38)	710 ～ 1,011 (862)	-	-
	2		Uncertain	12	30 ～ 39 (36)	674 ～ 903 (773)		
	3		Uncertain	12	34 ～ 40 (36)	619 ～ 951 (785)		
Sea bass (*Lateolabrax japonicus*) Offshore of Himeji	1	November, 2012	Uncertain	4	50 ～ 53 (52)	1,799 ～ 2,272 (2,022)	-	-
	2		Uncertain	3	56 ～ 62 (59)	2,502 ～ 2,685 (2,611)		
	3		Uncertain	3	55 ～ 57 (56)	2,250 ～ 2,793 (2,452)		
Sea bass (*Lateolabrax japonicus*) Nakaumi	1	October, 2012	Mixed	10	40.0～ 46.6 (42.6)	785 ～ 1,450 (935)	79.5	0.8
	2		Mixed	12	37.7～ 41.6 (39.2)	625 ～ 855 (716)	79.6	0.7
	3		Mixed	18	31.6～ 37.8 (34.6)	405 ～ 640 (499)	78.9	0.9
Sea bass (*Lateolabrax japonicus*) Hiroshima Bay	1	November, 2012	Mixed	12	31.8～ 33.8 (33.2)	430 ～ 586 (488)	76.9	1.4
	2		Mixed	11	34.0～ 34.8 (34.4)	481 ～ 613 (526)	78.1	1.0
	3		Female	8	35.0～ 36.8 (35.5)	556 ～ 623 (587)	77.6	1.2
Striped mullet (*Mugil cephalus*) Takamatsu Port	1	October, 2012	Uncertain	3	38 ～ 42 (40)	1,020 ～ 1,400 (1,250)	68.6	4.1
	2		Uncertain	2	40 ～ 45 (43)	1,500 ～ 1,700 (1,600)	68.4	6.1
	3		Uncertain	2	43 ～ 44 (44)	1,540 ～ 1,720 (1,630)	70.2	2.7
Sea bass (*Lateolabrax japonicus*) Mouth of Riv. Shimanto (Shimanto City)	1	October, 2012	Mixed	21	16.2～ 35.0 (22.4)	38.9～ 470 (163)	70.8	0.9
	2		Mixed	22	16.2～ 31.2 (21.8)	37.4～ 439 (147)	68.7	0.8
	3		Mixed	24	15.6～ 34.0 (21.8)	37.8～ 488 (142)	71.3	1.0
Sea bass (*Lateolabrax japonicus*) Mouth of Riv. Oita (Oita City)	1	December, 2012	Mixed	2	59 ～ 60 (60)	2,320 ～ 2,660 (2,490)	76.4	2.5
	2		Female	2	55 ～ 63 (59)	2,460 ～ 2,980 (2,720)	79.3	1.4
	3		Male	2	56 ～ 62 (59)	2,040 ～ 2,580 (2,310)	73.6	3.8
Sea bass (*Lateolabrax japonicus*) West Coast of Satsuma Peninsula	1	November, 2012	Mixed	10	20.0～ 30.0 (23.7)	136 ～ 379 (228)	79.6	1.3
	2		Mixed	17	19.0～ 30.0 (19.4)	116 ～ 143 (130)	80.7	1.5
	3		Mixed	20	16.7～ 18.9 (17.8)	75.6～ 140 (108)	79.9	1.3

Table 3-3-2 Basic data of specimens (fish as wildlife) in the Environmental Monitoring in FY 2012 (Part 2)

Fish species (Area)	No.	Sampling month	Sex	Number of animals	Weight (g) (Average)	Length (cm) (Average)	Water content %	Lipid content %
Okinawa seabeam (*Acanthopagrus sivicolus*) Nakagusuku Bay	1	January, 2013	Male	6	25.5～ 30.9 (28.0)	553 ～ 810 (689)	80	1.7
	2		Female	4	29.8～ 32.4 (31.0)	857 ～ 1,116 (977)	78	1.5
	3		Female	3	34.8～ 35.5 (35.2)	1,204 ～ 1,530 (1,367)	78	1.7

(Note) "Average." indicates the geometric mean calculated by assuming nd (below the detection limit) to be half the value of the detection limit.

Table 3-3-3 Basic data of specimens (birds as wildlife) in the Environmental Monitoring in FY 2012

Bird species (Area)	No.	Sampling month	Sex	Number of animals	Weight (g) (Average)	Length (cm) (Average)	Water content %	Lipid content %
Black-taild gull (*Larus crassirostris*) Kabu Is. (Hachinohe City)	1	June, 2012	Uncertain	95	3.0～ 23.0 (14.6)	112 ～ 700 (361)	-	-
	2		Uncertain	35	23.1～ 28.4 (26.1)	330 ～ 620 (452)		
	3		Uncertain	29	28.6～ 34.5 (30.8)	370 ～ 700 (480)		
Gray starling (*Sturnus cineraceus*) Suburb of Morioka City	1	August, 2012	Male	61	12.0～ 14.0 (13.0)	73.8～ 98.4 (85.8)	70.7	2.6
	2		Female	61	11.5～ 13.8 (12.9)	71.3～ 102 (85.5)	72.0	2.7
	3		Uncertain	58	11.4～ 11.4 (12.8)	71.3～ 95.5 (86.0)	72.2	2.2

(Note) "Average." indicates the geometric mean calculated by assuming nd (below the detection limit) to be half the value of the detection limit.

4. Summary of monitoring results

The detection ranges are shown in Table 3-4, and the detection limits are shown in Table 3-5.

The monitoring results in FY 2012 were statistically analysed together with the previous monitoring results, accumulated over the past 11 years (or 10 years) as a result of successive measurements at the same site or area from FY 2002 (FY 2003 for some substances and media), in order to detect inter-annual trends of increase or decrease over the 11 years (or 10 years). The results of the analyses are shown in Table 3-6

Additionally, the scope of monitoring for bioaccumulate in avian biologicals (birds) was adjusted as of the FY 2010 program to include additions of target substances listed under the Stockholm Convention. Target samplings taken from black tailed gulls and starlings were reduced from five (5) to one each. In considering that the subsequent reduction in available data could negatively impact the tracking of changes, these two (2) species were excluded from the statistical analysis for the present fiscal year. Table3-6 summarizes year by year findings.

○Data were carefully handled on the basis of following points.

・For sediment

At each monitoring point, three (3) specimen samples were collected. The target substance [20] 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol was analysed with the three (3) specimen samples for each place. The other substances were analysed for each place with one specimen sample that is a mixture of equal parts of the three (3) specimen samples.

・For wildlife

At each monitoring point, three (3) specimen samples were collected. The target substance [20] 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol was analysed with the three (3) specimen samples for each place. The other substances were analysed for each place with one specimen sample that is a mixture of equal parts of the three (3) specimen samples.

・For air

At each monitored site, the first sampling was for the monitoring in the warm season (September 3, 2012～October 23, 2012) and the second was for that in the cold season (November 5, 2012～December 20, 2012).

In Kagawa Pref., monitoring was carried out at not only the Takamatsu Joint Prefectural Government Building but also at the location of the Kagawa Prefectural Public Swimming Pool (Takamatsu City) as a reference site.

○Method for regression analysis and testing

The procedures described below were applied in an attempt to analyse and test the monitoring results obtained since FY 2002 (FY 2003 for air) in order to identify statistically significant differences which indicate inter-annual trends.

Before FY2002, three (3) specimen samples were collected at each monitoring place and respectively analysed for water monitoring; after FY2003, the substances were analysed for each place with one specimen sample. For this reason, one specimen sample were taken at the point which one specimen sample continually collected after FY2002 was used analysis.

Before FY2009, three (3) specimen samples were collected at each monitoring place and respectively analysed for sediment monitoring; after FY2010, the substances were analysed for each place with one specimen sample that is a mixture of equal parts of the three (3) specimen samples collected at the location. For this reason, the arithmetic mean value of the three (3) specimen samples at each monitoring place was used for the analysis before FY2009.

Before FY2009, five (5) specimen samples were collected at each monitoring place and respectively analysed for wildlife monitoring; after FY2010, the substances were analysed for each place with one specimen sample that is a mixture of equal parts of the three (3) or five (5) specimen samples collected at the location. For this reason, the arithmetic mean value of the three (3) specimen samples at each monitoring place was used for the analysis before FY2009.

Assessments done in past years applied nonparametric analysis to findings that diverged from norm. However, since such methods cannot support quantitative analysis, the procedures were deemed inadequate to properly track year by year changes. Therefore, as a means of evaluation that could be appropriately applied to findings out of the norm, regression lines with maximum probability estimates were used to analyse and track year by year changes, with boot strap methods being applied to test the mean differences.

(1) For successive samplings taken from the same point: if, in any fiscal year, concentrations in one-third or more samples failed to reach detectible limits (i.e., were Non-Detected or 'nd'), it was then judged inappropriate to apply linear regression analysis to year by year changes, since the most frequent findings came below detection limits. Therefore, year by year trend analysis is provided only when less than one third of the samples show "nd" or non-detected readings.
(2) In the inter-annual trend analyses, the increase or decrease was evaluated by examining a slope obtained from simple linear regression analysis (simple log-linear regression model). To obtain the proper regression line, the line was selected using methods to maximize the product of the probability density of each measured value according to the distribution of population obtained by each measurement result (maximum likelihood estimation). Where the total of samples at each point differed from others, the data were weighted so that the overall impact of data from different points was leveled. Also, the agreement between the linear regression model (primary expression) results and measurement results was evaluated in accord with Akaike's Information Criterion (AIC). AICs were calculated for both "slope model (simple log-linear regression model)" and "non-slope model (residuals from the mean value model)". These AIC data were used to calculate posteriori probability. When probability was 95% or greater, measurement results were deemed to be in agreement with the simple log-linear regression model.
(3) When agreement was found as per (2) above, concentrations were deemed to sufficient to demonstrate inter-annual increase or decrease trends, based on the (positive or negative) slope of the regression line obtained via (1) above. The results are indicated as " ↘ " or " ↗ " in Table 3-6.
(4) As addressed in (1) above, where concentrations found in one third or more samples failed to demonstrate detection, (i.e., were 'nd'), linear regression analysis was deemed inappropriate to track year by year changes. Instead, we employed mean difference derived using the boot strap method. This method helps verify differences in mean distribution between two (2) samples obtained from repeated calculations of mean values of randomly extracted data for these samples. This method was employed in the initial half-period period (FY 2002 – FY 2004) and the second-half period (FY2010 - 2012) for results where more than 50% of samples failed to evidence detection (nd) in any fiscal year.
(5) The second-half period indicated a lower concentration when it was deemed by the testing of differences in average values using the boot strap method (p-value: more than 5%) that there is a significant difference between the first-half and second-half periods and the average concentration in the second-half period was lower than the

first half. These results are indicated as " ¯|_ " (or"_|¯ ") in Table 3-6.

When findings did not clearly demonstrate a year by year or inter-annual decrease (or increase) in (3), or when there was no difference in (5), this is indicated in Table 3-6 as "―." When concentrations found in 50% or more samples failed to demonstrate detection, (i.e., were nd), this is indicated as "X" in Table 3-6 because that method is insufficient to analyse year by year trends.

Table 3-4-1 List of the detection ranges in the Environmental Monitoring in FY 2012 (Part 1)

No.	Target chemicals	Surface water（pg/L）		Sediment（pg/g-dry）	
		Range (Frepuency)	Av.	Range (Frepuency)	Av.
[1]	PCBs	72～6,500 (48/48)	400	tr(32)～640,000 (63/63)	5,700
[2]	HCB	8.1～330 (48/48)	29	3～12,000 (63/63)	100
[3]	Aldrin (reference)				
[4]	Dieldrin (reference)				
[5]	Endrin (reference)				
[6]	DDTs (reference)				
	[6-1] *p,p'*-DDT (reference)				
	[6-2] *p,p'*-DDE (reference)				
	[6-3] *p,p'*-DDD (reference)				
	[6-4] *o,p'*-DDT (reference)				
	[6-5] *o,p'*-DDE (reference)				
	[6-6] *o,p'*-DDD (reference)				
[7]	Chlordanes	31～930 (48/48)	120	tr(13)～39,000 (63/63)	270
	[7-1] *cis*-chlordane	10～350 (48/48)	43	tr(2.6)～11,000 (63/63)	69
	[7-2] *trans*-chlordane	12～300 (48/48)	41	tr(2.9)～13,000 (63/63)	80
	[7-3] Oxychlordane	nd～17 (44/48)	2.2	nd～75 (38/63)	tr(1.4)
	[7-4] *cis*-Nonachlor	1.1～58 (48/48)	6.4	tr(1)～4,900 (63/63)	44
	[7-5] *trans*-Nonachlor	7.9～210 (48/48)	30	2.5～10,000 (63/63)	69
[8]	Heptachlors				
	[8-1] heptachlor				
	[8-2] *cis*-heptachlor epoxide				
	[8-3] *trans*-heptachlor Epoxide				
[9]	Toxaphenes (reference)				
	[9-1] Parlar-26 (reference)				
	[9-2] Parlar-50 (reference)				
	[9-3] Parlar-62 (reference)				
[10]	Mirex (reference)				
[11]	HCHs				
	[11-1] *α*-HCH	9.5～2,200 (48/48)	65	tr(1.1)～3,900 (63/63)	100
	[11-2] *β*-HCH	17～820 (48/48)	150	3.7～8,300 (63/63)	160
	[11-3] *γ*-HCH（synonym:Lindane）	3.0～440 (48/48)	22	nd～3,500 (61/63)	30
	[11-4] *δ*-HCH	tr(0.5)～220 (48/48)	7.9	nd～3,100 (62/63)	28

(Note 1) “Av.” indicates the geometric mean calculated by assuming nd (below the detection limit) to be half the value of the detection limit.

(Note 2) “Range” is based on the concentrations of the samples and “Frequency” is based on the number of sites or areas. Therefore “Range” can be shown as “nd～” even if a target chemical is detected in all sites or areas.

(Note 3) “ ” means the medium was not monitored.

Table 3-4-2 List of the detection ranges in the Environmental Monitoring in FY 2012 (Part 2)

No.	Target chemicals	Surface water（pg/L）		Sediment（pg/g-dry）	
		Range (Frepuency)	Av.	Range (Frepuency)	Av.
[12]	Chlordecone (reference)				
[13]	Hexabromobiphenyls (reference)				
[14]	Polybromodiphenyl ethers (Br_4～Br_{10})	nd～12,000 (32/48)	tr(430)	nd～870,000 (60/63)	6,400
	[14-1] Tetrabromodiphenyl ethers	nd～22 (47/48)	tr(3)	nd～4,500 (60/63)	27
	[14-2] Pentabromodiphenyl ethers	nd～20 (32/48)	tr(1)	nd～2,900 (62/63)	21
	[14-3] Hexabromodiphenyl ethers	nd～7 (6/48)	nd	nd～1,700 (48/63)	15
	[14-4] Heptabromodiphenyl ethers	nd～10 (9/48)	nd	nd～4,400 (48/63)	34
	[14-5] Octabromodiphenyl ethers	nd～35 (16/48)	tr(2)	nd～15,000 (47/63)	78
	[14-6] Nonabromodiphenyl ethers	nd～320 (30/48)	tr(21)	nd～84,000 (52/63)	360
	[14-7] Decabromodiphenyl ether	nd～12,000 (31/48)	tr(400)	nd～760,000 (60/63)	5,700
[15]	Perfluorooctane sulfonic acid (PFOS)	39～14,000 (48/48)	550	tr(7)～1,200 (63/63)	68
[16]	Perfluorooctanoic acid (PFOA)	240～26,000 (48/48)	1,400	12～280 (63/63)	51
[17]	Pentachlorobenzene	3～170 (48/48)	14	nd～1,100 (62/63)	33
[18]	Endosulfans	nd～tr(32) (2/48)	nd	nd～690 (12/63)	nd
	α-Endosulfan	nd～30 (3/48)	nd	nd～480 (19/63)	nd
	β-Endosulfan	nd～tr(12) (1/48)	nd	nd～250 (8/63)	nd
[19]	1,2,5,6,9,10-Hexabromo cyclododecanes			nd～75,000 (39/63)	960
	[19-1] α-1,2,5,6,9,10-Hexabromo cyclododecane			nd～22,000 (47/63)	310
	[19-2] β-1,2,5,6,9,10-Hexabromo cyclododecane			nd～8,900 (29/63)	tr(93)
	[19-3] γ-1,2,5,6,9,10-Hexabromo cyclododecane			nd～55,000 (52/63)	420
	[19-4] δ-1,2,5,6,9,10-Hexabromo cyclododecane			nd～680 (5/63)	nd
	[19-5] ε-1,2,5,6,9,10-Hexabromo cyclododecane			nd～310 (7/63)	nd
[20]	2-(2*H*-1,2,3-Benzotriazol-2-yl) -4,6-di-*tert*-butylphenol	nd～tr(49) (1/48)	nd	nd～4,500 (52/63)	59

(Note 1) “Av.” indicates the geometric mean calculated by assuming nd (below the detection limit) to be half the value of the detection limit.

(Note 2) “Range” is based on the concentrations of the samples and “Frequency” is based on the number of sites or areas. Therefore “Range” can be shown as “nd～” even if a target chemical is detected in all sites or areas.

(Note 3) “ ” means the medium was not monitored.

(Note 4) The target chemicals of the Perfluorooctane sulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) monitoring survey were *n*-Perfluorooctane sulfonic acid and *n*-Perfluorooctanoic acid.

Table 3-4-3 List of the detection ranges in the Environmental Monitoring in FY 2012 (Part 3)

No.	Target chemicals	Wildlife (pg/g-wet)						Air (pg/m^3)			
		Bibalves		Fish		Birds		First (Warm season)		Second (Cold season)	
		Range (Frepuency)	Av.	Range (Frequency)	Av.	Range (Frequency)	Av.	Range (Frepuency)	Av.	Range (Frequency)	Av.
[1]	PCBs	680～34,000 (5/5)	6,600	920～130,000 (19/19)	13,000	5,600～6,200 (2/2)	5,900	27～840 (35/35)	130	tr(16)～280 (35/35)	54
[2]	HCB	10～340 (5/5)	39	33～1,100 (19/19)	200	470～1,500 (2/2)	840	84～150 (36/36)	120	68～150 (36/36)	97
[3]	Aldrin (reference)										
[4]	Dieldrin (reference)										
[5]	Endrin (reference)										
[6]	DDTs (reference)										
	[6-1] *p,p'*-DDT (reference)										
	[6-2] *p,p'*-DDE (reference)										
	[6-3] *p,p'*-DDD (reference)										
	[6-4] *o,p'*-DDT (reference)										
	[6-5] *o,p'*-DDE (reference)										
	[6-6] *o,p'*-DDD (reference)										
[7]	Chlordanes	660～7,700 (5/5)	2,000	330～10,000 (19/19)	2,500	690～870 (2/2)	770	9.0～2,000 (36/36)	190	nd～240 (35/36)	32
	[7-1] *cis*-chlordane	180～3,500 (5/5)	710	98～3,100 (19/19)	580	5～110 (2/2)	23	2.9～650 (36/36)	61	nd～74 (35/36)	10
	[7-2] *trans*-chlordane	140～1,300 (5/5)	390	19～1,100 (19/19)	170	tr(4)～10 (2/2)	tr(6)	2.8～780 (36/36)	70	nd～95 (35/36)	12
	[7-3] Oxychlordane	12～450 (5/5)	66	28～390 (19/19)	140	170～360 (2/2)	250	0.34～6.7 (36/36)	1.4	0.22～1.0 (36/36)	0.41
	[7-4] *cis*-Nonachlor	52～670 (5/5)	200	33～2,200 (19/19)	420	56～100 (2/2)	75	0.29～89 (36/36)	6.9	tr(0.05)～10 (36/36)	0.98
	[7-5] *trans*-Nonachlor	190～1,800 (5/5)	530	140～4,200 (19/19)	1,100	270～480 (2/2)	360	2.5～510 (36/36)	49	tr(0.50)～61 (36/36)	8.1
[8]	Heptachlors	tr(7)～190 (5/5)	53	tr(8)～120 (19/19)	44	150～170 (2/2)	160	1.1～61 (36/36)	16	tr(0.40)～21 (36/36)	4.2
	[8-1] heptachlor	nd～13 (4/5)	tr(3)	nd～5 (10/19)	nd	nd (0/2)	nd	0.46～58 (36/36)	13	nd～20 (35/36)	3.2
	[8-2] *cis*-heptachlor epoxide	6.2～180 (5/5)	48	6.9～120 (19/19)	41	150～170 (2/2)	160	0.37～6.3 (36/36)	2.0	0.30～1.9 (36/36)	0.62
	[8-3] *trans*-heptachlor epoxide	nd～tr(4) (1/5)	nd	nd (0/19)	nd	nd (0/2)	nd	nd～tr(0.08) (8/36)	nd	nd (0/36)	nd
[9]	Toxaphenes (reference)										
	[9-1] Parlar-26 (reference)										
	[9-2] Parlar-50 (reference)										
	[9-3] Parlar-62 (reference)										
[10]	Mirex (reference)										
[11]	HCHs										
	[11-1] *α*-HCH	4.0～340 (5/5)	23	nd～170 (18/19)	24	32～39 (2/2)	35	15～250 (36/36)	37	4.4～120 (36/36)	12
	[11-2] *β*-HCH	15～980 (5/5)	65	6.5～510 (19/19)	72	730～2,600 (2/2)	1,400	0.65～32 (36/36)	5.0	tr(0.26)～8.5 (36/36)	0.93
	[11-3] *γ*-HCH (synonym:Lindane)	3.0～68 (5/5)	8.1	nd～43 (18/19)	7.8	6.3～19 (2/2)	11	2.3～55 (36/36)	13	tr(0.63)～19 (36/36)	3.1
	[11-4] *δ*-HCH	nd～580 (3/5)	3	nd～12 (14/19)	tr(2)	tr(2)～7 (2/2)	4	tr(0.06)～20 (36/36)	1.0	nd～7.3 (35/36)	0.18

(Note 1) "Av." indicates the geometric mean calculated by assuming nd (below the detection limit) to be half the value of the detection limit.

(Note 2) "Range" is based on the concentrations of the samples and "Frequency" is based on the number of sites or areas. Therefore "Range" can be shown as "nd～" even if a target chemical is detected in all sites or areas.

(Note 3) "　" means the medium was not monitored.

Table 3-4-4 List of the detection ranges in the Environmental Monitoring in FY 2012 (Part 4)

No.	Target chemicals	Wildlife（pg/g-wet）						Air（pg/m^3）			
		Bibalves		Fish		Birds		First (Warm season)		Second (Cold season)	
		Renge (Frepuency)	Av.	Renge (Frepuency)	Av.	Renge (Frepuency)	Av.	Renge (Frepuency)	Av.	Renge (Frepuency)	Av.
[12]	Chlordecone (reference)										
[13]	Hexabromobiphenyls (reference)										
[14]	Polybromodiphenyl ethers(Br$_4$～Br$_{10}$)	tr(100)～850 (5/5)	300	tr(110)～1,400 (19/19)	380	630～1,600 (2/2)	1,000	nd～44 (22/36)	tr(7)	nd～79 (29/36)	tr(12)
	[14-1] Tetrabromodiphenyl ethers	24～190 (5/5)	59	tr(10)～650 (19/19)	120	49～110 (2/2)	73	nd～5.7 (35/36)	0.7	nd～1.7 (25/36)	tr(0.2)
	[14-2] Pentabromodiphenyl ethers	tr(8)～67 (5/5)	28	nd～180 (17/19)	37	66～110 (2/2)	85	nd～2.4 (30/36)	tr(0.13)	nd～0.77 (26/36)	tr(0.09)
	[14-3] Hexabromodiphenyl ethers	tr(6)～130 (5/5)	21	nd～320 (18/19)	55	72～320 (2/2)	150	nd～3.1 (9/36)	nd	nd～0.5 (22/36)	tr(0.1)
	[14-4] Heptabromodiphenyl ethers	nd～59 (3/5)	tr(8)	nd～120 (11/19)	tr(11)	14～280 (2/2)	63	nd～1.8 (6/36)	nd	nd～0.7 (8/36)	nd
	[14-5] Octabromodiphenyl ethers	nd～25 (4/5)	8	nd～160 (12/19)	tr(7)	40～420 (2/2)	130	nd～1.2 (29/36)	tr(0.2)	nd～1.2 (30/36)	0.3
	[14-6] Nonabromodiphenyl ethers	nd～45 (3/5)	tr(15)	nd～54 (9/19)	nd	67～150 (2/2)	100	nd～5.1 (24/36)	tr(0.5)	nd～4.7 (30/36)	tr(0.9)
	[14-7] Decabromodiphenyl ether	nd～480 (4/5)	120	nd～380 (11/19)	tr(59)	240～260 (2/2)	250	nd～31 (17/36)	nd	nd～73 (28/36)	tr(10)
[15]	Perfluorooctane sulfonic acid (PFOS)	tr(4)～160 (5/5)	27	tr(5)～7,300 (19/19)	110	63～410 (2/2)	160	1.3～8.9 (36/36)	3.6	1.0～5.9 (36/36)	2.7
[16]	Perfluorooctanoic acid (PFOA)	nd～46 (4/5)	tr(21)	nd～86 (18/19)	tr(35)	tr(26)～tr(28) (2/2)	tr(27)	1.9～120 (36/36)	11	1.6～48 (36/36)	6.9
[17]	Pentachlorobenzene	tr(5.8)～110 (5/5)	16	tr(5.0)～190 (19/19)	29	46～130 (2/2)	77	31～150 (36/36)	58	27～120 (36/36)	55
[18]	Endosulfans	nd～230 (4/5)	tr(68)	nd～tr(57) (8/19)	nd	nd～tr(29) (1/2)	nd	tr(6.5)～100 (36/36)	25	nd～21 (16/36)	nd
	α-Endosulfan	nd～200 (4/5)	tr(54)	nd～tr(54) (6/19)	nd	nd (0/2)	nd	tr(6.0)～98 (36/36)	23	nd～19 (15/36)	nd
	β-Endosulfan	nd～43 (4/5)	15	nd～15 (6/19)	nd	nd～tr(7) (1/2)	nd	nd～18 (33/36)	1.3	nd～1.7 (17/36)	nd
[19]	1,2,5,6,9,10-Hexabromo cyclododecanes	230～3,200 (5/5)	800	nd～10,000 (16/19)	630	nd～1,600 (1/2)	250	nd～440 (31/36)	4.5	nd～170 (33/36)	5.8
	[19-1] *α*-1,2,5,6,9,10-Hexabromo cyclododecane	190～2,500 (5/5)	530	nd～8,700 (18/19)	510	nd～1,400 (1/2)	120	nd～130 (31/36)	1.7	nd～63 (35/36)	2.9
	[19-2] *β*-1,2,5,6,9,10-Hexabromo cyclododecane	nd～90 (4/5)	tr(25)	nd～40 (8/19)	nd	nd (0/2)	nd	nd～29 (30/36)	0.5	nd～18 (35/36)	0.8
	[19-3] *γ*-1,2,5,6,9,10-Hexabromo cyclododecane	30～910 (5/5)	170	nd～1,600 (16/19)	75	nd～190 (1/2)	31	nd～280 (31/36)	1.6	nd～84 (35/36)	2.1
	[19-4] *δ*-1,2,5,6,9,10-Hexabromo cyclododecane	nd (0/5)	nd	nd (0/19)	nd	nd (0/2)	nd	nd～0.8 (1/36)	nd	nd～1.1 (1/36)	nd
	[19-5] *ε*-1,2,5,6,9,10-Hexabromo cyclododecane	nd～tr(30) (1/5)	nd	nd～tr(30) (3/19)	nd	nd (0/2)	nd	nd (0/36)	nd	nd～tr(0.5) (1/36)	nd
[20]	2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol	5.5～26 (5/5)	12	nd～1,700 (17/19)	26	nd～12 (1/2)	tr(2.9)				

(Note 1) “Av.” indicates the geometric mean calculated by assuming nd (below the detection limit) to be half the value of the detection limit.

(Note 2) “Range” is based on the concentrations of the samples and “Frequency” is based on the number of sites or areas. Therefore “Range” can be shown as “nd～” even if a target chemical is detected in all sites or areas.

(Note 3) “　　”means the medium was not monitored.

(Note 4) The target chemicals of the Perfluorooctane sulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) monitoring survey were *n*-Perfluorooctane sulfonic acid and *n*-Perfluorooctanoic acid. However, the possibility cannot be ruled out that the concentration of branched Perfluorooctanoic acid, which has a branched carbon chain, was included in measured concentration as *n*-Perfluorooctanoic acid in a survey of wildlife.

Table 3-5-1 List of the quantification [detection] limits in the Environmental Monitoring in FY 2012 (Part 1)

No.	Target chemicals	Surface water (pg/L)	Sediment (pg/g-dry)	Wildlife (pg/g-wet)	Air (pg/m^3)
[1]	PCBs	*44 [*15]	*51 [*18]	*34 [*11]	*26 [*8.5]
[2]	HCB	2.2 [0.7]	3 [1]	8.4 [2.8]	4.3 [1.4]
[3]	Aldrin (reference)				
[4]	Dieldrin (reference)				
[5]	Endrin (reference)				
[6]	DDTs (reference)				
	[6-1] *p,p'*-DDT (reference)				
	[6-2] *p,p'*-DDE (reference)				
	[6-3] *p,p'*-DDD (reference)				
	[6-4] *o,p'*-DDT (reference)				
	[6-5] *o,p'*-DDE (reference)				
	[6-6] *o,p'*-DDD (reference)				
[7]	Chlordanes	*7.3 [*2.7]	*14 [* 5]	*16 [*5.4]	*5.0 [*1.7]
	[7-1] *cis*-chlordane	1.6 [0.6]	2.9 [1.0]	5 [2]	1.5 [0.51]
	[7-2] *trans*-chlordane	2.5 [0.8]	4.0 [1.3]	7 [2]	2.1 [0.7]
	[7-3] Oxychlordane	0.9 [0.4]	1.7 [0.7]	3 [1]	0.08 [0.03]
	[7-4] *cis*-Nonachlor	0.8 [0.3]	3 [1]	2 [1]	0.12 [0.05]
	[7-5] *trans*-Nonachlor	1.5 [0.6]	2.4 [0.8]	4 [1]	1.2 [0.41]
[8]	Heptachlors			*14 [*5]	*0.58 [*0.21]
	[8-1] heptachlor			4 [1]	0.41 [0.14]
	[8-2] *cis*-heptachlor epoxide			1.5 [0.6]	0.05 [0.02]
	[8-3] *trans*-heptachlor epoxide			8 [3]	0.12 [0.05]
[9]	Toxaphenes (reference)				
	[9-1] Parlar-26 (reference)				
	[9-2] Parlar-50 (reference)				
	[9-3] Parlar-62 (reference)				
[10]	Mirex (reference)				
[11]	HCHs				
	[11-1] *α*-HCH	1.4 [0.5]	1.6 [0.5]	3.7 [1.2]	2.1 [0.7]
	[11-2] *β*-HCH	1.4 [0.5]	1.5 [0.6]	2 [0.8]	0.36 [0.12]
	[11-3] *γ*-HCH (synonym:Lindane)	1.3 [0.4]	1.3 [0.4]	2.3 [0.9]	0.95 [0.32]
	[11-4] *δ*-HCH	1.1 [0.4]	0.8 [0.3]	3 [1]	0.07 [0.03]

(Note 1) Each quantification limit is shown above the corresponding [detection limit].
(Note 2) " * " means the quantification [detection] limit is the sum value of congeners.
(Note 3) The same quantification [detection] limit was employed for bivalves, fish and birds as wildlife for each target chemical.
(Note 4) The quantification [detection] limit for surface water offshore of Himeji was different from the value shown in the table.
(Note 5) "▒"means the medium was not monitored.

Table 3-5-1 List of the quantification [detection] limits in the Environmental Monitoring in FY 2012 (Part 2)

No.	Target chemicals	Surface water（pg/L）	Sediment（pg/g-dry）	Wildlife（pg/g-wet）	Air（pg/m^3）
[12]	Chlordecone (reference)				
[13]	Hexabromobiphenyls (reference)				
[14]	Polybromodiphenyl ethers(Br_4～Br_{10})	*710 [*240]	*330 [*110]	*210 [*83]	*18 [*6]
	[14-1] Tetrabromodiphenyl ethers	4 [1]	2 [1]	19 [7]	0.3 [0.1]
	[14-2] Pentabromodiphenyl ethers	2 [1]	2.4 [0.9]	18 [6]	0.14 [0.06]
	[14-3] Hexabromodiphenyl ethers	3 [1]	3 [1]	10 [4]	0.3 [0.1]
	[14-4] Heptabromodiphenyl ethers	4 [1]	4 [2]	12 [5]	0.5 [0.2]
	[14-5] Octabromodiphenyl ethers	4 [2]	19 [6]	8 [3]	0.3 [0.1]
	[14-6] Nonabromodiphenyl ethers	40 [13]	34 [11]	24 [9]	1.2 [0.4]
	[14-7] Decabromodiphenyl ether	660 [220]	270 [89]	120 [50]	16 [5]
[15]	Perfluorooctane sulfonic acid (PFOS)	31 [12]	9 [4]	7 [3]	0.5 [0.2]
[16]	Perfluorooctanoic acid (PFOA)	170 [55]	4 [2]	38 [13]	0.7 [0.2]
[17]	Pentachlorobenzene	3 [1]	2.5 [0.8]	8.1 [2.7]	1.8 [0.6]
[18]	Endosulfans	*51 [*19]	*26 [*10]	*85 [*28]	*17 [*5.7]
	α-Endosulfan	27 [10]	13 [5]	71 [24]	16 [5.3]
	β-Endosulfan	24 [9]	13 [5]	14 [5]	1.2 [0.4]
[19]	1,2,5,6,9,10-Hexabromo cyclododecanes		*940 [*350]	*210 [*80]	*2.2 [*0.8]
	[19-1] *α*-1,2,5,6,9,10-Hexabromo cyclododecane		180 [70]	50 [20]	0.6 [0.2]
	[19-2] *β*-1,2,5,6,9,10-Hexabromo cyclododecane		150 [60]	40 [10]	0.3 [0.1]
	[19-3] *γ*-1,2,5,6,9,10-Hexabromo cyclododecane		160 [60]	30 [10]	0.3 [0.1]
	[19-4] *δ*-1,2,5,6,9,10-Hexabromo cyclododecane		300 [100]	50 [20]	0.4 [0.2]
	[19-5] *ε*-1,2,5,6,9,10-Hexabromo cyclododecane		150 [60]	40 [20]	0.6 [0.2]
[20]	2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol	100 [39]	20 [8]	4.6 [1.8]	

(Note 1) Each quantification limit is shown above the corresponding [detection limit].
(Note 2) " * " means the quantification [detection] limit is the sum value of congeners.
(Note 3) The same quantification [detection] limit was employed for bivalves, fish and birds as wildlife for each target chemical.
(Note 4) "　"means the medium was not monitored.

Table 3-6-1 Results of inter-annual trend analysis from FY2002 to FY2012 (surface water)

No	Name	Surface water	River area	Lake area	Mouth area	Sea area
[1]	PCBs	↘	↘	↘	↘	—
[2]	HCB	↘	—	—	↘	¬∟
[3]	Aldrin (reference)					
[4]	Dieldrin (reference)					
[5]	Endrin (reference)					
[6]	DDTs (reference)					
	[6-1] *p,p'*-DDT (reference)					
	[6-2] *p,p'*-DDE (reference)					
	[6-3] *p,p'*-DDD (reference)					
	[6-4] *o,p'*-DDT (reference)					
	[6-5] *o,p'*-DDE (reference)					
	[6-6] *o,p'*-DDD (reference)					
[7]	Chlordanes					
	[7-1] *cis*-chlordane	—	—	—	—	↘
	[7-2] *trans*-chlordane	—	—	—	—	—
	[7-3] Oxychlordane	—*	—*	X	—	X
	[7-4] *cis*-Nonachlor	—	—	—	—	—
	[7-5] *trans*-Nonachlor	—	↘	—	—	—
[8]	Heptachlors					
	[8-1] heptachlor	—	—	—	—	—
	[8-2] *cis*-heptachlor epoxide	—*	—*	X	—	X
	[8-3] *trans*-heptachlor epoxide	—	—	—	—	—
[9]	Toxaphenes (reference)					
	[9-1] Parlar-26 (reference)					
	[9-2] Parlar-50 (reference)					
	[9-3] Parlar-62 (reference)					
[10]	Mirex (reference)					
[11]	HCHs					
	[11-1] *α*-HCH	—	—	—	—	—
	[11-2] *β*-HCH	—	—	↘	—	—
	[11-3] *γ*-HCH (synonym:Lindane)	↘	↘	↘	↘	↘
	[11-4] *δ*-HCH	—*	—	—	—*	X

(Note 1) When the posteriori probability from AICs was more than 95%, the measurement results were deemed to be in agreement with the simple log-linear regression model.
(Note 2) "↘": An inter-annual trend of decrease was found.
"¬∟": Statistically significant differences between the first-half and second-half periods were found.
"—": An inter-annual trend was not found.
"X": This analysis approach was regarded as unsuitable because "measured concentrations of more than 50% of samples did not reach the detection limit (nd) in an FY or more," "measured concentrations did not show a normal distribution in an FY or more," "the number of samples was less than 11 in each FY," or "measured concentrations did not show a homoscedasticity in an FY or more."
"*":In case of using the bootstrap methods, there was not a significant difference between the values of first-half and second-half periods.
(Note 3) The classification of monitored sites with area are shown in Table 3-7
(Note 4)"▒": The inter-annual trend analysis was not analysed because not conducted the survey in FY 2012.

Table 3-6-2 Results of inter-annual trend analysis from FY2002 to FY2012 (sediment)

No	Name	Sediment	River area	Lake area	Mouth area	Sea area
[1]	PCBs	—	—*	—	—	—
[2]	HCB	—	—	—	—	—
[3]	Aldrin (reference)					
[4]	Dieldrin (reference)					
[5]	Endrin (reference)					
[6]	DDTs (reference)					
	[6-1] *p,p'*-DDT (reference)					
	[6-2] *p,p'*-DDE (reference)					
	[6-3] *p,p'*-DDD (reference)					
	[6-4] *o,p'*-DDT (reference)					
	[6-5] *o,p'*-DDE (reference)					
	[6-6] *o,p'*-DDD (reference)					
[7]	Chlordanes					
	[7-1] *cis*-chlordane	↘	↘	↘	↘	↘
	[7-2] *trans*-chlordane	↘	↘	—	—	—
	[7-3] Oxychlordane	¯|_	—*	X	—*	X
	[7-4] *cis*-Nonachlor	—	↘	—	↘	↘
	[7-5] *trans*-Nonachlor	↘	—	—	↘	↘
[8]	Heptachlors					
	[8-1] heptachlor					
	[8-2] *cis*-heptachlor epoxide					
	[8-3] *trans*-heptachlor epoxide					
[9]	Toxaphenes (reference)					
	[9-1] Parlar-26 (reference)					
	[9-2] Parlar-50 (reference)					
	[9-3] Parlar-62 (reference)					
[10]	Mirex (reference)					
[11]	HCHs					
	[11-1] *α*-HCH	—	↘	—	—	—
	[11-2] *β*-HCH	—	—	—	—	—
	[11-3] *γ*-HCH (synonym:Lindane)	—	—	—	—	—
	[11-4] *δ*-HCH	—	—	—	—	—

(Note 1) When the posteriori probability from AICs was more than 95%, the measurement results were deemed to be in agreement with the simple log-linear regression model.

(Note 2) "↘": An inter-annual trend of decrease was found.

"¯|_": Statistically significant differences between the first-half and second-half periods were found.

"—": An inter-annual trend was not found.

"X": This analysis approach was regarded as unsuitable because "measured concentrations of more than 50% of samples did not reach the detection limit (nd) in an FY or more," "measured concentrations did not show a normal distribution in an FY or more," "the number of samples was less than 11 in each FY," or "measured concentrations did not show a homoscedasticity in an FY or more."

"*": In case of using the bootstrap methods, there was not a significant difference between the values of first-half and second-half periods.

(Note 3) The classification of monitored sites with area are shown in Table 3-7

(Note 4)"■": The inter-annual trend analysis was not analysed because not conducted the survey in FY 2012

Table 3-6-3 Results of inter-annual trend analysis from FY2002 to FY2012 (wildlife)

No	Name	Bivalves	Fish
[1]	PCBs	—	—
[2]	HCB	—	—
[3]	Aldrin (reference)		
[4]	Dieldrin (reference)		
[5]	Endrin (reference)		
[6]	DDTs (reference)		
	[6-1] *p,p'*-DDT (reference)		
	[6-2] *p,p'*-DDE (reference)		
	[6-3] *p,p'*-DDD (reference)		
	[6-4] *o,p'*-DDT (reference)		
	[6-5] *o,p'*-DDE (reference)		
	[6-6] *o,p'*-DDD (reference)		
[7]	Chlordanes		
	[7-1] *cis*-chlordane	—	—
	[7-2] *trans*-chlordane	—	—
	[7-3] Oxychlordane	—	—
	[7-4] *cis*-Nonachlor	—	—
	[7-5] *trans*-Nonachlor	—	—
[8]	Heptachlors		
	[8-1] heptachlor	—*	X
	[8-2] *cis*-heptachlor epoxide	—	—
	[8-3] *trans*-heptachlor epoxide	X	X
[9]	Toxaphenes (reference)		
	[9-1] Parlar-26 (reference)		
	[9-2] Parlar-50 (reference)		
	[9-3] Parlar-62 (reference)		
[10]	Mirex (reference)		
[11]	HCHs		
	[11-1] *α*-HCH	↘	—
	[11-2] *β*-HCH	—	—
	[11-3] *γ*-HCH (synonym:Lindane)	—	↘
	[11-4] *δ*-HCH	X	—*

(Note 1) When the posteriori probability from AICs was more than 95%, the measurement results were deemed to be in agreement with the simple log-linear regression model.

(Note 2) "↘": An inter-annual trend of decrease was found.
"┐": Statistically significant differences between the first-half and second-half periods were found.
"—": An inter-annual trend was not found.
"X": This analysis approach was regarded as unsuitable because "measured concentrations of more than 50% of samples did not reach the detection limit (nd) in an FY or more," "measured concentrations did not show a normal distribution in an FY or more," "the number of samples was less than 11 in each FY," or "measured concentrations did not show a homoscedasticity in an FY or more.""*": In case of using the bootstrap methods, there was not a significant difference between the values of first-half and second-half periods.

(Note 3) "■": The inter-annual trend analysis was not analyzed because not conducted the survey in FY 2012.

Table 3-6-4 Results of inter-annual trend analysis from FY2002 to FY2012 (air)

No	Name	Air	
		Warm season	Cold season
[1]	PCBs	—	—
[2]	HCB	—	—
[3]	Aldrin (reference)		
[4]	Dieldrin (reference)		
[5]	Endrin (reference)		
[6]	DDTs (reference)		
	[6-1] *p,p'*-DDT (reference)		
	[6-2] *p,p'*-DDE (reference)		
	[6-3] *p,p'*-DDD (reference)		
	[6-4] *o,p'*-DDT (reference)		
	[6-5] *o,p'*-DDE (reference)		
	[6-6] *o,p'*-DDD (reference)		
[7]	Chlordanes		
	[7-1] *cis*-chlordane	↘	↘
	[7-2] *trans*-chlordane	↘	—
	[7-3] Oxychlordane	↘	—
	[7-4] *cis*-Nonachlor	↘	—
	[7-5] *trans*-Nonachlor	↘	—
[8]	Heptachlors		
	[8-1] heptachlor	↘	↘
	[8-2] *cis*-heptachlor epoxide	—	—
	[8-3] *trans*-heptachlor epoxide	X	X
[9]	Toxaphenes (reference)		
	[9-1] Parlar-26 (reference)		
	[9-2] Parlar-50 (reference)		
	[9-3] Parlar-62 (reference)		
[10]	Mirex (reference)		

(Note 1) When the posteriori probability from AICs was more than 95%, the measurement results were deemed to be in agreement with the simple log-linear regression model.

(Note 2) " ↘ ": An inter-annual trend of decrease was found.

" ⌐ ": Statistically significant differences between the first-half and second-half periods were found.

"—": An inter-annual trend was not found.

"X": This analysis approach was regarded as unsuitable because "measured concentrations of more than 50% of samples did not reach the detection limit (nd) in an FY or more," "measured concentrations did not show a normal distribution in an FY or more," "the number of samples was less than 11 in each FY," or "measured concentrations did not show a homoscedasticity in an FY or more."

(Note 3) "■": The inter-annual trend analysis was not analyzed because not conducted the survey in FY 2012.

Table 3-7 The classification of monitored sites with area at inter-annual trend analysis from FY2002 to FY2012

Classification	Local Communities	Monitored sites	Monitored media	
			Surface water	Sediment
River area	Hokkaido	Onnenai-ohashi Bridge, Riv. Teshio(Bifuka Town)		○
		Suzuran-ohashi Bridge, Riv Tokachi(Obihiro City)	○	○
		Ishikarikakokyo Bridge, Mouth of Riv. Ishikari(Ishikari City)	○	○
	Iwate Pref.	Riv. Toyosawa(Hanamaki City)	○	○
	Sendai City	Hirose-ohashi Bridge, Riv. Hirose(Sendai City)		○
	Yamagata Pref.	Mouth of Riv. Mogami(Sakata City)	○	○
	Ibaraki Pref.	Tonekamome-ohasi Bridge, Mouth of Riv. Tone(Kamisu City)	○	○
	Tochigi Pref.	Riv. Tagawa(Utsunomiya City)	○	○
	Saitama Pref.	Akigaseshusui of Riv. Arakawa	○	
	Niigata Pref.	Lower Riv. Shinano(Niigata City)	○	○
	Toyama Pref.	Hagiura-bashi Bridge, Mouth of Riv. Jintsu(Toyama City)	○	○
	Fukui Pref.	Mishima-bashi Bridge, Riv. Shono(Tsuruga City)	○	○
	Yamanashi Pref.	Senshu-bashi Bridge, Riv. Arakawa(Kofu City)		○
	Shizuoka Pref.	Riv. Tenryu(Iwata City)	○	○
	Kyoto City	Miyamae-bashi Bridge, Riv. Katsura(Kyoto City)	○	○
	Osaka City	Osaka Port	○	○
		Riv. Yodo(Osaka City)		○
	Nara Pref.	Riv. Yamato(Ooji Town)		○
	Wakayama Pref.	Kinokawa-ohashi Bridge, Mouth of Riv. Kinokawa(Wakayama City)	○	○
	Kochi Pref.	Mouth of Riv. Shimanto(Shimanto City)	○	○
	Kumamoto Pref.	Hiraki-bashi Bridge, Riv. Midori(Uto City)	○	
	Miyazaki Pref.	Mouth of Riv. Oyodo(Miyazaki City)	○	○
	Kagoshima Pref.	Riv. Amori(Kirishima City)	○	○
		Gotanda-bashi Bridge, Riv. Gotanda(Ichikikushikino City)	○	○
Lake area	Akita Pref.	Lake Hachiro	○	○
	Nagano Pref.	Lake Suwa(center)	○	○
	Shiga Pref.	Lake Biwa(center, offshore of Minamihira)		○
		Lake Biwa(center, offshore of Karasaki)	○	○
River mouth area	Hokkaido	Tomakomai Port		○
	Chiba City	Mouth of Riv. Hanami(Chiba City)	○	○
	Tokyo Met.	Mouth of Riv. Arakawa(Koto Ward)	○	○
		Mouth of Riv. Sumida(Minato Ward)	○	○
	Kawasaki City	Mouth of Riv. Tama(Kawasaki City)		○
	Ishikawa Pref.	Mouth of Riv. Sai(Kanazawa City)	○	○
	Aichi Pref.	Kinuura Port		○
	Mie Pref.	Toba Port		○
	Osaka Pref.	Mouth of Riv. Yamato(Sakai City)	○	○
	Osaka City	Mouth of Riv. Yodo(Osaka City)		○
	Tokushima Pref.	Mouth of Riv. Yoshino(Tokushima City)	○	○
	Kagawa Pref.	Takamatsu Port	○	○
	Kitakyushu City	Dokai Bay	○	○
	Oita Pref.	Mouth of Riv. Oita(Oita City)		○
	Okinawa Pref.	Naha Port	○	○
Sea area	Miyagi Pref.	Sendai Bay(Matsushima Bay)	○	○
	Fukushima Pref.	Onahama Port	○	○
	Chiba Pref.	Coast of Ichihara and Anegasaki		○
	Yokohama City	Yokohama Port	○	○
	Kawasaki City	Keihin Canal, Port of Kawasaki	○	○
	Shizuoka Pref.	Shimizu Port		○
	Aichi Pref.	Nagoya Port	○	○
	Mie Pref.	Yokkaichi Port	○	○
	Kyoto Pref.	Miyazu Port	○	○
	Osaka City	Outside Osaka Port		○
	Hyogo Pref.	Offshore of Himeji	○	○
	Kobe City	Kobe Port(center)	○	○
	Okayama Pref.	Offshore of Mizushima	○	○
	Hiroshima Pref.	Kure Port	○	○
		Hiroshima Bay	○	○
	Yamaguchi Pref.	Tokuyama Bay	○	○
		Offshore of Ube	○	○
		Offshore of Hagi	○	○
	Ehime Pref.	Niihama Port		○
	Fukuoka City	Hakata Bay		○
	Saga Pref.	Imari Bay	○	○
	Nagasaki Pref.	Omura Bay	○	○

(Note) There are monitored sites which were classified in the area unlike these names by the situations

In the wake of the monitoring surveys of FYs 2002~2011, FY 2012 saw a high sensitivity analysis covering four (4) of ten (10) POPs treaty substances and HCHs. All these chemicals were found, excepting heptachlors (heptachlor) in wildlife (birds) and heptachlors (*trans*-heptachlor epoxide) in wildlife (fish and birds) and in air (cold season).

A high sensitivity analysis also surveyed for Polybromodiphenyl ethers (Br_4~Br_{10}), Perfluorooctane sulfonic acid (PFOS), Perfluorooctanoic acid (PFOA), Pentachlorobenzene, Endosulfans, 1,2,5,6,9,10-Hexabromocyclododecanes and 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol. All these chemicals were detected excepting *δ*-1,2,5,6,9,10-Hexabromocyclododecane in wildlife , *ε*-1,2,5,6,9,10-Hexabromo-cyclododecane in wildlife and in the air (warm season). 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol was detected in surface water, in sediment and in wildlife.

The monitoring results for each chemical (group) are described below.

[1] PCBs

・ History and state of monitoring

Polychlorinated biphenyls (PCBs) had been used as insulating oil, etc. and were designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in June 1974, since the substances are persistent, highly accumulative in living organisms, and chronically toxic.

In previous monitoring series, the substances were monitored in wildlife (bivalves, fish and birds) during the period of FY 1978〜2001 under the framework of "the Wildlife Monitoring." Under the framework of "The Follow-up Survey of the Status of Pollution by Unintentionally Formed Chemicals," sediment and wildlife (fish) were the monitored media in FY 1996 and FY 1997, and surface water, sediment, wildlife (fish) and air were the monitored media in FY 2000 and FY 2001.

Under the framework of the Environmental Monitoring, the substances in surface water, sediment, wildlife (bivalves, fish and birds) and air have been monitored since FY 2002.

・ Monitoring results

<Surface Water>

The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of **15 pg/L, and the detection range was 72〜6,500pg/L. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendency in specimens from river areas, lake areas and river mouth areas identified as statistically significant and reduction tendency in specimens from the overall areas was also identified as statistically significant.

Stocktaking of the detection of PCBs (total amount) in surface water during FY2002~2012

PCBs (total amount)	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] Limit**	Detection Frequency	
							Sample	Site
Surface water (pg/L)	2002	470	330	11,000	60	7.4 [2.5]	114/114	38/38
	2003	530	450	3,100	230	9.4 [2.5]	36/36	36/36
	2004	630	540	4,400	140	14 [5.0]	38/38	38/38
	2005	520	370	7,800	140	10 [3.2]	47/47	47/47
	2006	240	200	4,300	15	9 [3]	48/48	48/48
	2007	180	140	2,700	12	7.6 [2.9]	48/48	48/48
	2008	260	250	4,300	27	7.8 [3.0]	48/48	48/48
	2009	210	170	3,900	14	10 [4]	48/48	48/48
	2010	120	99	2,200	nd	73 [24]	41/49	41/49
	2011	150	130	2,100	16	4.5 [1.7]	49/49	49/49
	2012	400	280	6,500	72	44 [15]	48/48	48/48

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.
(Note 2) " ** " indicates the sum value of the Quantification [Detection] limits of each congener.

< Sediment>

The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of **18pg/g-dry, and the detection range was tr(32)〜640,000 pg/g.

Stocktaking of the detection of PCBs (total amount) in sediment during FY2002~2012

PCBs (total amount)	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] Limit**	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	11,000	11,000	630,000	39	10 [3.5]	189/189	63/63
	2003	9,400	9,500	5,600,000	39	10 [3.2]	186/186	62/62
	2004	8,400	7,600	1,300,000	38	7.9 [2.6]	189/189	63/63
	2005	8,600	7,100	690,000	42	6.3 [2.1]	189/189	63/63
	2006	8,800	6,600	690,000	36	4 [1]	192/192	64/64
	2007	7,400	6,800	820,000	19	4.7 [1.5]	192/192	64/64
	2008	8,700	8,900	630,000	22	3.3 [1.2]	192/192	64/64
	2009	7,600	7,100	1,700,000	17	5.1 [2.1]	192/192	64/64
	2010	6,500	7,800	710,000	nd	660 [220]	56/64	56/64
	2011	6,300	7,400	950,000	24	12 [4.5]	64/64	64/64
	2012	5,700	6,700	640,000	tr(32)	51 [18]	63/63	63/63

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002~FY2009.
(Note 2) “ ** ” indicates the sum value of the Quantification [Detection] limits of each congener.

<Wildlife>

The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of **11pg/g-wet, and the detection range was 680～34,000 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of **11pg/g-wet, and the detection range was 920～130,000 pg/g-wet. For birds, the presence of the substance was monitored in 2 area, and it was detected at all 2 valid area adopting the detection limit of **11pg/g-wet, and the detection range was 5,600～6,200 pg/g-wet.

Stocktaking of the detection of PCBs (total amount) in wildlife (bivalves, fish and birds) during FY2002~2012

PCBs (total amount)	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] Limit**	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	8,800	28,000	160,000	200	25 [8.4]	38/38	8/8
	2003	11,000	9,600	130,000	1,000	50 [17]	30/30	6/6
	2004	11,000	11,000	150,000	1,500	85 [29]	31/31	7/7
	2005	11,000	13,000	85,000	920	69 [23]	31/31	7/7
	2006	8,500	8,600	77,000	690	42 [14]	31/31	7/7
	2007	9,000	11,000	66,000	980	46 [18]	31/31	7/7
	2008	8,600	8,600	69,000	870	47 [17]	31/31	7/7
	2009	8,700	11,000	62,000	780	32 [11]	31/31	7/7
	2010	9,200	11,000	46,000	1,500	52 [20]	6/6	6/6
	2011	8,900	17,000	65,000	820	220 [74]	4/4	4/4
	2012	6,600	12,000	34,000	680	34 [11]	5/5	5/5
Fish (pg/g-wet)	2002	17,000	8,100	550,000	1,500	25 [8.4]	70/70	14/14
	2003	11,000	9,600	150,000	870	50 [17]	70/70	14/14
	2004	15,000	10,000	540,000	990	85 [29]	70/70	14/14
	2005	14,000	8,600	540,000	800	69 [23]	80/80	16/16
	2006	13,000	9,000	310,000	990	42 [14]	80/80	16/16
	2007	11,000	6,200	530,000	790	46 [18]	80/80	16/16
	2008	12,000	9,100	330,000	1,200	47 [17]	85/85	17/17
	2009	12,000	12,000	290,000	840	32 [11]	90/90	18/18
	2010	13,000	10,000	260,000	880	52 [20]	18/18	18/18
	2011	14,000	12,000	250,000	900	220 [74]	18/18	18/18
	2012	13,000	14,000	130,000	920	34 [11]	19/19	19/19

PCBs (total amount)	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] Limit**	Detection Frequency	
							Sample	Site
Birds (pg/g-wet)	2002	12,000	14,000	22,000	4,800	25 [8.4]	10/10	2/2
	2003	19,000	22,000	42,000	6,800	50 [17]	10/10	2/2
	2004	9,000	9,400	13,000	5,900	85 [29]	10/10	2/2
	2005	10,000	9,700	19,000	5,600	69 [23]	10/10	2/2
	2006	12,000	9,800	48,000	5,600	42 [14]	10/10	2/2
	2007	7,600	7,800	15,000	3,900	46 [18]	10/10	2/2
	2008	9,700	7,400	56,000	3,000	47 [17]	10/10	2/2
	2009	5,900	5,700	9,500	3,900	32 [11]	10/10	2/2
	2010	7,700	---	9,100	6,600	52 [20]	2/2	2/2
	2011	---	---	5,400	5,400	220 [74]	1/1	1/1
	2012	5,900	---	6,200	5,600	34 [11]	2/2	2/2

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002~FY2009.
(Note 2) " ** " indicates the sum value of the Quantification [Detection] limits of each congener.

<Air>

The presence of the substance in air in the warm season was monitored at 36 sites and, excluding 1 sites whose concentrations were treated as invalid, it was detected at all 35 valid sites adopting the detection limit of **8.5pg/m^3, and the detection range was 27～840 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites and, excluding 1 sites whose concentrations were treated as invalid, it was detected at all 35 valid sites adopting the detection limit of **8.5pg/m^3, and the detection range was tr(16)～280 pg/m^3.

Stocktaking of the detection of PCBs (total amount) in air during FY2002~2012

PCBs (total amount)	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] limit**	Detection Frequency	
							Sample	Site
Air (pg/m^3)	***2002	100	100	880	16	99 [33]	102/102	34/34
	2003 Warm season	260	340	2,600	36	6.6 [2.2]	35/35	35/35
	2003 Cold season	110	120	630	17		34/34	34/34
	2004 Warm season	240	250	3,300	25	2.9 [0.98]	37/37	37/37
	2004 Cold season	130	130	1,500	20		37/37	37/37
	2005 Warm season	190	210	1,500	23	0.38 [0.14]	37/37	37/37
	2005 Cold season	66	64	380	20		37/37	37/37
	2006 Warm season	170	180	1,500	21	0.8 [0.3]	37/37	37/37
	2006 Cold season	82	90	450	19		37/37	37/37
	2007 Warm season	250	290	980	37	0.37 [0.13]	24/24	24/24
	2007 Cold season	72	76	230	25		22/22	22/22
	2008 Warm season	200	170	960	52	0.8 [0.3]	22/22	22/22
	2008 Cold season	93	86	1,500	21		36/36	36/36
	2009 Warm season	200	190	1,400	43	0.75 [0.26]	34/34	34/34
	2009 Cold season	85	78	380	20		34/34	34/34
	2010 Warm season	160	150	970	36	7.3 [2.5]	35/35	35/35
	2010 Cold season	84	86	630	19		35/35	35/35
	2011 Warm season	150	160	660	32	18 [5.9]	35/35	35/35
	2011 Cold season	76	66	320	tr(17)		37/37	37/37
	2012 Warm season	130	130	840	27	26 [8.5]	35/35	35/35
	2012 Cold season	54	62	280	tr(16)		35/35	35/35

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.
(Note 2) " ** " :The sum value of the Quantification [Detection] limits of each congener.
(Note 3) " *** " :In 2002, there was a technical problem in the measuring method for lowly chlorinated congeners, and therefore the values are shown just as reference.

[2] Hexachlorobenzene

・ History and state of monitoring

Hexachlorobenzene had been used as pesticidal material and was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in August 1979.

In previous monitoring series, the substance was monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～1996 and in FY 1998, FY 2000 and FY 2001 under the framework of " the Wildlife Monitoring. " Under the framework of " the Surface Water/Sediment Monitoring," the substance in surface water and sediment was monitored during the period of FY 1986～1998 and FY 1986～2001, respectively.

Under the framework of the Environmental Monitoring, the substance in surface water, sediment, wildlife (bivalves, fish and birds) and air has been monitored since FY 2002.

・ Monitoring results

<Surface Water>

The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.7pg/L,and the detection range was 8.1～330 pg/L. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas and river mouth areas were identified as statistically significant, the second-half period indicated lower concentration than the first-half period in specimens from sea areas as statistically significant and reduction tendency in specimens from the overall areas was also identified as statistically significant.

Stocktaking of the detection of Hexachlorobenzene in surface water during FY2002~2011

HCB	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface water (pg/L)	2002	37	28	1,400	9.8	0.6 [0.2]	114/114	38/38
	2003	29	24	340	11	5 [2]	36/36	36/36
	2004	30	tr(29)	180	tr(11)	30 [8]	38/38	38/38
	2005	21	17	210	tr(6)	15 [5]	47/47	47/47
	2006	16	tr(12)	190	nd	16 [5]	46/48	46/48
	2007	17	14	190	tr(4)	8 [3]	48/48	48/48
	2008	16	13	480	4	3 [1]	48/48	48/48
	2009	15	17	180	2.4	0.5 [0.2]	49/49	49/49
	2010	tr(10)	tr(8)	120	nd	13 [4]	39/49	39/49
	2011	13	12	140	tr(3)	5 [2]	49/49	49/49
	2012	29	23	330	8.1	2.2 [0.7]	48/48	48/48

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

< Sediment>

The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 1pg/g-dry, and the detection range was 3～12,000 pg/g-dry.

Stocktaking of the detection of Hexachlorobenzene in sediment during FY2002~2012

HCB	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	240	200	19,000	7.6	0.9 [0.3]	189/189	63/63
	2003	160	120	42,000	5	4 [2]	186/186	62/62
	2004	140	100	25,000	tr(6)	7 [3]	189/189	63/63
	2005	170	130	22,000	13	3 [1]	189/189	63/63
	2006	180	120	19,000	10	2.9 [1.0]	192/192	64/64
	2007	140	110	65,000	nd	5 [2]	191/192	64/64
	2008	160	97	29,000	4.4	2.0 [0.8]	192/192	64/64
	2009	150	120	34,000	nd	1.8 [0.7]	190/192	64/64
	2010	130	96	21,000	4	3 [1]	64/64	64/64
	2011	150	110	35,000	11	7 [3]	64/64	64/64
	2012	100	110	12,000	3	3 [1]	63/63	63/63

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Wildlife>

The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 2.8pg/g-wet, and the detection range was 10～340 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 2.8pg/g-wet, and the detection range was 33～1,100 pg/g-wet. For birds, the presence of the substance was monitored in 2 area, and it was detected at 2 valid area adopting the detection limit of 2.8pg/g-wet, and the detection range was 470～1,500pg/g-wet.

Stocktaking of the detection of Hexachlorobenzene in wildlife (bivalves, fish and birds) during FY2002~2012

HCB	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	21	22	330	2.4	0.18 [0.06]	38/38	8/8
	2003	44	27	660	tr(21)	23 [7.5]	30/30	6/6
	2004	32	31	80	14	14 [4.6]	31/31	7/7
	2005	51	28	450	19	11 [3.8]	31/31	7/7
	2006	46	28	340	11	3 [1]	31/31	7/7
	2007	37	22	400	11	7 [3]	31/31	7/7
	2008	38	24	240	13	7 [3]	31/31	7/7
	2009	34	32	200	12	4 [2]	31/31	7/7
	2010	34	48	210	tr(4)	5 [2]	6/6	6/6
	2011	45	34	920	4	4 [1]	4/4	4/4
	2012	39	38	340	10	8.4 [2.8]	5/5	5/5
Fish (pg/g-wet)	2002	140	180	910	19	0.18 [0.06]	70/70	14/14
	2003	180	170	1,500	28	23 [7.5]	70/70	14/14
	2004	230	210	1,800	26	14 [4.6]	70/70	14/14
	2005	180	160	1,700	29	11 [3.8]	80/80	16/16
	2006	180	220	1,400	25	3 [1]	80/80	16/16
	2007	160	140	1,500	17	7 [3]	80/80	16/16
	2008	170	210	1,500	25	7 [3]	85/85	17/17
	2009	210	180	30,000	29	4 [2]	90/90	18/18
	2010	240	280	1,700	36	5 [2]	18/18	18/18
	2011	260	320	1,500	34	4 [1]	18/18	18/18
	2012	200	300	1,100	33	8.4 [2.8]	19/19	19/19

HCB	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Birds (pg/g-wet)	2002	1,000	1,200	1,600	560	0.18 [0.06]	10/10	2/2
	2003	1,800	2,000	4,700	790	23 [7.5]	10/10	2/2
	2004	980	1,300	2,200	410	14 [4.6]	10/10	2/2
	2005	1,000	1,100	2,500	400	11 [3.8]	10/10	2/2
	2006	970	1,100	2,100	490	3 [1]	10/10	2/2
	2007	960	1,100	2,000	420	7 [3]	10/10	2/2
	2008	880	1,100	2,500	240	7 [3]	10/10	2/2
	2009	850	910	1,500	400	4 [2]	10/10	2/2
	2010	970	---	1,900	500	5 [2]	2/2	2/2
	2011	---	---	460	460	4 [1]	1/1	1/1
	2012	840	---	1,500	470	8.4 [2.8]	2/2	2/2

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Air>

The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 1.4pg/m^3, and the detection range was 84～150 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 1.4pg/m^3, and the detection range was 68～150 pg/m^3.

Stocktaking of the detection of Hexachlorobenzene in air during FY2002~2012

HCB	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	99	93	3,000	57	0.9 [0.3]	102/102	34/34
	2003 Warm season	150	130	430	81	2.3 [0.78]	35/35	35/35
	2003 Cold season	94	90	320	64		34/34	34/34
	2004 Warm season	130	130	430	47	1.1 [0.37]	37/37	37/37
	2004 Cold season	98	89	390	51		37/37	37/37
	2005 Warm season	88	90	250	27	0.14 [0.034]	37/37	37/37
	2005 Cold season	77	68	180	44		37/37	37/37
	2006 Warm season	83	89	210	23	0.21 [0.07]	37/37	37/37
	2006 Cold season	65	74	170	8.2		37/37	37/37
	2007 Warm season	110	100	230	72	0.09 [0.03]	24/24	24/24
	2007 Cold season	77	72	120	55		22/22	22/22
	2008 Warm season	120	110	260	78	0.22 [0.08]	22/22	22/22
	2008 Cold season	87	83	160	58		36/36	36/36
	2009 Warm season	110	110	210	78	0.6 [0.2]	34/34	34/34
	2009 Cold season	87	87	150	59		34/34	34/34
	2010 Warm season	120	120	160	73	1.8 [0.7]	37/37	37/37
	2010 Cold season	100	96	380	56		37/37	37/37
	2011 Warm season	120	110	180	87	2.3 [0.75]	35/35	35/35
	2011 Cold season	96	96	160	75		37/37	37/37
	2012 Warm season	120	110	150	84	4.3 [1.4]	36/36	36/36
	2012 Cold season	97	95	150	68		36/36	36/36

[3] Aldrin (reference)

・ History and state of monitoring

Aldrin had been used as a soil insecticide until FY 1971 when the application of the substance was substantially stopped. Its registration under the Agricultural Chemicals Regulation Law was expired in FY 1975. It was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in October 1981.

In previous monitoring series until FY 2001, the substance was monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～1989, FY 1991 and FY 1993 under the framework of “the Wildlife Monitoring.”

Under the framework of the Environmental Monitoring, the substance in surface water, sediment, wildlife (bivalves, fish and birds) and air had been monitored during FY 2002 ~ FY 2009.

As of FY 2010, monitoring surveys are conducted every few years. No monitoring was conducted during FY 2010 ~ FY2012. For reference, the monitoring results up to FY 2009 are given below.

・ Monitoring results until FY 2009

<Surface Water>

Stocktaking of the detection of aldrin in surface water during FY2002~2009

Aldrin	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface water (pg/L)	2002	0.8	0.9	18	nd	0.6 [0.2]	93/114	37/38
	2003	0.9	0.9	3.8	nd	0.6 [0.2]	34/36	34/36
	2004	tr(1.5)	tr(1.8)	13	nd	2 [0.4]	33/38	33/38
	2005	tr(0.6)	tr(0.7)	5.7	nd	0.9 [0.3]	32/47	32/47
	2006	nd	nd	4.4	nd	1.7 [0.6]	18/48	18/48
	2007	tr(0.6)	tr(0.6)	9.5	nd	1.0 [0.3]	34/48	34/48
	2008	tr(0.8)	tr(0.7)	21	nd	1.4 [0.6]	26/48	26/48
	2009	0.7	0.9	22	nd	0.7 [0.3]	32/49	32/49

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.
(Note 2) No monitoring was conducted from FY 2010 to FY2012.

<Sediment>

Stocktaking of the detection of aldrin in sediment during FY2002~2009

Aldrin	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	14	12	570	nd	6 [2]	149/189	56/63
	2003	19	18	1,000	nd	2 [0.6]	178/186	60/62
	2004	10	10	390	nd	2 [0.6]	170/189	62/63
	2005	8.4	7.1	500	nd	1.4 [0.5]	173/189	62/63
	2006	10	9.3	330	nd	1.9 [0.6]	184/192	64/64
	2007	7.5	6.7	330	nd	1.8 [0.6]	172/192	60/64
	2008	6	6	370	nd	3 [1]	153/192	56/64
	2009	8.9	7.8	540	nd	0.5 [0.2]	180/192	64/64

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.
(Note 2) No monitoring was conducted from FY 2010 to FY2012.

<Wildlife>

Stocktaking of the detection of aldrin in wildlife (bivalves, fish and birds) during FY2002~2009

Aldrin	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Aldrin	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2002	tr(1.6)	nd	34	nd	4.2 [1.4]	12/38	4/8
	2003	tr(1.7)	tr(0.85)	51	nd	2.5 [0.84]	15/30	3/6
	2004	tr(2.5)	tr(1.6)	46	nd	4.0 [1.3]	16/31	4/7
	2005	tr(1.8)	nd	84	nd	3.5 [1.2]	11/31	3/7
	2006	tr(2)	nd	19	nd	4 [2]	11/31	3/7
	2007	tr(2)	nd	26	nd	5 [2]	5/31	2/7
	2008	tr(2)	nd	20	nd	5 [2]	5/31	3/7
	2009	tr(1.6)	tr(0.8)	89	nd	2.1 [0.8]	16/31	6/7
Fish (pg/g-wet)	2002	nd	nd	tr(2.0)	nd	4.2 [1.4]	1/70	1/14
	2003	nd	nd	tr(1.9)	nd	2.5 [0.84]	16/70	7/14
	2004	nd	nd	tr(2.4)	nd	4.0 [1.3]	5/70	2/14
	2005	nd	nd	6.4	nd	3.5 [1.2]	11/80	5/16
	2006	nd	nd	tr(2)	nd	4 [2]	2/80	2/16
	2007	nd	nd	tr(2)	nd	5 [2]	2/80	2/16
	2008	nd	nd	tr(2)	nd	5 [2]	1/85	1/17
	2009	nd	nd	3.1	nd	2.1 [0.8]	22/90	7/18
Birds (pg/g-wet)	2002	nd	nd	nd	nd	4.2 [1.4]	0/10	0/2
	2003	nd	nd	nd	nd	2.5 [0.84]	0/10	0/2
	2004	nd	nd	nd	nd	4.0 [1.3]	0/10	0/2
	2005	nd	nd	nd	nd	3.5 [1.2]	0/10	0/2
	2006	nd	nd	nd	nd	4 [2]	0/10	0/2
	2007	nd	nd	nd	nd	5 [2]	0/10	0/2
	2008	nd	nd	nd	nd	5 [2]	0/10	0/2
	2009	nd	nd	nd	nd	2.1 [0.8]	0/10	0/2

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted from FY 2010 to FY2012.

<Air>

Stocktaking of the detection of aldrin in air during FY2002~2009

Aldrin	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2002	tr(0.030)	nd	3.2	nd	0.060 [0.020]	41/102	19/34
	2003 Warm season	1.5	1.9	28	nd	0.023 [0.0077]	34/35	34/35
	2003 Cold season	0.55	0.44	6.9	0.030		34/34	34/34
	2004 Warm season	tr(0.12)	nd	14	nd	0.15 [0.05]	15/37	15/37
	2004 Cold season	tr(0.08)	nd	13	nd		14/37	14/37
	2005 Warm season	0.33	0.56	10	nd	0.08 [0.03]	29/37	29/37
	2005 Cold season	tr(0.04)	nd	1.8	nd		9/37	9/37
	2006 Warm season	0.30	0.35	8.5	nd	0.14 [0.05]	31/37	31/37
	2006 Cold season	tr(0.05)	nd	1.1	nd		16/37	16/37
	2007 Warm season	0.58	0.48	19	nd	0.05 [0.02]	35/36	35/36
	2007 Cold season	0.14	0.15	2.1	nd		34/36	34/36
	2008 Warm season	0.27	0.30	9.4	tr(0.02)	0.04 [0.02]	25/25	25/25
	2008 Cold season	0.09	0.08	1.3	nd		22/25	22/25
	2009 Warm season	0.07	nd	10	nd	0.04 [0.02]	10/25	10/25
	2009 Cold season	tr(0.03)	nd	1.8	nd		8/24	8/24

(Note) No monitoring was conducted from FY 2010 to FY2012.

[4] Dieldrin (reference)

・ History and state of monitoring

Dieldrin was used as a pesticide and its application culminated during the period of 1955～1964. The substance had been used as termitecides as a Soil-Residue-Prone Pesticide under the Agricultural Chemicals Regulation Law in 1971, but its registration under the Agricultural Chemicals Regulation Law was expired in FY 1975. It had been used for termite control and was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in October 1981.

In previous monitoring series until FY 2001, the substance was monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～1996, FY 1998, FY 2000 and FY 2001 under the framework of "the Wildlife Monitoring." Under the framework of "the Surface Water/Sediment Monitoring," the substance in surface water and sediment was monitored during the period of FY 1986～1998 and FY 1986～2001, respectively.

Under the framework of the Environmental Monitoring, the substance in surface water, sediment, wildlife (bivalves, fish and birds) and air had been monitored during FY 2002 ~ FY 2009 and in FY 2011.

No monitoring was conducted in FY 2012. For reference, the monitoring results up to FY 2011 are given below.

・ Monitoring results

<Surface Water>

Stocktaking of the detection of dieldrin in surface water during FY2002~2009,2011

Dieldrin	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface water (pg/L)	2002	42	41	940	3.3	1.8 [0.6]	114/114	38/38
	2003	57	57	510	9.7	0.7 [0.3]	36/36	36/36
	2004	55	51	430	9	2 [0.5]	38/38	38/38
	2005	39	49	630	4.5	1.0 [0.34]	47/47	47/47
	2006	36	32	800	6	3 [1]	48/48	48/48
	2007	38	36	750	3.1	2.1 [0.7]	48/48	48/48
	2008	36	37	450	3.6	1.5 [0.6]	48/48	48/48
	2009	36	32	650	2.7	0.6 [0.2]	49/49	49/49
	2011	33	38	300	2.1	1.6 [0.6]	49/49	49/49

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

(Note 2) No monitoring was conducted in FY 2010 and FY2012.

< Sediment>

Stocktaking of the detection of dieldrin in sediment during FY2002~2009,2011

Dieldrin	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2002	70	51	2,300	4	3 [1]	189/189	63/63
	2003	66	56	9,100	nd	4 [2]	184/186	62/62
	2004	65	62	3,700	tr(1.9)	3 [0.9]	189/189	63/63
	2005	61	55	4,200	tr(2)	3 [1]	189/189	63/63
	2006	61	54	1,500	tr(1.7)	2.9 [1.0]	192/192	64/64
	2007	49	40	2,700	tr(1.2)	2.7 [0.9]	192/192	64/64
	2008	48	43	2,900	tr(0.7)	1.2 [0.5]	192/192	64/64
	2009	51	47	3,000	1.1	0.8 [0.3]	192/192	64/64
	2011	47	44	2,200	2	5 [2]	64/64	64/64

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted in FY 2010 and FY2012.

<Wildlife>

Stocktaking of the detection of dieldrin in wildlife (bivalves, fish and birds) during FY2002~2009,2011

Dieldrin	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2002	440	390	190,000	tr(7)	12 [4]	38/38	8/8
	2003	440	160	78,000	46	4.8 [1.6]	30/30	6/6
	2004	630	270	69,000	42	31 [10]	31/31	7/7
	2005	500	140	39,000	34	9.4 [3.4]	31/31	7/7
	2006	450	120	47,000	30	7 [3]	31/31	7/7
	2007	380	110	77,000	37	9 [3]	31/31	7/7
	2008	430	150	24,000	47	9 [3]	31/31	7/7
	2009	490	230	28,000	48	7 [2]	31/31	7/7
	2011	390	690	3,800	16	3 [1]	4/4	4/4
Fish (pg/g-wet)	2002	290	270	2,400	46	12 [4]	70/70	14/14
	2003	220	200	1,000	29	4.8 [1.6]	70/70	14/14
	2004	250	230	2,800	tr(23)	31 [10]	70/70	14/14
	2005	230	250	1,400	21	9.4 [3.4]	80/80	16/16
	2006	230	220	1,400	19	7 [3]	80/80	16/16
	2007	250	210	1,900	23	9 [3]	80/80	16/16
	2008	240	240	1,300	15	9 [3]	85/85	17/17
	2009	240	190	1,400	29	7 [2]	90/90	18/18
	2011	270	340	1,100	17	3 [1]	18/18	18/18
Birds (pg/g-wet)	2002	1,100	1,100	1,700	820	12 [4]	10/10	2/2
	2003	1,300	1,400	2,200	790	4.8 [1.6]	10/10	2/2
	2004	600	610	960	370	31 [10]	10/10	2/2
	2005	830	740	1,800	500	9.4 [3.4]	10/10	2/2
	2006	700	690	1,300	440	7 [3]	10/10	2/2
	2007	710	710	910	560	9 [3]	10/10	2/2
	2008	680	620	1,300	260	9 [3]	10/10	2/2
	2009	470	420	890	330	7 [2]	10/10	2/2
	2011	---	---	770	770	3 [1]	1/1	1/1

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted in FY 2010 and FY2012.

<Air>

Stocktaking of the detection of dieldrin in air during FY2002~2009,2011

Dieldrin	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Ait (pg/m^3)	2002	5.6	5.4	110	0.73	0.60 [0.20]	102/102	34/34
	2003 Warm season	19	22	260	2.1	2.1 [0.70]	35/35	35/35
	2003 Cold season	5.7	5.2	110	tr(0.82)		34/34	34/34
	2004 Warm season	17	22	280	1.1	0.33 [0.11]	37/37	37/37
	2004 Cold season	5.5	6.9	76	0.81		37/37	37/37
	2005 Warm season	14	12	200	1.5	0.54 [0.24]	37/37	37/37
	2005 Cold season	3.9	3.6	50	0.88		37/37	37/37
	2006 Warm season	15	14	290	1.5	0.3 [0.1]	37/37	37/37
	2006 Cold season	4.5	4.2	250	0.7		37/37	37/37
	2007 Warm season	19	22	310	1.3	0.18 [0.07]	36/36	36/36
	2007 Cold season	4.5	3.7	75	0.96		36/36	36/36
	2008 Warm season	14	16	220	1.6	0.24 [0.09]	37/37	37/37
	2008 Cold season	4.9	3.8	72	0.68		37/37	37/37
	2009 Warm season	13	13	150	0.91	0.06 [0.02]	37/37	37/37
	2009 Cold season	4.5	4.0	80	0.52		37/37	37/37
	2011 Warm season	12	15	230	0.80	0.42 [0.14]	35/35	35/35
	2011 Cold season	4.3	4.9	96	0.52		37/37	37/37

(Note) No monitoring was conducted in FY 2010 and FY2012.

[5] Endrin (reference)

・ History and state of monitoring

Endrin was used as an insecticide and a rodenticide, but its registration under the Agricultural Chemicals Regulation Law was expired in FY 1975. It was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in October 1981.

In previous monitoring series until FY 2001, the substance was monitored in wildlife (bivalves, fish and birds) during the periods of FY 1978～1989 and FY 1991～FY 1993 under the framework of " the Wildlife Monitoring ".

Under the framework of the Environmental Monitoring, the substance in surface water, sediment, wildlife (bivalves, fish and birds) and air has been monitored since FY 2002.

No monitoring was conducted in FY 2012. For reference, the monitoring results up to FY 2011 are given below.

・ Monitoring results

<Surface Water>

Stocktaking of the detection of endrin in surface water during FY2002~2009,2011

Endrin	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface water (pg/L)	2002	tr(4.8)	tr(5.5)	31	nd	6.0 [2.0]	101/114	36/38
	2003	5.7	6.0	78	0.7	0.7 [0.3]	36/36	36/36
	2004	7	7	100	tr(0.7)	2 [0.5]	38/38	38/38
	2005	4.0	4.5	120	nd	1.1 [0.4]	45/47	45/47
	2006	3.1	3.5	26	nd	1.3 [0.4]	44/48	44/48
	2007	3.5	3.4	25	nd	1.9 [0.6]	46/48	46/48
	2008	3	4	20	nd	3 [1]	45/48	45/48
	2009	2.0	2.3	67	nd	0.7 [0.3]	39/49	39/49
	2011	3.8	4.6	71	nd	1.6 [0.6]	47/49	47/49

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

(Note 2) No monitoring was conducted in FY 2010 and FY2012.

<Sediment>

Stocktaking of the detection of endrin in sediment during FY2002~2009,2011

Endrin	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2002	10	10	19,000	nd	6 [2]	141/189	54/63
	2003	12	11	29,000	nd	5 [2]	150/186	53/62
	2004	15	13	6,900	nd	3 [0.9]	182/189	63/63
	2005	12	11	19,000	nd	2.6 [0.9]	170/189	61/63
	2006	12	10	61,000	nd	4 [1]	178/192	63/64
	2007	11	9	61,000	nd	5 [2]	151/192	55/64
	2008	11	11	38,000	nd	1.9 [0.7]	168/192	61/64
	2009	9.6	8.4	11,000	nd	1.6 [0.6]	168/192	63/64
	2011	8.8	14	1,100	nd	1.1 [0.4]	59/64	59/64

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted in FY 2010 and FY2012.

<Wildlife>

Stocktaking of the detection of endrin in wildlife (bivalves, fish and birds) during FY2002~2009,2011

Endrin	Monitored year	Geometric Mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2002	42	27	12,000	nd	18 [6]	35/38	7/8
	2003	38	21	5,000	6.3	4.8 [1.6]	30/30	6/6
	2004	65	25	4,600	tr(5.7)	12 [4.2]	31/31	7/7
	2005	39	19	2,100	nd	17 [5.5]	27/31	7/7
	2006	40	15	3,100	tr(5)	11 [4]	31/31	7/7
	2007	28	12	3,000	tr(6)	9 [3]	31/31	7/7
	2008	30	10	1,500	tr(6)	8 [3]	31/31	7/7
	2009	38	19	1,400	tr(5)	7 [3]	31/31	7/7
	2011	33	62	110	tr(3)	4 [2]	4/4	4/4
Fish (pg/g-wet)	2002	20	24	180	nd	18 [6]	54/70	13/14
	2003	14	10	180	nd	4.8 [1.6]	67/70	14/14
	2004	18	24	220	nd	12 [4.2]	57/70	13/14
	2005	19	tr(16)	2,100	nd	17 [5.5]	58/80	12/16
	2006	13	tr(10)	150	nd	11 [4]	66/80	16/16
	2007	13	12	170	nd	9 [3]	69/80	15/16
	2008	11	10	200	nd	8 [3]	63/85	14/17
	2009	17	12	270	nd	7 [3]	86/90	18/18
	2011	18	19	160	nd	4 [2]	16/18	16/18
Birds (pg/g-wet)	2002	28	52	99	nd	18 [6]	7/10	2/2
	2003	22	30	96	5.4	4.8 [1.6]	10/10	2/2
	2004	tr(11)	25	62	nd	12 [4.2]	5/10	1/2
	2005	18	28	64	nd	17 [5.5]	7/10	2/2
	2006	16	23	57	tr(4)	11 [4]	10/10	2/2
	2007	17	28	55	nd	9 [3]	9/10	2/2
	2008	10	26	83	nd	8 [3]	5/10	1/2
	2009	11	17	43	tr(3)	7 [3]	10/10	2/2
	2011	---	---	tr(3)	tr(3)	4 [2]	1/1	1/1

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted in FY 2010 and FY2012.

<Air>

Stocktaking of the detection of endrin in air during FY2002~2009,2011

Endrin	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2002	0.22	0.28	2.5	nd	0.090 [0.030]	90/102	32/34
	2003 Warm season	0.74	0.95	6.2	0.081	0.042 [0.014]	35/35	35/35
	2003 Cold season	0.23	0.20	2.1	0.042		34/34	34/34
	2004 Warm season	0.64	0.68	6.5	tr(0.054)	0.14 [0.048]	37/37	37/37
	2004 Cold season	0.23	0.26	1.9	nd		36/37	36/37
	2005 Warm season	tr(0.4)	tr(0.3)	2.9	nd	0.5 [0.2]	27/37	27/37
	2005 Cold season	nd	nd	0.7	nd		8/37	8/37
	2006 Warm season	0.31	0.32	5.4	nd	0.30 [0.10]	32/37	32/37
	2006 Cold season	nd	nd	5.0	nd		7/37	7/37
	2007 Warm season	0.69	0.73	6.3	tr(0.06)	0.09 [0.04]	36/36	36/36
	2007 Cold season	0.16	0.13	1.5	nd		33/36	33/36
	2008 Warm season	0.53	0.68	4.6	tr(0.06)	0.10 [0.04]	37/37	37/37
	2008 Cold season	0.18	0.18	1.8	nd		35/37	35/37
	2009 Warm season	0.49	0.51	3.4	nd	0.09 [0.04]	36/37	36/37
	2009 Cold season	0.17	0.15	1.8	nd		36/37	36/37
	2011 Warm season	0.46	0.62	5.1	nd	0.09 [0.04]	34/35	34/35
	2011 Cold season	0.16	0.16	1.8	nd		33/37	33/37

(Note) No monitoring was conducted in FY 2010 and FY2012.

[6] DDTs (reference)

・ History and state of monitoring

DDT, along with hexachlorocyclohexanes (HCHs) and drins, was used as insecticides in high volume. Its registration under the Agricultural Chemicals Regulation Law was expired in FY 1971. It was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in October 1981. Among several DDT isomers with chlorine at various positions on the aromatic ring, not only *p,p'*-DDT and *o,p'*-DDT as active substances but also *p,p'*-DDE, *o,p'*-DDE, *p,p'*-DDD and *o,p'*-DDD as the environmentally degraded products of DDTs have been the target chemicals in monitoring series since FY 1978.

In previous monitoring series, *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD had been monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～2001 under the framework of "the Wildlife Monitoring." Under the framework of "the Surface Water/Sediment Monitoring," surface water and sediment had been the monitored media during the period of FY 1986～1998 and FY 1986～2001, respectively. Similarly, *o,p'*-DDT, *o,p'*-DDE and *o,p'*-DDD had been monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～1996 and in FY 1998, FY 2000 and FY 2001 under the framework of "the Wildlife Monitoring."

Under the framework of the Environmental Monitoring, *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD, *o,p'*-DDT, *o,p'*-DDE and *o,p'*-DDD have been monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air since FY 2002.

As of FY 2010, monitoring surveys are conducted every few years. No monitoring was conducted in FY 2011 and FY2012. For reference, the monitoring results up to FY 2010 are given below.

・ Monitoring results until FY 2010

○ *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD

<Surface Water>

Stocktaking of the detection of *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD in surface water during FY2002~2010

p,p'-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	13	11	440	0.25	0.6 [0.2]	114/114	38/38
	2003	14	12	740	tr(2.8)	3 [0.9]	36/36	36/36
	2004	15	14	310	nd	6 [2]	36/38	36/38
	2005	8	9	110	1	4 [1]	47/47	47/47
	2006	9.1	9.2	170	tr(1.6)	1.9 [0.6]	48/48	48/48
	2007	7.3	9.1	670	nd	1.7 [0.6]	46/48	46/48
	2008	11	11	1,200	nd	1.2 [0.5]	47/48	47/48
	2009	9.2	8.4	440	0.81	0.15 [0.06]	49/49	49/49
	2010	8.5	7.6	7,500	tr(1.0)	2.4 [0.8]	49/49	49/49

p,p'-DDE	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	25	26	760	1.3	0.6 [0.2]	114/114	38/38
	2003	26	22	380	5	4 [2]	36/36	36/36
	2004	36	34	680	tr(6)	8 [3]	38/38	38/38
	2005	26	24	410	4	6 [2]	47/47	47/47
	2006	24	24	170	tr(4)	7 [2]	48/48	48/48
	2007	22	23	440	tr(2)	4 [2]	48/48	48/48
	2008	27	28	350	2.5	1.1 [0.4]	48/48	48/48
	2009	23	23	240	3.4	1.1 [0.4]	49/49	49/49
	2010	14	12	1,600	2.4	2.3 [0.8]	49/49	49/49

p,p'-DDD	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	16	18	190	0.57	0.24 [0.08]	114/114	38/38
	2003	19	18	410	4	2 [0.5]	36/36	36/36
	2004	19	18	740	tr(2.4)	3 [0.8]	38/38	38/38
	2005	17	16	130	tr(1.8)	1.9 [0.64]	47/47	47/47
	2006	16	17	99	2.0	1.6 [0.5]	48/48	48/48
	2007	15	12	150	tr(1.5)	1.7 [0.6]	48/48	48/48
	2008	22	20	850	2.0	0.6 [0.2]	48/48	48/48
	2009	14	13	140	1.4	0.4 [0.2]	49/49	49/49
	2010	12	10	970	1.6	0.20 [0.08]	49/49	49/49

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

(Note 2) No monitoring was conducted from FY 2011 to FY2012.

＜Sediment＞

Stocktaking of the detection of *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD in sediment during FY2002~2010

p,p'-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	380	240	97,000	tr(5)	6 [2]	189/189	63/63
	2003	290	220	55,000	3	2 [0.4]	186/186	62/62
	2004	460	230	98,000	7	2 [0.5]	189/189	63/63
	2005	360	230	1,700,000	5.1	1.0 [0.34]	189/189	63/63
	2006	310	240	130,000	4.5	1.4 [0.5]	192/192	64/64
	2007	210	150	130,000	3	1.3 [0.5]	192/192	64/64
	2008	270	180	1,400,000	4.8	1.2 [0.5]	192/192	64/64
	2009	250	170	2,100,000	1.9	1.0 [0.4]	192/192	64/64
	2010	230	200	220,000	9.3	2.8 [0.9]	64/64	64/64
***p,p'*-DDE**	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2002	780	630	23,000	8.4	2.7 [0.9]	189/189	63/63
	2003	790	780	80,000	9.5	0.9 [0.3]	186/186	62/62
	2004	720	700	39,000	8	3 [0.8]	189/189	63/63
	2005	710	730	64,000	8.4	2.7 [0.94]	189/189	63/63
	2006	710	820	49,000	5.8	1.0 [0.3]	192/192	64/64
	2007	670	900	61,000	3.2	1.1 [0.4]	192/192	64/64
	2008	920	940	96,000	9.0	1.7 [0.7]	192/192	64/64
	2009	700	660	50,000	6.7	0.8 [0.3]	192/192	64/64
	2010	680	790	40,000	11	5 [2]	64/64	64/64
***p,p'*-DDD**	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2002	640	690	51,000	tr(2.2)	2.4 [0.8]	189/189	63/63
	2003	670	580	32,000	3.7	0.9 [0.3]	186/186	62/62
	2004	650	550	75,000	4	2 [0.7]	189/189	63/63
	2005	600	570	210,000	5.2	1.7 [0.64]	189/189	63/63
	2006	560	540	53,000	2.2	0.7 [0.2]	192/192	64/64
	2007	520	550	80,000	3.5	1.0 [0.4]	192/192	64/64
	2008	740	660	300,000	2.8	1.0 [0.4]	192/192	64/64
	2009	540	560	300,000	3.9	0.4 [0.2]	192/192	64/64
	2010	510	510	78,000	4.4	1.4 [0.5]	64/64	64/64

(Note01) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.
(Note 2) No monitoring was conducted from FY 2011 to FY2012.

<Wildlife>

Stocktaking of the detection of *p,p'*-DDT in wildlife (bivalves, fish and birds) during FY2002~2010

p,p'-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	200	200	1,200	38	4.2 [1.4]	38/38	8/8
	2003	290	290	1,800	49	11 [3.5]	30/30	6/6
	2004	360	340	2,600	48	3.2 [1.1]	31/31	7/7
	2005	240	170	1,300	66	5.1 [1.7]	31/31	7/7
	2006	250	220	1,100	56	6 [2]	31/31	7/7
	2007	240	150	1,200	49	5 [2]	31/31	7/7
	2008	160	100	1,400	12	5 [2]	31/31	7/7
	2009	240	170	9,600	46	3 [1]	31/31	7/7
	2010	180	280	470	43	3 [1]	6/6	6/6
Fish (pg/g-wet)	2002	430	450	24,000	6.8	4.2 [1.4]	70/70	14/14
	2003	220	400	1,900	tr(3.7)	11 [3.5]	70/70	14/14
	2004	410	330	53,000	5.5	3.2 [1.1]	70/70	14/14
	2005	280	330	8,400	tr(3.8)	5.1 [1.7]	80/80	16/16
	2006	300	340	3,000	tr(5)	6 [2]	80/80	16/16
	2007	260	320	1,800	9	5 [2]	80/80	16/16
	2008	280	310	2,900	7	5 [2]	85/85	17/17
	2009	250	300	2,000	4	3 [1]	90/90	18/18
	2010	240	280	2,100	7	3 [1]	18/18	18/18
Birds (pg/g-wet)	2002	440	510	1,300	76	4.2 [1.4]	10/10	2/2
	2003	610	620	1,400	180	11 [3.5]	10/10	2/2
	2004	340	320	700	160	3.2 [1.1]	10/10	2/2
	2005	430	550	900	180	5.1 [1.7]	10/10	2/2
	2006	580	490	1,800	110	6 [2]	10/10	2/2
	2007	480	350	1,900	160	5 [2]	10/10	2/2
	2008	160	170	270	56	5 [2]	10/10	2/2
	2009	300	190	2,900	85	3 [1]	10/10	2/2
	2010	3	---	15	nd	3 [1]	1/2	1/2

Stocktaking of the detection of *p,p'*-DDE in wildlife (bivalves, fish and birds) during FY2002~2010

p,p'-DDE	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	1,000	1,700	6,000	140	2.4 [0.8]	38/38	8/8
	2003	1,200	1,000	6,500	190	5.7 [1.9]	30/30	6/6
	2004	1,300	1,400	8,400	220	8.2 [2.7]	31/31	7/7
	2005	1,200	1,600	6,600	230	8.5 [2.8]	31/31	7/7
	2006	1,000	1,200	6,000	160	1.9 [0.7]	31/31	7/7
	2007	1,100	1,200	5,600	180	3 [1]	31/31	7/7
	2008	900	1,100	5,800	120	3 [1]	31/31	7/7
	2009	940	1,100	6,400	150	4 [1]	31/31	7/7
	2010	1,100	1,300	6,300	230	3 [1]	6/6	6/6
Fish (pg/g-wet)	2002	2,900	2,200	98,000	510	2.4 [0.8]	70/70	14/14
	2003	2,000	2,200	12,000	180	5.7 [1.9]	70/70	14/14
	2004	3,000	2,100	52,000	390	8.2 [2.7]	70/70	14/14
	2005	2,400	2,400	73,000	230	8.5 [2.8]	80/80	16/16
	2006	2,200	2,600	28,000	280	1.9 [0.7]	80/80	16/16
	2007	2,200	2,000	22,000	160	3 [1]	80/80	16/16
	2008	2,500	2,000	53,000	320	3 [1]	85/85	17/17
	2009	2,300	2,100	20,000	260	4 [1]	90/90	18/18
	2010	2,300	2,100	13,000	260	3 [1]	18/18	18/18
Birds (pg/g-wet)	2002	36,000	60,000	170,000	8,100	2.4 [0.8]	10/10	2/2
	2003	66,000	76,000	240,000	18,000	5.7 [1.9]	10/10	2/2
	2004	34,000	65,000	200,000	6,800	8.2 [2.7]	10/10	2/2
	2005	44,000	86,000	300,000	7,100	8.5 [2.8]	10/10	2/2
	2006	38,000	57,000	160,000	5,900	1.9 [0.7]	10/10	2/2
	2007	40,000	56,000	320,000	6,700	3 [1]	10/10	2/2
	2008	51,000	79,000	160,000	7,500	3 [1]	10/10	2/2
	2009	30,000	64,000	220,000	4,300	4 [1]	10/10	2/2
	2010	32,000	---	160,000	6,300	3 [1]	2/2	2/2

Stocktaking of the detection of *p,p'*-DDD in wildlife (bivalves, fish and birds) during FY2002~2010

p,p'-DDD	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	340	710	3,200	11	5.4 [1.8]	38/38	8/8
	2003	390	640	2,600	tr(7.5)	9.9 [3.3]	30/30	6/6
	2004	440	240	8,900	7.8	2.2 [0.70]	31/31	7/7
	2005	370	800	1,700	13	2.9 [0.97]	31/31	7/7
	2006	300	480	1,400	7.3	2.4 [0.9]	31/31	7/7
	2007	310	360	1,500	7	3 [1]	31/31	7/7
	2008	280	280	1,300	6	3 [1]	31/31	7/7
	2009	220	170	2,400	5.8	2.4 [0.9]	31/31	7/7
	2010	180	330	960	11	1.3 [0.5]	6/6	6/6
Fish (pg/g-wet)	2002	750	680	14,000	80	5.4 [1.8]	70/70	14/14
	2003	510	520	3,700	43	9.9 [3.3]	70/70	14/14
	2004	770	510	9,700	56	2.2 [0.70]	70/70	14/14
	2005	510	650	6,700	29	2.9 [0.97]	80/80	16/16
	2006	520	580	4,300	60	2.4 [0.9]	80/80	16/16
	2007	470	490	4,100	36	3 [1]	80/80	16/16
	2008	460	440	4,100	33	3 [1]	85/85	17/17
	2009	440	460	2,500	57	2.4 [0.9]	90/90	18/18
	2010	560	610	2,900	57	1.3 [0.5]	18/18	18/18
Birds (pg/g-wet)	2002	580	740	3,900	140	5.4 [1.8]	10/10	2/2
	2003	640	860	3,900	110	9.9 [3.3]	10/10	2/2
	2004	330	520	1,400	52	2.2 [0.70]	10/10	2/2
	2005	310	540	1,400	45	2.9 [0.97]	10/10	2/2
	2006	410	740	1,800	55	2.4 [0.9]	10/10	2/2
	2007	440	780	2,300	70	3 [1]	10/10	2/2
	2008	240	490	1,100	35	3 [1]	10/10	2/2
	2009	280	430	3,400	31	2.4 [0.9]	10/10	2/2
	2010	440	---	1,600	120	1.3 [0.5]	2/2	2/2

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted from FY 2011 to FY2012.

<Air>

Stocktaking of the detection of *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD in air during FY2002~2010

p,p'-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	1.9	1.8	22	0.25	0.24 [0.08]	102/102	34/34
	2003 Warm season	5.8	6.6	24	0.75	0.14 [0.046]	35/35	35/35
	2003 Cold season	1.7	1.6	11	0.31		34/34	34/34
	2004 Warm season	4.7	5.1	37	0.41	0.22 [0.074]	37/37	37/37
	2004 Cold season	1.8	1.7	13	0.29		37/37	37/37
	2005 Warm season	4.1	4.2	31	0.44	0.16 [0.054]	37/37	37/37
	2005 Cold season	1.1	0.99	4.8	0.25		37/37	37/37
	2006 Warm season	4.2	3.8	51	0.35	0.17 [0.06]	37/37	37/37
	2006 Cold season	1.4	1.2	7.3	0.29		37/37	37/37
	2007 Warm season	4.9	5.2	30	0.6	0.07 [0.03]	36/36	36/36
	2007 Cold season	1.2	1.2	8.8	0.23		36/36	36/36
	2008 Warm season	3.6	3.0	27	0.76	0.07 [0.03]	37/37	37/37
	2008 Cold season	1.2	1.0	15	0.22		37/37	37/37
	2009 Warm season	3.6	3.6	28	0.44	0.07 [0.03]	37/37	37/37
	2009 Cold season	1.1	1.0	8.0	0.20		37/37	37/37
	2010 Warm season	3.5	3.1	56	0.28	0.10 [0.03]	37/37	37/37
	2010 Cold season	1.3	0.89	16	0.30		37/37	37/37

p,p'-DDE	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Air (pg/m³)	2002	2.8	2.7	28	0.56	0.09 [0.03]	102/102	34/34
	2003 Warm season	7.2	7.0	51	1.2	0.40 [0.13]	35/35	35/35
	2003 Cold season	2.8	2.4	22	1.1		34/34	34/34
	2004 Warm season	6.1	6.3	95	0.62	0.12 [0.039]	37/37	37/37
	2004 Cold season	2.9	2.6	43	0.85		37/37	37/37
	2005 Warm season	5.0	5.7	42	1.2	0.14 [0.034]	37/37	37/37
	2005 Cold season	1.7	1.5	9.9	0.76		37/37	37/37
	2006 Warm season	5.0	4.7	49	1.7	0.10 [0.03]	37/37	37/37
	2006 Cold season	1.9	1.7	9.5	0.52		37/37	37/37
	2007 Warm season	6.4	6.1	120	0.54	0.04 [0.02]	36/36	36/36
	2007 Cold season	2.1	1.9	39	0.73		36/36	36/36
	2008 Warm season	4.8	4.4	96	0.98	0.04 [0.02]	37/37	37/37
	2008 Cold season	2.2	2.0	22	0.89		37/37	37/37
	2009 Warm season	4.9	4.8	130	0.87	0.08 [0.03]	37/37	37/37
	2009 Cold season	2.1	1.9	100	0.60		37/37	37/37
	2010 Warm season	4.9	4.1	200	tr(0.41)	0.62 [0.21]	37/37	37/37
	2010 Cold season	2.2	1.8	28	tr(0.47)		37/37	37/37

p,p'-DDD	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Air (pg/m³)	2002	0.12	0.13	0.76	nd	0.018 [0.006]	101/102	34/34
	2003 Warm season	0.30	0.35	1.4	0.063	0.054 [0.018]	35/35	35/35
	2003 Cold season	0.13	0.14	0.52	tr(0.037)		34/34	34/34
	2004 Warm season	0.24	0.27	1.4	tr(0.036)	0.053 [0.018]	37/37	37/37
	2004 Cold season	0.12	0.12	0.91	tr(0.025)		37/37	37/37
	2005 Warm season	0.24	0.26	1.3	tr(0.07)	0.16 [0.05]	37/37	37/37
	2005 Cold season	tr(0.06)	tr(0.07)	0.29	nd		28/37	28/37
	2006 Warm season	0.28	0.32	1.3	nd	0.13 [0.04]	36/37	36/37
	2006 Cold season	0.14	tr(0.12)	0.99	nd		36/37	36/37
	2007 Warm season	0.26	0.27	1.4	0.046	0.011 [0.004]	36/36	36/36
	2007 Cold season	0.093	0.087	0.5	0.026		36/36	36/36
	2008 Warm season	0.17	0.17	1.1	0.037	0.025 [0.009]	37/37	37/37
	2008 Cold season	0.091	0.081	0.31	0.036		37/37	37/37
	2009 Warm season	0.17	0.18	0.82	0.03	0.03 [0.01]	37/37	37/37
	2009 Cold season	0.08	0.08	0.35	tr(0.02)		37/37	37/37
	2010 Warm season	0.20	0.17	1.7	0.04	0.02 [0.01]	37/37	37/37
	2010 Cold season	0.10	0.09	0.41	0.02		37/37	37/37

(Note) No monitoring was conducted from FY 2011 to FY2012.

○ *o,p′*-DDT, *o,p′*-DDE and *o,p′*-DDD

<Surface Water>

Stocktaking of the detection of *o,p′*-DDT, *o,p′*-DDE and *o,p′*-DDD in surface water during FY2002~2010

o,p′-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	5.4	4.6	77	0.19	1.2 [0.4]	114/114	38/38
	2003	6	5	100	tr(1.5)	3 [0.7]	36/36	36/36
	2004	tr(4.5)	5	85	nd	5 [2]	29/38	29/38
	2005	3	3	39	nd	3 [1]	42/47	42/47
	2006	2.8	2.4	52	0.51	2.3 [0.8]	48/48	48/48
	2007	tr(2.1)	tr(2.2)	86	nd	2.5 [0.8]	38/48	38/48
	2008	3.1	3.0	230	nd	1.4 [0.5]	44/48	44/48
	2009	2.4	2.4	100	0.43	0.16 [0.06]	49/49	49/49
	2010	1.5	tr(1.2)	700	nd	1.5 [0.5]	43/49	43/49
o,p′-DDE	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	2.4	2.1	680	nd	0.9 [0.3]	113/114	38/38
	2003	2.2	2.0	170	tr(0.42)	0.8 [0.3]	36/36	36/36
	2004	3	2	170	tr(0.6)	2 [0.5]	38/38	38/38
	2005	2.5	2.1	410	0.4	1.2 [0.4]	47/47	47/47
	2006	tr(1.6)	tr(1.4)	210	nd	2.6 [0.9]	28/48	28/48
	2007	tr(1.5)	tr(1.1)	210	nd	2.3 [0.8]	29/48	29/48
	2008	1.5	1.8	260	nd	0.7 [0.3]	39/48	39/48
	2009	1.3	1.1	140	nd	0.22 [0.09]	47/49	47/49
	2010	0.97	0.65	180	tr(0.13)	0.24 [0.09]	49/49	49/49
o,p′-DDD	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	5.6	6.0	110	nd	0.60 [0.20]	113/114	38/38
	2003	7.1	5.0	160	1.1	0.8 [0.3]	36/36	36/36
	2004	6	5	81	tr(0.7)	2 [0.5]	38/38	38/38
	2005	5.2	5.4	51	tr(0.5)	1.2 [0.4]	47/47	47/47
	2006	2.5	3.3	39	nd	0.8 [0.3]	40/48	40/48
	2007	4.6	3.9	41	tr(0.3)	0.8 [0.3]	48/48	48/48
	2008	6.7	7.2	170	nd	0.8 [0.3]	47/48	47/48
	2009	4.4	3.8	41	0.44	0.22 [0.09]	49/49	49/49
	2010	4.6	3.8	170	tr(0.5)	0.6 [0.2]	49/49	49/49

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted from FY 2011 to FY2012.

＜Sediment＞

Stocktaking of the detection of *o,p′*-DDT, *o,p′*-DDE and *o,p′*-DDD in sediment during FY2002~2010

o,p′-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	76	47	27,000	nd	6 [2]	183/189	62/63
	2003	50	43	3,200	nd	0.8 [0.3]	185/186	62/62
	2004	69	50	17,000	tr(1.1)	2 [0.6]	189/189	63/63
	2005	58	46	160,000	0.8	0.8 [0.3]	189/189	63/63
	2006	57	52	18,000	tr(0.8)	1.2 [0.4]	192/192	64/64
	2007	38	31	27,000	nd	1.8 [0.6]	186/192	63/64
	2008	51	40	140,000	tr(0.7)	1.5 [0.6]	192/192	64/64
	2009	44	30	100,000	nd	1.2 [0.5]	190/192	64/64
	2010	40	33	13,000	1.4	1.1 [0.4]	64/64	64/64

o,p'-DDE	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	54	37	16,000	nd	3 [1]	188/189	63/63
	2003	48	39	24,000	tr(0.5)	0.6 [0.2]	186/186	62/62
	2004	40	34	28,000	nd	3 [0.8]	184/189	63/63
	2005	40	32	31,000	nd	2.6 [0.9]	181/189	62/63
	2006	42	40	27,000	tr(0.4)	1.1 [0.4]	192/192	64/64
	2007	37	41	25,000	nd	1.2 [0.4]	186/192	63/64
	2008	50	48	37,000	nd	1.4 [0.6]	186/192	63/64
	2009	37	31	33,000	nd	0.6 [0.2]	191/192	64/64
	2010	37	32	25,000	tr(0.7)	1.2 [0.5]	64/64	64/64

o,p'-DDD	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	160	150	14,000	nd	6 [2]	184/189	62/63
	2003	160	130	8,800	tr(1.0)	2 [0.5]	186/186	62/62
	2004	140	120	16,000	tr(0.7)	2 [0.5]	189/189	63/63
	2005	130	110	32,000	tr(0.8)	1.0 [0.3]	189/189	63/63
	2006	120	110	13,000	tr(0.3)	0.5 [0.2]	192/192	64/64
	2007	110	130	21,000	tr(0.5)	1.0 [0.4]	192/192	64/64
	2008	170	150	50,000	0.5	0.3 [0.1]	192/192	64/64
	2009	120	120	24,000	0.5	0.5 [0.2]	192/192	64/64
	2010	130	130	6,900	tr(0.8)	0.9 [0.4]	64/64	64/64

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted from FY 2011 to FY2012.

<Wildlife>

Stocktaking of the detection of *o,p'*-DDT in wildlife (bivalves, fish and birds) during FY2002~2010

o,p'-DDT	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	110	83	480	22	12 [4]	38/38	8/8
	2003	130	120	480	35	2.9 [0.97]	30/30	6/6
	2004	160	140	910	20	1.8 [0.61]	31/31	7/7
	2005	98	57	440	29	2.6 [0.86]	31/31	7/7
	2006	92	79	380	24	3 [1]	31/31	7/7
	2007	79	52	350	20	3 [1]	31/31	7/7
	2008	58	37	330	5	3 [1]	31/31	7/7
	2009	74	48	2,500	17	2.2 [0.8]	31/31	7/7
	2010	51	67	160	15	3 [1]	6/6	6/6
Fish (pg/g-wet)	2002	130	130	2,300	tr(6)	12 [4]	70/70	14/14
	2003	85	120	520	2.9	2.9 [0.97]	70/70	14/14
	2004	160	140	1,800	3.7	1.8 [0.61]	70/70	14/14
	2005	100	110	1,500	5.8	2.6 [0.86]	80/80	16/16
	2006	100	110	700	6	3 [1]	80/80	16/16
	2007	69	90	430	3	3 [1]	80/80	16/16
	2008	72	92	720	3	3 [1]	85/85	17/17
	2009	61	73	470	2.4	2.2 [0.8]	90/90	18/18
	2010	58	71	550	5	3 [1]	18/18	18/18
Birds (pg/g-wet)	2002	12	tr(10)	58	nd	12 [4]	8/10	2/2
	2003	24	16	66	8.3	2.9 [0.97]	10/10	2/2
	2004	8.5	13	43	tr(0.87)	1.8 [0.61]	10/10	2/2
	2005	11	14	24	3.4	2.6 [0.86]	10/10	2/2
	2006	14	10	120	3	3 [1]	10/10	2/2
	2007	9	9	26	tr(2)	3 [1]	10/10	2/2
	2008	4	6	16	nd	3 [1]	8/10	2/2
	2009	6.3	7.6	12	tr(1.4)	2.2 [0.8]	10/10	2/2
	2010	nd	---	nd	nd	3 [1]	0/2	0/2

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted from FY 2011 to FY2012.

Stocktaking of the detection of *o,p'*-DDE and *o,p'*-DDD in wildlife (bivalves, fish and birds) during FY2002~2010

o,p'-DDE	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	83	66	1,100	13	3.6 [1.2]	38/38	8/8
	2003	85	100	460	17	3.6 [1.2]	30/30	6/6
	2004	86	69	360	19	2.1 [0.69]	31/31	7/7
	2005	70	89	470	12	3.4 [1.1]	31/31	7/7
	2006	62	81	340	12	3 [1]	31/31	7/7
	2007	56	69	410	8.9	2.3 [0.9]	31/31	7/7
	2008	49	52	390	8	3 [1]	31/31	7/7
	2009	46	58	310	8	3 [1]	31/31	7/7
	2010	46	58	160	7.8	1.5 [0.6]	6/6	6/6
Fish (pg/g-wet)	2002	91	50	13,000	3.6	3.6 [1.2]	70/70	14/14
	2003	51	54	2,500	nd	3.6 [1.2]	67/70	14/14
	2004	76	48	5,800	tr(0.89)	2.1 [0.69]	70/70	14/14
	2005	54	45	12,000	tr(1.4)	3.4 [1.1]	80/80	16/16
	2006	56	43	4,800	tr(1)	3 [1]	80/80	16/16
	2007	45	29	4,400	nd	2.3 [0.9]	79/80	16/16
	2008	50	37	13,000	tr(1)	3 [1]	85/85	17/17
	2009	46	33	4,300	tr(1)	3 [1]	90/90	18/18
	2010	47	37	2,800	tr(1.2)	1.5 [0.6]	18/18	18/18
Birds (pg/g-wet)	2002	28	26	49	20	3.6 [1.2]	10/10	2/2
	2003	tr(2.3)	tr(2.0)	4.2	nd	3.6 [1.2]	9/10	2/2
	2004	tr(1.0)	tr(1.1)	3.7	nd	2.1 [0.69]	5/10	1/2
	2005	tr(1.2)	tr(1.9)	tr(2.9)	nd	3.4 [1.1]	7/10	2/2
	2006	tr(1)	tr(2)	3	tr(1)	3 [1]	10/10	2/2
	2007	tr(1.0)	tr(1.4)	2.8	nd	2.3 [0.9]	6/10	2/2
	2008	tr(1)	nd	3	nd	3 [1]	5/10	1/2
	2009	nd	tr(1)	tr(2)	nd	3 [1]	6/10	2/2
	2010	tr(1.1)	---	3.7	nd	1.5 [0.6]	1/2	1/2

o,p'-DDD	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	120	190	2,900	tr(9)	12 [4]	38/38	8/8
	2003	200	220	1,900	6.5	6.0 [2.0]	30/30	6/6
	2004	220	130	2,800	6.0	5.7 [1.9]	31/31	7/7
	2005	170	280	1,800	10	3.3 [1.1]	31/31	7/7
	2006	150	200	1,000	7	4 [1]	31/31	7/7
	2007	150	200	1,200	6	3 [1]	31/31	7/7
	2008	130	140	1,100	5	4 [2]	31/31	7/7
	2009	95	51	1,000	5	3 [1]	31/31	7/7
	2010	57	50	400	5.8	0.6 [0.2]	6/6	6/6
Fish (pg/g-wet)	2002	95	90	1,100	nd	12 [4]	66/70	14/14
	2003	75	96	920	nd	6.0 [2.0]	66/70	14/14
	2004	120	96	1,700	nd	5.7 [1.9]	68/70	14/14
	2005	83	81	1,400	nd	3.3 [1.1]	79/80	16/16
	2006	80	86	1,100	tr(1)	4 [1]	80/80	16/16
	2007	66	62	1,300	nd	3 [1]	78/80	16/16
	2008	65	74	1,000	nd	4 [2]	80/85	16/17
	2009	63	64	760	nd	3 [1]	87/90	18/18
	2010	75	99	700	2.6	0.6 [0.2]	18/18	18/18
Birds (pg/g-wet)	2002	15	15	23	tr(8)	12 [4]	10/10	2/2
	2003	15	14	36	tr(5.0)	6.0 [2.0]	10/10	2/2
	2004	6.1	5.7	25	nd	5.7 [1.9]	9/10	2/2
	2005	7.3	7.5	9.7	4.7	3.3 [1.1]	10/10	2/2
	2006	8	8	19	5	4 [1]	10/10	2/2
	2007	7	7	10	5	3 [1]	10/10	2/2
	2008	4	tr(3)	14	tr(2)	4 [2]	10/10	2/2
	2009	6	5	13	3	3 [1]	10/10	2/2
	2010	6.3	---	11	3.6	0.6 [0.2]	2/2	2/2

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

(Note 2) No monitoring was conducted from FY 2011 to FY2012.

<Air>

Stocktaking of the detection of *o,p'*-DDT, *o,p'*-DDE and *o,p'*-DDD in air during FY2002~2010

o,p'-DDT	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	2.2	2.0	40	0.41	0.15 [0.05]	102/102	34/34
	2003 Warm season	6.9	7.7	38	0.61	0.12 [0.040]	35/35	35/35
	2003 Cold season	1.6	1.4	6.4	0.43		34/34	34/34
	2004 Warm season	5.1	5.4	22	0.54	0.093 [0.031]	37/37	37/37
	2004 Cold season	1.5	1.4	9.4	0.35		37/37	37/37
	2005 Warm season	3.0	3.1	14	0.67	0.10 [0.034]	37/37	37/37
	2005 Cold season	0.76	0.67	3.0	0.32		37/37	37/37
	2006 Warm season	2.5	2.4	20	0.55	0.09 [0.03]	37/37	37/37
	2006 Cold season	0.90	0.79	3.9	0.37		37/37	37/37
	2007 Warm season	2.9	2.6	19	0.24	0.03 [0.01]	36/36	36/36
	2007 Cold season	0.77	0.63	3.4	0.31		36/36	36/36
	2008 Warm season	2.3	2.1	18	0.33	0.03 [0.01]	37/37	37/37
	2008 Cold season	0.80	0.62	6.5	0.32		37/37	37/37
	2009 Warm season	2.3	2.2	14	0.33	0.019 [0.008]	37/37	37/37
	2009 Cold season	0.80	0.71	3.7	0.20		37/37	37/37
	2010 Warm season	2.2	1.9	26	0.19	0.14 [0.05]	37/37	37/37
	2010 Cold season	0.81	0.69	5.5	0.22		37/37	37/37

o,p'-DDE	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	0.60	0.56	8.5	0.11	0.03 [0.01]	102/102	34/34
	2003 Warm season	1.4	1.5	7.5	0.17	0.020 [0.0068]	35/35	35/35
	2003 Cold season	0.50	0.47	1.7	0.18		34/34	34/34
	2004 Warm season	1.1	1.2	8.9	0.14	0.037 [0.012]	37/37	37/37
	2004 Cold season	0.53	0.49	3.9	0.14		37/37	37/37
	2005 Warm season	1.6	1.5	7.9	0.33	0.074 [0.024]	37/37	37/37
	2005 Cold season	0.62	0.59	2.0	0.24		37/37	37/37
	2006 Warm season	1.1	1.1	7.4	nd	0.09 [0.03]	36/37	36/37
	2006 Cold season	0.65	0.56	2.6	0.19		37/37	37/37
	2007 Warm season	0.66	0.67	7	0.096	0.017 [0.007]	36/36	36/36
	2007 Cold season	0.3	0.29	3.7	0.12		36/36	36/36
	2008 Warm season	0.48	0.52	5.0	0.11	0.025 [0.009]	37/37	37/37
	2008 Cold season	0.30	0.24	1.1	0.15		37/37	37/37
	2009 Warm season	0.51	0.46	6.7	0.098	0.016 [0.006]	37/37	37/37
	2009 Cold season	0.27	0.24	23	0.072		37/37	37/37
	2010 Warm season	0.49	0.41	9.0	0.09	0.04 [0.01]	37/37	37/37
	2010 Cold season	0.27	0.23	2.3	0.08		37/37	37/37

o,p'-DDD	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	0.14	0.18	0.85	nd	0.021 [0.007]	97/102	33/34
	2003 Warm season	0.37	0.42	1.3	0.059	0.042 [0.014]	35/35	35/35
	2003 Cold season	0.15	0.14	0.42	0.062		34/34	34/34
	2004 Warm season	0.31	0.33	2.6	tr(0.052)	0.14 [0.048]	37/37	37/37
	2004 Cold season	0.14	tr(0.13)	0.86	nd		35/37	35/37
	2005 Warm season	0.22	0.19	0.90	tr(0.07)	0.10 [0.03]	37/37	37/37
	2005 Cold season	tr(0.07)	tr(0.07)	0.21	nd		35/37	35/37
	2006 Warm season	0.28	0.28	1.4	tr(0.05)	0.10 [0.03]	37/37	37/37
	2006 Cold season	0.12	0.11	0.79	nd		34/37	34/37
	2007 Warm season	0.28	0.29	1.9	0.05	0.05 [0.02]	36/36	36/36
	2007 Cold season	0.095	0.09	0.33	tr(0.03)		36/36	36/36
	2008 Warm season	0.19	0.16	1.6	0.05	0.04 [0.01]	37/37	37/37
	2008 Cold season	0.10	0.09	0.26	0.04		37/37	37/37
	2009 Warm season	0.20	0.19	0.90	0.04	0.03 [0.01]	37/37	37/37
	2009 Cold season	0.08	0.08	0.28	tr(0.02)		37/37	37/37
	2010 Warm season	0.21	0.19	1.8	0.04	0.03 [0.01]	37/37	37/37
	2010 Cold season	0.10	0.09	0.48	tr(0.02)		37/37	37/37

(Note) No monitoring was conducted from FY 2011 to FY2012.

[7] Chlordanes

・ History and state of monitoring

Chlordanes were used as insecticides, but the registration of Chlordanes under the Agricultural Chemicals Regulation Law was expired in FY 1968. The substances were designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in September 1986 because of its properties such as persistency, since it had been used as termitecides for wood products such as primary processed timber, plywood and house.

Although manufactured Chlordanes have complicated compositions, heptachlor, γ-chlordane, heptachlor epoxide, *cis*-chlordane, *trans*-chlordane, oxychlordane (as a chlordane metabolite), *cis*-nonachlor (not registrated as an Agricultural Chemical) and *trans*-nonachlor (not registrated as an Agricultural Chemical) were the original target chemicals in monitoring series. Since FY 1983, 5 of those 8 chemicals (*cis*-chlordane, *trans*-chlordane, oxychlordane, *cis*-nonachlor and *trans*-nonachlor) have been the target chemicals owning to their high detection frequency in the FY 1982 High-Pre*cis*ion Environmental Survey.

In previous monitoring series, Chlordanes had been monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～2001 under the framework of " the Wildlife Monitoring. " Under the framework of "the Surface Water/Sediment Monitoring", *cis*-chlordane, *trans*-chlordane, *cis*-nonachlor and *trans*-nonachlor in surface water and sediment have been the monitored during the period of FY 1986～1998 and FY 1986～2001, respectively.

Under the framework of the Environmental Monitoring, *cis*-chlordane, *trans*-chlordane, oxychlordane (as a chlordane metabolite), *cis*-nonachlor (not registrated as an Agricultural Chemical) and *trans*-nonachlor have been monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air since FY 2002.

・ Monitoring results

○ *cis*-Chlordane and *trans*-Chlordane

<Surface Water>

cis-chlordane: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.6pg/L, and the detection range was 10～350pg/L. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendency in specimens from sea areas was identified as statistically significant.

trans-chlordane: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.8pg/L, and the detection range was 12～300pg/L.

Stocktaking of the detection of *cis*-chlordane and *trans*-chlordane in surface water FY2002~2012

cis-chlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2002	42	32	880	2.5	0.9 [0.3]	114/114	38/38
	2003	69	51	920	12	3 [0.9]	36/36	36/36
	2004	92	87	1,900	10	6 [2]	38/38	38/38
	2005	53	54	510	6	4 [1]	47/47	47/47
	2006	31	26	440	5	5 [2]	48/48	48/48
	2007	23	22	680	nd	4 [2]	47/48	47/48
	2008	29	29	480	2.9	1.6 [0.6]	48/48	48/48
	2009	29	26	710	4.4	1.1 [0.4]	49/49	49/49
	2010	19	14	170	nd	11 [4]	47/49	47/49
	2011	20	16	500	3.8	1.4 [0.6]	49/49	49/49
	2012	43	37	350	10	1.6 [0.6]	48/48	48/48

trans-chlordane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	33	24	780	3.1	1.5 [0.5]	114/114	38/38
	2003	34	30	410	6	5 [2]	36/36	36/36
	2004	32	26	1,200	5	5 [2]	38/38	38/38
	2005	25	21	200	3	4 [1]	47/47	47/47
	2006	24	16	330	tr(4)	7 [2]	48/48	48/48
	2007	16	20	580	nd	2.4 [0.8]	47/48	47/48
	2008	23	22	420	3	3 [1]	48/48	48/48
	2009	23	18	690	3.0	0.8 [0.3]	49/49	49/49
	2010	15	tr(11)	310	nd	13 [4]	44/49	44/49
	2011	16	13	470	3.2	1.0 [0.4]	49/49	49/49
	2012	41	33	300	12	2.5 [0.8]	48/48	48/48

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

<Sediment>

cis-chlordane:The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 1.0pg/g-dry, and the detection range was tr(2.6)～11,000 pg/g-dry. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas ,lake areas ,river mouth areas and sea areas were identified as statistically significant and reduction tendency in specimens from the overall areas was also identified as statistically significant.

trans-chlordane:The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 1.3pg/g-dry, and the detection range was tr(2.9)～13,000 pg/g-dry. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas was identified as statistically significant and reduction tendency in specimens from the overall sediments was also identified as statistically significant.

Stocktaking of the detection of *cis*-chlordane and *trans*-chlordane in sediment FY2002~2012

cis-chlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	140	98	18,000	1.8	0.9 [0.3]	189/189	63/63
	2003	190	140	19,000	tr(3.6)	4 [2]	186/186	62/62
	2004	160	97	36,000	4	4 [2]	189/189	63/63
	2005	150	100	44,000	3.3	1.9 [0.64]	189/189	63/63
	2006	100	70	13,000	tr(0.9)	2.4 [0.8]	192/192	64/64
	2007	82	55	7,500	nd	5 [2]	191/192	64/64
	2008	100	63	11,000	tr(2.3)	2.4 [0.9]	192/192	64/64
	2009	84	61	8,600	2.0	0.7 [0.3]	192/192	64/64
	2010	82	62	7,200	tr(4)	6 [2]	64/64	64/64
	2011	70	58	4,500	1.7	1.1 [0.4]	64/64	64/64
	2012	69	61	11,000	tr(2.6)	2.9 [1.0]	63/63	63/63
trans-chlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	150	110	16,000	2.1	1.8 [0.6]	189/189	63/63
	2003	130	100	13,000	tr(2.4)	4 [2]	186/186	62/62
	2004	110	80	26,000	3	3 [0.9]	189/189	63/63
	2005	110	81	32,000	3.4	2.3 [0.84]	189/189	63/63
	2006	110	76	12,000	2.2	1.1 [0.4]	192/192	64/64
	2007	82	58	7,500	nd	2.2 [0.8]	191/192	64/64
	2008	110	66	10,000	2.4	2.0 [0.8]	192/192	64/64
	2009	91	68	8,300	2.1	1.7 [0.7]	192/192	64/64
	2010	95	69	8,000	tr(4)	11 [4]	64/64	64/64
	2011	73	64	4,300	3.2	1.3 [0.5]	64/64	64/64
	2012	80	71	13,000	tr(2.9)	4.0 [1.3]	63/63	63/63

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Wildlife>

cis-chlordane: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 2pg/g-wet, and the detection range was 180～3,500 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 2pg/g-wet, and the detection range was 98～3,100pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 2pg/g-wet, and the detection range was 5～110 pg/g-wet.

trans-chlordane: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 2pg/g-wet, and the detection range was 140～1,300 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 2pg/g-wet, and the detection range was 19～1,100 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 2pg/g-wet, and the detection range was tr(4)～10 pg/g-wet.

Stocktaking of the detection of *cis*-chlordane in wildlife (bivalves, fish and birds) FY2002~2012

cis-chlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	730	1,200	26,000	24	2.4 [0.8]	38/38	8/8
	2003	1,100	1,400	14,000	110	3.9 [1.3]	30/30	6/6
	2004	1,300	1,600	14,000	91	18 [5.8]	31/31	7/7
	2005	1,000	960	13,000	78	12 [3.9]	31/31	7/7
	2006	970	1,100	18,000	67	4 [1]	31/31	7/7
	2007	870	590	19,000	59	5 [2]	31/31	7/7
	2008	750	560	11,000	85	5 [2]	31/31	7/7
	2009	1,200	1,100	16,000	83	4 [2]	31/31	7/7
	2010	1,600	2,300	15,000	67	4 [2]	6/6	6/6
	2011	790	880	3,400	160	3 [1]	4/4	4/4
	2012	710	500	3,500	180	5 [2]	5/5	5/5
Fish (pg/g-wet)	2002	610	550	6,900	57	2.4 [0.8]	70/70	14/14
	2003	510	400	4,400	43	3.9 [1.3]	70/70	14/14
	2004	620	490	9,800	68	18 [5.8]	70/70	14/14
	2005	520	600	8,000	42	12 [3.9]	80/80	16/16
	2006	520	420	4,900	56	4 [1]	80/80	16/16
	2007	430	360	5,200	30	5 [2]	80/80	16/16
	2008	430	340	3,500	36	5 [2]	85/85	17/17
	2009	430	450	3,200	41	4 [2]	90/90	18/18
	2010	450	630	3,400	51	4 [2]	18/18	18/18
	2011	580	660	3,800	79	3 [1]	18/18	18/18
	2012	580	550	3,100	98	5 [2]	19/19	19/19
Birds (pg/g-wet)	2002	67	180	450	10	2.4 [0.8]	10/10	2/2
	2003	47	120	370	6.8	3.9 [1.3]	10/10	2/2
	2004	39	110	240	tr(5.8)	18 [5.8]	10/10	2/2
	2005	53	120	340	tr(5.8)	12 [3.9]	10/10	2/2
	2006	32	83	250	5	4 [1]	10/10	2/2
	2007	29	83	230	tr(4)	5 [2]	10/10	2/2
	2008	24	87	280	tr(3)	5 [2]	10/10	2/2
	2009	21	48	130	4	4 [2]	10/10	2/2
	2010	27	---	180	4	4 [2]	2/2	2/2
	2011	---	---	6	6	3 [1]	1/1	1/1
	2012	23	---	110	5	5 [2]	2/2	2/2

trans-chlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Bivalves (pg/g-wet)	2002	390	840	2,300	33	2.4 [0.8]	38/38	8/8
	2003	550	840	2,800	69	7.2 [2.4]	30/30	6/6
	2004	560	770	2,800	53	48 [16]	31/31	7/7
	2005	470	660	2,400	40	10 [3.5]	31/31	7/7
	2006	470	580	2,800	41	4 [2]	31/31	7/7
	2007	440	460	1,500	34	6 [2]	31/31	7/7
	2008	360	410	1,300	52	7 [3]	31/31	7/7
	2009	540	560	16,000	48	4 [1]	31/31	7/7
	2010	520	640	5,500	31	3 [1]	6/6	6/6
	2011	490	470	2,900	150	4 [1]	4/4	4/4
	2012	390	310	1,300	140	7 [2]	5/5	5/5
Fish (pg/g-wet)	2002	190	160	2,700	20	2.4 [0.8]	70/70	14/14
	2003	160	120	1,800	9.6	7.2 [2.4]	70/70	14/14
	2004	200	130	5,200	tr(17)	48 [16]	70/70	14/14
	2005	160	180	3,100	tr(9.8)	10 [3.5]	76/80	16/16
	2006	150	120	2,000	14	4 [2]	80/80	16/16
	2007	130	100	2,100	8	6 [2]	80/80	16/16
	2008	120	71	1,300	14	7 [3]	85/85	17/17
	2009	130	140	1,300	10	4 [1]	90/90	18/18
	2010	120	170	1,100	9	3 [1]	18/18	18/18
	2011	180	240	1,300	20	4 [1]	18/18	18/18
	2012	170	140	1,100	19	7 [2]	19/19	19/19
Birds (pg/g-wet)	2002	14	14	26	8.9	2.4 [0.8]	10/10	2/2
	2003	11	12	27	tr(5.9)	7.2 [2.4]	10/10	2/2
	2004	nd	nd	tr(26)	nd	48 [16]	5/10	1/2
	2005	11	12	30	tr(4.5)	10 [3.5]	10/10	2/2
	2006	7	8	17	tr(3)	4 [2]	10/10	2/2
	2007	7	8	19	tr(3)	6 [2]	10/10	2/2
	2008	tr(5)	9	27	nd	7 [3]	7/10	2/2
	2009	6	7	13	tr(3)	4 [1]	10/10	2/2
	2010	4	---	10	tr(2)	3 [1]	2/2	2/2
	2011	---	---	5	5	4 [1]	1/1	1/1
	2012	tr(6)	---	10	tr(4)	7 [2]	2/2	2/2

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

＜Air＞

cis-chlordane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.51pg/m^3, and the detection range was 2.9～650 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.51pg/m^3, and none of the detected concentrations exceeded 74pg/m^3. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendency in specimens at the warm season and the cold season were identified as statistically significant.

trans-chlordane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.7pg/m^3, and the detection range was 2.8～780 pg/m^3.For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.7pg/m^3, and none of the detected concentrations exceeded 95 pg/m^3. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendencies in specimens at the warm season was identified as statistically significant.

Stocktaking of the detection of *cis*-chlordane and *trans*-chlordane in air during FY2002~2012

cis-chlordane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	31	40	670	0.86	0.60 [0.20]	102/102	34/34
	2003 Warm season	110	120	1,600	6.4	0.51 [0.17]	35/35	35/35
	2003 Cold season	30	38	220	2.5		34/34	34/34
	2004 Warm season	92	160	1,000	2.3	0.57 [0.19]	37/37	37/37
	2004 Cold season	29	49	290	1.2		37/37	37/37
	2005 Warm season	92	120	1,000	3.4	0.16 [0.054]	37/37	37/37
	2005 Cold season	16	19	260	1.4		37/37	37/37
	2006 Warm season	82	110	760	2.9	0.13 [0.04]	37/37	37/37
	2006 Cold season	19	19	280	2.0		37/37	37/37
	2007 Warm season	90	120	1,100	3.3	0.10 [0.04]	36/36	36/36
	2007 Cold season	17	20	230	1.4		36/36	36/36
	2008 Warm season	75	120	790	1.9	0.14 [0.05]	37/37	37/37
	2008 Cold season	21	34	200	1.5		37/37	37/37
	2009 Warm season	67	110	790	2.7	0.16 [0.06]	37/37	37/37
	2009 Cold season	19	22	180	0.65		37/37	37/37
	2010 Warm season	68	100	700	1.8	0.17 [0.06]	37/37	37/37
	2010 Cold season	20	27	130	0.84		37/37	37/37
	2011 Warm season	66	95	700	1.5	1.3 [0.42]	35/35	35/35
	2011 Cold season	20	31	240	tr(0.88)		37/37	37/37
	2012 Warm season	61	98	650	2.9	1.5 [0.51]	36/36	36/36
	2012 Cold season	10	14	74	nd		35/36	35/36

trans-chlordane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	36	48	820	0.62	0.60 [0.20]	102/102	34/34
	2003 Warm season	130	150	2,000	6.5	0.86 [0.29]	35/35	35/35
	2003 Cold season	37	44	290	2.5		34/34	34/34
	2004 Warm season	110	190	1,300	2.2	0.69 [0.23]	37/37	37/37
	2004 Cold season	35	60	360	1.5		37/37	37/37
	2005 Warm season	100	130	1,300	3.2	0.34 [0.14]	37/37	37/37
	2005 Cold season	19	23	310	1.9		37/37	37/37
	2006 Warm season	96	140	1,200	3.4	0.17 [0.06]	37/37	37/37
	2006 Cold season	22	21	350	2.0		37/37	37/37
	2007 Warm season	100	140	1,300	3.8	0.12 [0.05]	36/36	36/36
	2007 Cold season	20	24	300	1.5		36/36	36/36
	2008 Warm season	87	130	990	2.5	0.17 [0.06]	37/37	37/37
	2008 Cold season	25	41	250	1.8		37/37	37/37
	2009 Warm season	79	120	960	2.6	0.12 [0.05]	37/37	37/37
	2009 Cold season	23	30	210	0.68		37/37	37/37
	2010 Warm season	79	120	820	2.0	1.2 [0.4]	37/37	37/37
	2010 Cold season	24	34	150	tr(1.0)		37/37	37/37
	2011 Warm season	76	110	810	tr(1.4)	1.6 [0.53]	35/35	35/35
	2011 Cold season	24	37	290	tr(0.70)		37/37	37/37
	2012 Warm season	70	120	780	2.8	2.1 [0.7]	36/36	36/36
	2012 Cold season	12	18	95	nd		35/36	35/36

○ Oxychlordane, *cis*-Nonachlor and *trans*-Nonachlor

<Surface Water>

Oxychlordane: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 44 pf the 48 valid sites adopting the detection limit of 0.4pg/L, and none of the detected concentrations exceeded 17 pg/L.

cis-Nonachlor: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.3pg/L, and the detection range was 1.1～58 pg/L.

trans-Nonachlor: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.6pg/L, and the detection range was 7.9～210 pg/L. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas was identified as statistically significant.

Stocktaking of the detection of Oxychlordane, *cis*-Nonachlor and *trans*-Nonachlor in surface water during FY2002~2012

Oxychlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2002	2.7	3.5	41	nd	1.2 [0.4]	96/114	35/38
	2003	3	2	39	tr(0.6)	2 [0.5]	36/36	36/36
	2004	3.2	2.9	47	tr(0.7)	2 [0.5]	38/38	38/38
	2005	2.6	2.1	19	nd	1.1 [0.4]	46/47	46/47
	2006	tr(2.5)	tr(2.4)	18	nd	2.8 [0.9]	43/48	43/48
	2007	tr(2)	nd	41	nd	6 [2]	25/48	25/48
	2008	1.9	1.9	14	nd	1.9 [0.7]	40/48	40/48
	2009	2.0	1.9	19	nd	1.1 [0.4]	45/49	45/49
	2010	1.5	1.3	45	nd	0.7 [0.3]	47/49	47/49
	2011	1.9	1.8	34	nd	1.3 [0.5]	44/49	44/49
	2012	2.2	2.3	17	nd	0.9 [0.4]	44/48	44/48
cis-Nonachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2002	7.9	6.7	250	0.23	1.8 [0.6]	114/114	38/38
	2003	8.0	7.0	130	1.3	0.3 [0.1]	36/36	36/36
	2004	7.5	6.3	340	0.8	0.6 [0.2]	38/38	38/38
	2005	6.0	5.9	43	0.9	0.5 [0.2]	47/47	47/47
	2006	6.6	5.6	83	1.0	0.8 [0.3]	48/48	48/48
	2007	5.9	6.1	210	nd	2.4 [0.8]	43/48	43/48
	2008	6.5	5.9	130	0.9	0.9 [0.3]	48/48	48/48
	2009	7.1	5.5	210	1.4	0.3 [0.1]	49/49	49/49
	2010	5.4	3.9	40	tr(0.9)	1.3 [0.4]	49/49	49/49
	2011	5.0	4.3	130	0.8	0.6 [0.2]	49/49	49/49
	2012	6.4	5.9	58	1.1	0.8 [0.3]	48/48	48/48
trans-Nonachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2002	30	24	780	1.8	1.2 [0.4]	114/114	38/38
	2003	26	20	450	4	2 [0.5]	36/36	36/36
	2004	25	19	1,100	tr(3)	4 [2]	38/38	38/38
	2005	20	17	150	2.6	2.5 [0.84]	47/47	47/47
	2006	21	16	310	3.2	3.0 [1.0]	48/48	48/48
	2007	17	17	540	tr(2)	5 [2]	48/48	48/48
	2008	18	17	340	1.9	1.6 [0.6]	48/48	48/48
	2009	20	17	530	2.7	1.0 [0.4]	49/49	49/49
	2010	12	11	93	nd	8 [3]	45/49	45/49
	2011	15	12	480	2.6	1.3 [0.5]	49/49	49/49
	2012	30	26	210	7.9	1.5 [0.6]	48/48	48/48

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

<Sediment>

Oxychlordane: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 38 of the 63 valid sites adopting the detection limit of 0.7pg/g-dry, and none of the detected concentrations exceeded 75 pg/g-dry. As results of the inter-annual trend analysis from FY 2003 to FY 2012, the second-half period indicated lower concentration than the first-half period in specimens from overall sediments as statistically significant.

cis-Nonachlor: The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 1pg/g-dry, and the detection range was tr(1)～4,900 pg/g-dry. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas, river mouth areas and sea areas were identified as statistically significant.

trans-Nonachlor: The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 0.8pg/g-dry, and the detection range was 2.5～10,000 pg/g-dry. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river mouth areas and sea areas were identified as statistically significant and reduction tendency in specimens from the overall sediments was also identified as statistically significant.

Stocktaking of the detection of Oxychlordane, *cis*-Nonachlor and *trans*-Nonachlor in sediment during FY2002~2012

Oxychlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	2.7	1.7	120	nd	1.5 [0.5]	153/189	59/63
	2003	2	2	85	nd	1 [0.4]	158/186	57/62
	2004	tr(2.1)	tr(1.3)	140	nd	3 [0.8]	129/189	54/63
	2005	2.3	tr(1.9)	160	nd	2.0 [0.7]	133/189	51/63
	2006	tr(2.5)	tr(1.7)	280	nd	2.9 [1.0]	141/192	54/64
	2007	tr(2.1)	tr(1.5)	76	nd	2.5 [0.9]	117/192	46/64
	2008	tr(2)	tr(1)	340	nd	3 [1]	110/192	48/64
	2009	2	tr(1)	150	nd	2 [1]	97/192	45/64
	2010	1.7	1.2	60	nd	1.0 [0.4]	56/64	56/64
	2011	tr(1.6)	tr(1.2)	83	nd	2.2 [0.9]	36/64	36/64
	2012	tr(1.4)	tr(1.0)	75	nd	1.7 [0.7]	38/63	38/63
cis-Nonachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	76	66	7,800	nd	2.1 [0.7]	188/189	63/63
	2003	66	50	6,500	nd	3 [0.9]	184/186	62/62
	2004	53	34	9,400	tr(0.8)	2 [0.6]	189/189	63/63
	2005	56	42	9,900	tr(1.1)	1.9 [0.64]	189/189	63/63
	2006	58	48	5,800	tr(0.6)	1.2 [0.4]	192/192	64/64
	2007	48	35	4,200	nd	1.6 [0.6]	191/192	64/64
	2008	57	42	5,100	1.1	0.6 [0.2]	192/192	64/64
	2009	53	38	4,700	1.4	1.0 [0.4]	192/192	64/64
	2010	53	45	3,600	2.3	0.9 [0.3]	64/64	64/64
	2011	41	38	2,900	nd	1.1 [0.4]	63/64	63/64
	2012	44	35	4,900	tr(1)	3 [1]	63/63	63/63

trans-Nonachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	130	83	13,000	3.1	1.5 [0.5]	189/189	63/63
	2003	110	78	11,000	2	2 [0.6]	186/186	62/62
	2004	94	63	23,000	3	2 [0.6]	189/189	63/63
	2005	99	72	24,000	2.4	1.5 [0.54]	189/189	63/63
	2006	100	65	10,000	3.4	1.2 [0.4]	192/192	64/64
	2007	78	55	8,400	tr(1.6)	1.7 [0.6]	192/192	64/64
	2008	91	53	8,400	tr(1.6)	2.2 [0.8]	192/192	64/64
	2009	85	58	7,800	2.0	0.9 [0.3]	192/192	64/64
	2010	80	65	6,200	tr(3)	6 [2]	64/64	64/64
	2011	68	52	4,500	1.7	0.8 [0.3]	64/64	64/64
	2012	69	62	10,000	2.5	2.4 [0.8]	63/63	63/63

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

＜Wildlife＞

Oxychlordane: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 12～450 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 28～390 pg/g-wet. For birds, the presence of the substance was monitored in 2 area, and it was detected at all 2 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 170～360 pg/g-wet.

cis-Nonachlor: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 52～670 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 33～2,200 pg/g-wet. For birds, the presence of the substance was monitored in 2 area, and it was detected at all 2 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 56～100 pg/g-wet.

trans-Nonachlor: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 190～1,800 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 140～4,200 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 270～480 pg/g-wet.

Stocktaking of the detection of Oxychlordane, *cis*-Nonachlor and *trans*-Nonachlor in wildlife (bivalves, fish and birds) during FY2002~2012

Oxychlordane	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2002	71	83	5,600	nd	3.6 [1.2]	37/38	8/8
	2003	93	62	1,900	11	8.4 [2.8]	30/30	6/6
	2004	110	100	1,700	14	9.2 [3.1]	31/31	7/7
	2005	99	79	1,400	12	9.3 [3.1]	31/31	7/7
	2006	91	90	2,400	7	7 [3]	31/31	7/7
	2007	70	43	2,200	8	6 [2]	31/31	7/7
	2008	64	55	1,100	7	7 [2]	31/31	7/7
	2009	100	89	820	10	4 [1]	31/31	7/7
	2010	240	390	3,300	11	8 [3]	6/6	6/6
	2011	68	100	260	8	3 [1]	4/4	4/4
	2012	66	80	450	12	3 [1]	5/5	5/5
Fish (pg/g-wet)	2002	170	140	3,900	16	3.6 [1.2]	70/70	14/14
	2003	150	160	820	30	8.4 [2.8]	70/70	14/14
	2004	160	140	1,500	25	9.2 [3.1]	70/70	14/14
	2005	150	150	1,900	20	9.3 [3.1]	80/80	16/16
	2006	150	120	3,000	28	7 [3]	80/80	16/16
	2007	120	100	1,900	17	6 [2]	80/80	16/16
	2008	130	130	2,200	15	7 [2]	85/85	17/17
	2009	120	99	2,400	23	4 [1]	90/90	18/18
	2010	120	140	1,000	33	8 [3]	18/18	18/18
	2011	140	130	2,300	33	3 [1]	18/18	18/18
	2012	140	180	390	28	3 [1]	19/19	19/19
Birds (pg/g-wet)	2002	640	630	890	470	3.6 [1.2]	10/10	2/2
	2003	760	700	1,300	610	8.4 [2.8]	10/10	2/2
	2004	460	450	730	320	9.2 [3.1]	10/10	2/2
	2005	610	660	860	390	9.3 [3.1]	10/10	2/2
	2006	510	560	720	270	7 [3]	10/10	2/2
	2007	440	400	740	290	6 [2]	10/10	2/2
	2008	560	530	960	290	7 [2]	10/10	2/2
	2009	300	290	540	190	4 [1]	10/10	2/2
	2010	400	---	510	320	8 [3]	2/2	2/2
	2011	---	---	590	590	3 [1]	1/1	1/1
	2012	250	---	360	170	3 [1]	2/2	2/2

cis-Nonachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Bivalves (pg/g-wet)	2002	170	300	870	8.6	1.2 [0.4]	38/38	8/8
	2003	290	260	1,800	48	4.8 [1.6]	30/30	6/6
	2004	320	380	1,800	43	3.4 [1.1]	31/31	7/7
	2005	270	220	1,300	27	4.5 [1.5]	31/31	7/7
	2006	270	180	1,500	31	3 [1]	31/31	7/7
	2007	250	250	1,000	26	3 [1]	31/31	7/7
	2008	210	210	780	33	4 [1]	31/31	7/7
	2009	300	310	10,000	31	3 [1]	31/31	7/7
	2010	280	310	1,300	35	3 [1]	6/6	6/6
	2011	250	280	1,300	77	1.8 [0.7]	4/4	4/4
	2012	200	190	670	52	2 [1]	5/5	5/5
Fish (pg/g-wet)	2002	460	420	5,100	46	1.2 [0.4]	70/70	14/14
	2003	360	360	2,600	19	4.8 [1.6]	70/70	14/14
	2004	430	310	10,000	48	3.4 [1.1]	70/70	14/14
	2005	380	360	6,200	27	4.5 [1.5]	80/80	16/16
	2006	370	330	3,300	33	3 [1]	80/80	16/16
	2007	320	280	3,700	16	3 [1]	80/80	16/16
	2008	350	300	3,200	46	4 [1]	85/85	17/17
	2009	340	340	2,600	27	3 [1]	90/90	18/18
	2010	320	370	2,200	23	3 [1]	18/18	18/18
	2011	440	450	2,900	45	1.8 [0.7]	18/18	18/18
	2012	420	450	2,200	33	2 [1]	19/19	19/19
Birds (pg/g-wet)	2002	200	240	450	68	1.2 [0.4]	10/10	2/2
	2003	200	260	660	68	4.8 [1.6]	10/10	2/2
	2004	140	150	240	73	3.4 [1.1]	10/10	2/2
	2005	160	180	370	86	4.5 [1.5]	10/10	2/2
	2006	120	130	270	60	3 [1]	10/10	2/2
	2007	130	140	300	42	3 [1]	10/10	2/2
	2008	140	150	410	37	4 [1]	10/10	2/2
	2009	81	85	160	44	3 [1]	10/10	2/2
	2010	100	---	190	57	3 [1]	2/2	2/2
	2011	---	---	76	76	1.8 [0.7]	1/1	1/1
	2012	75	---	100	56	2 [1]	2/2	2/2

trans-Nonachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Bivalves (pg/g-wet)	2002	450	1,100	1,800	21	2.4 [0.8]	38/38	8/8
	2003	800	700	3,800	140	3.6 [1.2]	30/30	6/6
	2004	780	870	3,400	110	13 [4.2]	31/31	7/7
	2005	700	650	3,400	72	6.2 [2.1]	31/31	7/7
	2006	660	610	3,200	85	3 [1]	31/31	7/7
	2007	640	610	2,400	71	7 [3]	31/31	7/7
	2008	510	510	2,000	94	6 [2]	31/31	7/7
	2009	780	680	33,000	79	3 [1]	31/31	7/7
	2010	790	870	6,000	84	4 [2]	6/6	6/6
	2011	640	680	3,000	200	3 [1]	4/4	4/4
	2012	530	400	1,800	190	4 [1]	5/5	5/5
Fish (pg/g-wet)	2002	1,000	900	8,300	98	2.4 [0.8]	70/70	14/14
	2003	920	840	5,800	85	3.6 [1.2]	70/70	14/14
	2004	1,100	760	21,000	140	13 [4.2]	70/70	14/14
	2005	970	750	13,000	80	6.2 [2.1]	80/80	16/16
	2006	940	680	6,900	120	3 [1]	80/80	16/16
	2007	800	680	7,900	71	7 [3]	80/80	16/16
	2008	860	750	6,900	87	6 [2]	85/85	17/17
	2009	810	720	7,400	68	3 [1]	90/90	18/18
	2010	800	---	4,700	110	4 [2]	18/18	18/18
	2011	1,100	1,000	5,000	190	3 [1]	18/18	18/18
	2012	1,100	1,300	4,200	140	4 [1]	19/19	19/19
Birds (pg/g-wet)	2002	890	980	1,900	350	2.4 [0.8]	10/10	2/2
	2003	1,100	1,400	3,700	350	3.6 [1.2]	10/10	2/2
	2004	690	780	1,200	390	13 [4.2]	10/10	2/2
	2005	870	880	2,000	440	6.2 [2.1]	10/10	2/2
	2006	650	620	1,500	310	3 [1]	10/10	2/2
	2007	590	680	1,400	200	7 [3]	10/10	2/2
	2008	740	850	2,600	180	6 [2]	10/10	2/2
	2009	400	430	730	220	3 [1]	10/10	2/2
	2010	510	---	880	290	4 [2]	2/2	2/2
	2011	---	---	400	400	3 [1]	1/1	1/1
	2012	360	---	480	270	4 [1]	2/2	2/2

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Air>

Oxychlordane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.03pg/m^3, and the detection range was 0.34～6.7 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.03pg/m^3, and the detection range was 0.22～1.0 pg/m^3. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendency in specimens at the warm season was identified as statistically significant.

cis-Nonachlor: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.05pg/m^3, and the detection range was 0.29～89 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.05pg/m^3, and the detection range was tr(0.05)～10 pg/m^3. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendency in specimens at the warm season was identified as statistically significant.

trans-Nonachlor: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.41pg/m^3, and the detection range was 2.5～510 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.41pg/m^3, and the detection range was tr(0.50)～61 pg/m^3. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendency in specimens at the warm season was identified as statistically significant.

Stocktaking of the detection of Oxychlordane, *cis*-Nonachlor and *trans*-Nonachlor in air during FY2002~2012

Oxychlordane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2002	0.96	0.98	8.3	nd	0.024 [0.008]	101/102	34/34
	2003 Warm season	2.5	2.7	12	0.41	0.045 [0.015]	35/35	35/35
	2003 Cold season	0.87	0.88	3.2	0.41		34/34	34/34
	2004 Warm season	1.9	2.0	7.8	0.41	0.13 [0.042]	37/37	37/37
	2004 Cold season	0.80	0.76	3.9	0.27		37/37	37/37
	2005 Warm season	1.9	2.0	8.8	0.65	0.16 [0.054]	37/37	37/37
	2005 Cold season	0.55	0.50	2.2	0.27		37/37	37/37
	2006 Warm season	1.8	1.9	5.7	0.47	0.23 [0.08]	37/37	37/37
	2006 Cold season	0.54	0.56	5.1	tr(0.13)		37/37	37/37
	2007 Warm season	1.9	1.8	8.6	0.56	0.05 [0.02]	36/36	36/36
	2007 Cold season	0.61	0.63	2.4	0.26		36/36	36/36
	2008 Warm season	1.7	1.7	7.1	0.50	0.04 [0.01]	37/37	37/37
	2008 Cold season	0.61	0.63	1.8	0.27		37/37	37/37
	2009 Warm season	1.7	1.8	6.5	0.38	0.04 [0.02]	37/37	37/37
	2009 Cold season	0.65	0.61	2.7	0.24		37/37	37/37
	2010 Warm season	1.5	1.5	6.2	0.44	0.03 [0.01]	37/37	37/37
	2010 Cold season	0.56	0.55	2.3	0.26		37/37	37/37
	2011 Warm season	1.5	1.5	5.2	0.28	0.07 [0.03]	35/35	35/35
	2011 Cold season	0.61	0.57	2.6	0.21		37/37	37/37
	2012 Warm season	1.4	1.6	6.7	0.34	0.08 [0.03]	36/36	36/36
	2012 Cold season	0.41	0.38	1.0	0.22		36/36	36/36

cis-Nonachlor	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	3.1	4.0	62	0.071	0.030 [0.010]	102/102	34/34
	2003 Warm season	12	15	220	0.81	0.026 [0.0088]	35/35	35/35
	2003 Cold season	2.7	3.5	23	0.18		34/34	34/34
	2004 Warm season	10	15	130	0.36	0.072 [0.024]	37/37	37/37
	2004 Cold season	2.7	4.4	28	0.087		37/37	37/37
	2005 Warm season	10	14	160	0.30	0.08 [0.03]	37/37	37/37
	2005 Cold season	1.6	1.6	34	0.08		37/37	37/37
	2006 Warm season	11	12	170	0.28	0.15 [0.05]	37/37	37/37
	2006 Cold season	2.4	2.0	41	tr(0.14)		37/37	37/37
	2007 Warm season	10	14	150	0.31	0.03 [0.01]	36/36	36/36
	2007 Cold season	1.6	1.7	22	0.09		36/36	36/36
	2008 Warm season	7.9	12	87	0.18	0.03 [0.01]	37/37	37/37
	2008 Cold season	2.0	2.7	19	0.16		37/37	37/37
	2009 Warm season	7.5	10	110	0.33	0.04 [0.02]	37/37	37/37
	2009 Cold season	1.9	2.1	18	0.07		37/37	37/37
	2010 Warm season	7.5	10	68	0.23	0.11 [0.04]	37/37	37/37
	2010 Cold season	1.8	2.1	13	tr(0.06)		37/37	37/37
	2011 Warm season	7.4	8.8	89	0.24	0.15 [0.051]	35/35	35/35
	2011 Cold season	1.9	2.9	28	nd		36/37	36/37
	2012 Warm season	6.9	11	89	0.29	0.12 [0.05]	36/36	36/36
	2012 Cold season	0.98	1.1	10	tr(0.05)		36/36	36/36

trans-Nonachlor	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	24	30	550	0.64	0.30 [0.10]	102/102	34/34
	2003 Warm season	87	100	1,200	5.1	0.35 [0.12]	35/35	35/35
	2003 Cold season	24	28	180	2.1		34/34	34/34
	2004 Warm season	72	120	870	1.9	0.48 [0.16]	37/37	37/37
	2004 Cold season	23	39	240	0.95		37/37	37/37
	2005 Warm season	75	95	870	3.1	0.13 [0.044]	37/37	37/37
	2005 Cold season	13	16	210	1.2		37/37	37/37
	2006 Warm season	68	91	800	3.0	0.10 [0.03]	37/37	37/37
	2006 Cold season	16	15	240	1.4		37/37	37/37
	2007 Warm season	72	96	940	2.5	0.09 [0.03]	36/36	36/36
	2007 Cold season	13	15	190	1.1		36/36	36/36
	2008 Warm season	59	91	650	1.5	0.09 [0.03]	37/37	37/37
	2008 Cold season	17	25	170	1.3		37/37	37/37
	2009 Warm season	54	81	630	2.2	0.07 [0.03]	37/37	37/37
	2009 Cold season	16	19	140	0.75		37/37	37/37
	2010 Warm season	52	78	520	1.7	0.8 [0.3]	37/37	37/37
	2010 Cold season	15	17	89	tr(0.7)		37/37	37/37
	2011 Warm season	53	72	550	1.2	1.1 [0.35]	35/35	35/35
	2011 Cold season	16	24	210	tr(0.70)		37/37	37/37
	2012 Warm season	49	79	510	2.5	1.2 [0.41]	36/36	36/36
	2012 Cold season	8.1	10	61	tr(0.50)		36/36	36/36

[8] Heptachlors

・ History and state of monitoring

Heptachlor and its metabolite, heptachlor epoxide, are a group of organochlorine insecticides applied for agricultural crops such as rice, wheat, barley, potato, sweet potato, tobacco, beans, cruciferous vegetables, alliaceous vegetables, cucurbitaceous vegetables, sugar beet and spinach. The substances were not registrated under the Agricultural Chemicals Regulation Law in FY 1975. The substances were designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in September 1986, since it includes the technical chlordane used as a termitecide.

In previous monitoring series before FY 2001, heptachlor and heptachlor epoxide were measured in FY 1982 (in surface water, sediment and fish) and in FY 1986 (in air) under the framework of "the Environmental Survey and Monitoring of Chemicals."

Under the framework of the Environmental Monitoring, Heptachlor in water, sediment, and fish has been monitored since FY 2002, and *cis*-Heptachlor epoxide and *trans*-Heptachlor epoxide have also been monitored since FY 2003.

Under the framework of the Environmental Monitoring, the substances in sediment, wildlife (bivalves, fish and birds) and air were monitored in FY 2012.

・ Monitoring results

○ heptachlor, *cis*-heptachlor epoxide, and *trans*-heptachlor epoxide

<Surface Water>

Stocktaking of the detection of heptachlor*, cis*-heptachlor epocide and *trans*-heptachlor epocide in surface water during FY2002~2011

Heptachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	tr(1.2)	tr(1.0)	25	nd	1.5 [0.5]	97/114	38/38
	2003	tr(1.8)	tr(1.6)	7	tr(1.0)	2 [0.5]	36/36	36/36
	2004	nd	nd	29	nd	5 [2]	9/38	9/38
	2005	nd	tr(1)	54	nd	3 [1]	25/47	25/47
	2006	nd	nd	6	nd	5 [2]	5/48	5/48
	2007	nd	nd	5.2	nd	2.4 [0.8]	12/48	12/48
	2008	nd	nd	4.6	nd	2.1 [0.8]	19/48	19/48
	2009	tr(0.5)	nd	17	nd	0.8 [0.3]	20/49	20/49
	2010	nd	nd	43	nd	2.2 [0.7]	4/49	4/49
	2011	nd	nd	22	nd	1.3 [0.5]	6/49	6/49

cis-Heptachlor epoxide	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2003	9.8	11	170	1.2	0.7 [0.2]	36/36	36/36
	2004	10	10	77	2	2 [0.4]	38/38	38/38
	2005	7.1	6.6	59	1.0	0.7 [0.2]	47/47	47/47
	2006	7.6	6.6	47	1.1	2.0 [0.7]	48/48	48/48
	2007	6.1	5.8	120	tr(0.9)	1.3 [0.4]	48/48	48/48
	2008	4.7	5.0	37	nd	0.6 [0.2]	46/48	46/48
	2009	5.5	4.2	72	0.8	0.5 [0.2]	49/49	49/49
	2010	5.9	3.9	710	0.7	0.4 [0.2]	49/49	49/49
	2011	5.8	5.8	160	0.7	0.7 [0.3]	49/49	49/49

trans-Heptachlor epoxide	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Surface Water (pg/L)	2003	nd	nd	2	nd	2 [0.4]	4/36	4/36
	2004	nd	nd	nd	nd	0.9 [0.3]	0/38	0/38
	2005	nd	nd	nd	nd	0.7 [0.2]	0/47	0/47
	2006	nd	nd	nd	nd	1.8 [0.6]	0/48	0/48
	2007	nd	nd	tr(0.9)	nd	2.0 [0.7]	2/48	2/48
	2008	nd	nd	nd	nd	1.9 [0.7]	0/48	0/48
	2009	nd	nd	nd	nd	0.7 [0.3]	0/49	0/49
	2010	nd	nd	8.0	nd	1.3 [0.5]	2/49	2/49
	2011	nd	nd	2.8	nd	0.8 [0.3]	3/49	3/49

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.
(Note 2) No monitoring was conducted in FY2012.

<Sediment>

Stocktaking of the detection of heptachlor, *cis*-heptachlor epocide and *trans*-heptachlor epocide in sediment during FY2002~2011

Heptachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Sediment (pg/g-dry)	2002	4.1	3.2	120	nd	1.8 [0.6]	167/189	60/63
	2003	tr(2.7)	tr(2.2)	160	nd	3 [1.0]	138/186	53/62
	2004	tr(2.8)	tr(2.3)	170	nd	3 [0.9]	134/189	53/63
	2005	3.1	2.8	200	nd	2.5 [0.8]	120/189	48/63
	2006	5.2	3.9	230	nd	1.9 [0.6]	190/192	64/64
	2007	tr(1.8)	tr(1.5)	110	nd	3.0 [0.7]	143/192	57/64
	2008	tr(1)	nd	85	nd	4 [1]	59/192	27/64
	2009	1.6	1.3	65	nd	1.1 [0.4]	144/192	59/64
	2010	1.2	tr(0.8)	35	nd	1.1 [0.4]	51/64	51/64
	2011	tr(1.3)	tr(1.2)	48	nd	1.8 [0.7]	40/64	40/64
cis-Heptachlor epoxide	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Sediment (pg/g-dry)	2003	4	3	160	nd	3 [1]	153/186	55/62
	2004	tr(5)	tr(3)	230	nd	6 [2]	136/189	52/63
	2005	tr(4)	tr(3)	140	nd	7 [2]	119/189	49/63
	2006	4.0	3.2	210	nd	3.0 [1.0]	157/192	58/64
	2007	3	tr(2)	270	nd	3 [1]	141/192	53/64
	2008	3	2	180	nd	2 [1]	130/192	51/64
	2009	2.7	1.9	290	nd	0.7 [0.3]	176/192	63/64
	2010	3.1	2.4	300	nd	0.8 [0.3]	62/64	62/64
	2011	2.8	2.5	160	nd	0.6 [0.2]	63/64	63/64
trans-Heptachlor epoxide	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Sediment (pg/g-dry)	2003	nd	nd	nd	nd	9 [3]	0/186	0/62
	2004	nd	nd	tr(2.5)	nd	4 [2]	1/189	1/63
	2005	nd	nd	nd	nd	5 [2]	0/189	0/63
	2006	nd	nd	19	nd	7 [2]	2/192	2/64
	2007	nd	nd	31	nd	10 [4]	2/192	2/64
	2008	nd	nd	nd	nd	1.7 [0.7]	0/192	0/64
	2009	nd	nd	nd	nd	1.4 [0.6]	0/192	0/64
	2010	nd	nd	4	nd	3 [1]	1/64	1/64
	2011	nd	nd	2.4	nd	2.3 [0.9]	2/64	2/64

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.
(Note 2) No monitoring was conducted in FY 2012.

<Wildlife>

Heptachlor: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 1pg/g-wet, and none of the detected concentrations exceeded 13 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 10 of the 19 valid areas adopting the detection limit of 1pg/g-wet, and none of the detected concentrations exceeded 5 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was not detected at all 2 valid areas adopting the detection range of 1pg/g-wet.

cis-heptachlor epoxide: The presence of the substance in bivalves was monitored in 5 areas, and it was detected all 5 valid areas adopting the detection limit of 0.6pg/g-wet, and the detection range was 6.2～180 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 0.6 pg/g-wet, and the detection range was 6.9～120 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 2 valid areas adopting the detection limit of 0.6pg/g-wet, and the detection range was 150～170 pg/g-wet.

trans-heptachlor epoxide: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 1 of the 5 valid areas adopting the detection limit of 3pg/g-wet, and none of the detected concentrations exceeded tr(4) pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was not detected at all 19 valid areas adopting the detection limit of 3pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was not detected at all 2 valid areas adopting the detection limit of 3pg/g-wet.

Stocktaking of the detection of heptachlor, *cis*-heptachlor amd *trans*-heptachlor in wildlife (bivalves, fish and birds) during FY2002~2012

Heptachlor	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2002	tr(3.5)	4.6	15	nd	4.2 [1.4]	28/38	6/8
	2003	tr(2.8)	tr(2.4)	14	nd	6.6 [2.2]	16/30	4/6
	2004	tr(3.4)	5.2	16	nd	4.1 [1.4]	23/31	6/7
	2005	tr(2.9)	tr(2.9)	24	nd	6.1 [2.0]	18/31	6/7
	2006	tr(4)	tr(4)	20	nd	6 [2]	23/31	6/7
	2007	tr(3)	tr(3)	12	nd	6 [2]	20/31	6/7
	2008	tr(2)	nd	9	nd	6 [2]	13/31	5/7
	2009	tr(4)	nd	120	nd	5 [2]	14/31	4/7
	2010	3	tr(2)	78	nd	3 [1]	5/6	5/6
	2011	4	4	51	nd	3 [1]	3/4	3/4
	2012	tr(3)	tr(3)	13	nd	4 [1]	4/5	4/5
Fish (pg/g-wet)	2002	4.2	4.8	20	nd	4.2 [1.4]	57/70	12/14
	2003	nd	nd	11	nd	6.6 [2.2]	29/70	8/14
	2004	tr(2.3)	tr(2.1)	460	nd	4.1 [1.4]	50/70	11/14
	2005	nd	nd	7.6	nd	6.1 [2.0]	32/80	8/16
	2006	tr(2)	nd	8	nd	6 [2]	36/80	8/16
	2007	tr(2)	nd	7	nd	6 [2]	28/80	6/16
	2008	nd	nd	9	nd	6 [2]	25/85	7/17
	2009	tr(2)	nd	8	nd	5 [2]	30/90	11/18
	2010	tr(2)	tr(2)	5	nd	3 [1]	12/18	12/18
	2011	tr(1)	tr(1)	7	nd	3 [1]	13/18	13/18
	2012	nd	tr(1)	5	nd	4 [1]	10/19	10/19
Birds (pg/g-wet)	2002	tr(1.7)	tr(2.8)	5.2	nd	4.2 [1.4]	7/10	2/2
	2003	nd	nd	nd	nd	6.6 [2.2]	0/10	0/2
	2004	nd	nd	tr(1.5)	nd	4.1 [1.4]	1/10	1/2
	2005	nd	nd	nd	nd	6.1 [2.0]	0/10	0/2
	2006	nd	nd	nd	nd	6 [2]	0/10	0/2
	2007	nd	nd	nd	nd	6 [2]	0/10	0/2
	2008	nd	nd	nd	nd	6 [2]	0/10	0/2
	2009	nd	nd	nd	nd	5 [2]	0/10	0/2
	2010	nd	nd	tr(1)	nd	3 [1]	1/2	1/2
	2011	---	---	nd	nd	3 [1]	0/1	0/1
	2012	nd	---	nd	nd	4 [1]	0/2	0/2

cis-Heptachlor epoxide	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2003	44	29	880	9.7	6.9 [2.3]	30/30	6/6
	2004	64	34	840	tr(9.8)	9.9 [3.3]	31/31	7/7
	2005	49	20	590	7.4	3.5 [1.2]	31/31	7/7
	2006	56	23	1,100	8	4 [1]	31/31	7/7
	2007	37	20	1,100	8	4 [1]	31/31	7/7
	2008	37	19	510	8	5 [2]	31/31	7/7
	2009	59	33	380	10	3 [1]	31/31	7/7
	2010	170	260	1,800	9.0	2.4 [0.9]	6/6	6/6
	2011	55	110	320	3.9	2.0 [0.8]	4/4	4/4
	2012	48	120	180	6.2	1.5 [0.6]	5/5	5/5
Fish (pg/g-wet)	2003	43	43	320	7.0	6.9 [2.3]	70/70	14/14
	2004	51	49	620	tr(3.3)	9.9 [3.3]	70/70	14/14
	2005	41	45	390	4.9	3.5 [1.2]	80/80	16/16
	2006	42	48	270	4	4 [1]	80/80	16/16
	2007	43	49	390	4	4 [1]	80/80	16/16
	2008	39	46	350	tr(3)	5 [2]	85/85	17/17
	2009	41	50	310	4	3 [1]	90/90	18/18
	2010	39	49	230	5.0	2.4 [0.9]	18/18	18/18
	2011	50	62	540	3.2	2.0 [0.8]	18/18	18/18
	2012	41	62	120	6.9	1.5 [0.6]	19/19	19/19
Birds (pg/g-wet)	2003	540	510	770	370	6.9 [2.3]	10/10	2/2
	2004	270	270	350	190	9.9 [3.3]	10/10	2/2
	2005	370	340	690	250	3.5 [1.2]	10/10	2/2
	2006	330	310	650	240	4 [1]	10/10	2/2
	2007	280	270	350	250	4 [1]	10/10	2/2
	2008	370	370	560	180	5 [2]	10/10	2/2
	2009	220	210	390	160	3 [1]	10/10	2/2
	2010	290	300	360	240	2.4 [0.9]	2/2	2/2
	2011	---	---	410	410	2.0 [0.8]	1/1	1/1
	2012	160	---	170	150	1.5 [0.6]	2/2	2/2

trans-Heptachlor epoxide	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2003	nd	nd	48	nd	13 [4.4]	5/30	1/6
	2004	nd	nd	55	nd	12 [4.0]	9/31	2/7
	2005	nd	nd	37	nd	23 [7.5]	5/31	1/7
	2006	nd	nd	45	nd	13 [5]	5/31	1/7
	2007	nd	nd	61	nd	13 [5]	5/31	1/7
	2008	nd	nd	33	nd	10 [4]	5/31	1/7
	2009	tr(3)	nd	24	nd	8 [3]	13/31	3/7
	2010	3	tr(2)	24	nd	3 [1]	3/6	3/6
	2011	nd	nd	tr(6)	nd	7 [3]	1/4	1/4
	2012	nd	nd	tr(4)	nd	8 [3]	1/5	1/5
Fish (pg/g-wet)	2003	nd	nd	nd	nd	13 [4.4]	0/70	0/14
	2004	nd	nd	tr(10)	nd	12 [4.0]	2/70	2/14
	2005	nd	nd	nd	nd	23 [7.5]	0/80	0/16
	2006	nd	nd	nd	nd	13 [5]	0/80	0/16
	2007	nd	nd	nd	nd	13 [5]	0/80	0/16
	2008	nd	nd	nd	nd	10 [4]	0/85	0/17
	2009	nd	nd	nd	nd	8 [3]	0/90	0/18
	2010	nd	nd	nd	nd	3 [1]	0/18	0/18
	2011	nd	nd	nd	nd	7 [3]	0/18	0/18
	2012	nd	nd	nd	nd	8 [3]	0/19	0/19
Birds (pg/g-wet)	2003	nd	nd	nd	nd	13 [4.4]	0/10	0/2
	2004	nd	nd	nd	nd	12 [4.0]	0/10	0/2
	2005	nd	nd	nd	nd	23 [7.5]	0/10	0/2
	2006	nd	nd	nd	nd	13 [5]	0/10	0/2
	2007	nd	nd	nd	nd	13 [5]	0/10	0/2
	2008	nd	nd	nd	nd	10 [4]	0/10	0/2
	2009	nd	nd	nd	nd	8 [3]	0/10	0/2
	2010	nd	nd	nd	nd	3 [1]	0/2	0/2
	2011	---	---	nd	nd	7 [3]	0/1	0/1
	2012	nd	---	nd	nd	8 [3]	0/2	0/2

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Air>

Heptachlor: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.14pg/m³, and the detection range was 0.46～58 pg/m³. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.14pg/m³, and the detection value was 20 pg/m³. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens at the warm season and the cold season were identified as statistically significant.

cis-heptachlor epoxide: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.02pg/m³, and the detection range was 0.37～6.3 pg/m³. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.02pg/m³, and the detection range was 0.30～1.9 pg/m³.

trans-heptachlor epoxide: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 8 of the 36 valid sites adopting the detection limit of 0.05pg/m³, and none of the detected concentrations exceeded tr(0.08) pg/gm³. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was not detected at all 36 valid sites adopting the detection limit of 0.05pg/m³.

Stocktaking of the detection of heptachlor, *cis*-heptachlor epocide and *trans*-heptachlor epocide in air during FY2002~2012

Heptachlor	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	11	14	220	0.20	0.12 [0.04]	102/102	34/34
	2003 Warm season	27	41	240	1.1	0.25 [0.085]	35/35	35/35
	2003 Cold season	10	16	65	0.39		34/34	34/34
	2004 Warm season	23	36	200	0.46	0.23 [0.078]	37/37	37/37
	2004 Cold season	11	18	100	0.53		37/37	37/37
	2005 Warm season	25	29	190	1.1	0.16 [0.054]	37/37	37/37
	2005 Cold season	6.5	7.9	61	0.52		37/37	37/37
	2006 Warm season	20	27	160	0.88	0.11 [0.04]	37/37	37/37
	2006 Cold season	6.8	7.2	56	0.32		37/37	37/37
	2007 Warm season	22	27	320	1.1	0.07 [0.03]	36/36	36/36
	2007 Cold season	6.3	8.0	74	0.42		36/36	36/36
	2008 Warm season	20	31	190	0.92	0.06 [0.02]	37/37	37/37
	2008 Cold season	7.5	12	60	0.51		37/37	37/37
	2009 Warm season	18	30	110	0.48	0.04 [0.01]	37/37	37/37
	2009 Cold season	6.3	7.8	48	0.15		37/37	37/37
	2010 Warm season	17	26	160	0.69	0.11 [0.04]	37/37	37/37
	2010 Cold season	7.2	9.5	53	0.22		37/37	37/37
	2011 Warm season	16	25	110	0.73	0.30 [0.099]	35/35	35/35
	2011 Cold season	6.1	10	56	tr(0.13)		37/37	37/37
	2012 Warm season	13	21	58	0.46	0.41 [0.14]	36/36	36/36
	2012 Warm season	3.2	4.9	20	nd		35/36	35/36

cis-Heptachlor epoxide	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2002	3.5	3.5	28	0.45	0.015 [0.0048]	35/35	35/35
	2003 Warm season	1.3	1.3	6.6	0.49		34/34	34/34
	2003 Cold season	2.8	2.9	9.7	0.65	0.052 [0.017]	37/37	37/37
	2004 Warm season	1.1	1.1	7.0	0.44		37/37	37/37
	2004 Cold season	1.5	1.7	11	tr(0.10)	0.12 [0.044]	37/37	37/37
	2005 Warm season	0.91	0.81	2.9	0.43		37/37	37/37
	2005 Cold season	1.7	2.0	6.7	0.13	0.11 [0.04]	37/37	37/37
	2006 Warm season	0.74	0.88	3.2	nd		36/37	36/37
	2006 Cold season	2.9	2.8	13	0.54	0.03 [0.01]	36/36	36/36
	2007 Warm season	0.93	0.82	3.0	0.41		36/36	36/36
	2007 Cold season	2.4	2.2	9.9	0.53	0.022 [0.008]	37/37	37/37
	2008 Warm season	0.91	0.84	3.0	0.37		37/37	37/37
	2008 Cold season	2.5	2.6	16	0.37	0.03 [0.01]	37/37	37/37
	2009 Warm season	1.0	0.91	3.8	0.42		37/37	37/37
	2009 Cold season	2.3	2.3	10	0.38	0.02 [0.01]	37/37	37/37
	2010 Warm season	0.93	0.85	4.3	0.33		37/37	37/37
	2011 Warm season	2.0	2.3	6.0	0.29	0.04 [0.01]	35/35	35/35
	2011 Cold season	0.90	0.90	2.8	0.35		37/37	37/37
	2012 Warm season	2.0	2.1	6.3	0.37	0.05 [0.02]	36/36	36/36
	2012 Warm season	0.62	0.57	1.9	0.30		36/36	36/36

trans-Heptachlor epoxide	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2003 Warm season	tr(0.036)	tr(0.038)	0.30	nd	0.099 [0.033]	18/35	18/35
	2003 Cold season	nd	nd	tr(0.094)	nd		3/34	3/34
	2004 Warm season	nd	nd	tr(0.38)	nd	0.6 [0.2]	4/37	4/37
	2004 Cold season	nd	nd	nd	nd		0/37	0/37
	2005 Warm season	tr(0.10)	tr(0.12)	1.2	nd	0.16 [0.05]	27/37	27/37
	2005 Cold season	nd	nd	0.32	nd		3/37	3/37
	2006 Warm season	nd	nd	0.7	nd	0.3 [0.1]	2/37	2/37
	2006 Cold season	nd	nd	tr(0.1)	nd		1/37	1/37
	2007 Warm season	nd	nd	0.16	nd	0.14 [0.06]	8/36	8/36
	2007 Cold season	nd	nd	tr(0.06)	nd		1/36	1/36
	2008 Warm season	nd	nd	0.17	nd	0.16 [0.06]	6/37	6/37
	2008 Cold season	nd	nd	nd	nd		0/37	0/37
	2009 Warm season	nd	nd	0.18	nd	0.14 [0.05]	10/37	10/37
	2009 Cold season	nd	nd	tr(0.06)	nd		1/37	1/37
	2010 Warm season	nd	nd	0.16	nd	0.16 [0.06]	6/37	6/37
	2010 Warm season	nd	nd	nd	nd		0/37	0/37
	2011 Warm season	nd	nd	0.14	nd	0.13 [0.05]	5/35	5/35
	2011 Cold season	nd	nd	nd	nd		0/37	0/37
	2012 Warm season	nd	nd	tr(0.08)	nd	0.12 [0.05]	8/36	8/36
	2012 Warm season	nd	nd	nd	nd		0/36	0/36

[9] Toxaphenes (reference)

・ History and state of monitoring

Toxaphenes are a group of organochlorine insecticides. No domestic record of manufacture/import of the substances was reported since those were historically never registrated under the Agricultural Chemicals Regulation Law. The substances were designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in September 2002.

In previous monitoring series before FY 2001, the substance was measured in FY 1983 (in surface water and sediment) under the framework of "the Environmental Survey and Monitoring of Chemicals."

Under the framework of the Environmental Monitoring, Parlar-26, Parlar-50 and Parlar-62 had been monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air from FY 2003 to FY 2009.

No monitoring was conducted from FY 2010 to FY 2012. For reference, the monitoring results up to FY 2009 are given below.

・ Monitoring results until FY 2009

○ Parlar-26, Parlar-50, and Parlar-62

<Surface Water>

Stocktaking of the detection of Parlar-26, Parlar-50 and Parlar-62 in surface water during FY2003~2009

Parlar-26	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2003	nd	nd	nd	nd	40 [20]	0/36	0/36
	2004	nd	nd	nd	nd	9 [3]	0/38	0/38
	2005	nd	nd	nd	nd	10 [4]	0/47	0/47
	2006	nd	nd	nd	nd	16 [5]	0/48	0/48
	2007	nd	nd	nd	nd	20 [5]	0/48	0/48
	2008	nd	nd	nd	nd	8 [3]	0/48	0/48
	2009	nd	nd	nd	nd	5 [2]	0/49	0/49
Parlar-50	**Monitored year**	**Geometric mean**	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Surface Water (pg/L)	2003	nd	nd	nd	nd	70 [30]	0/36	0/36
	2004	nd	nd	nd	nd	20 [7]	0/38	0/38
	2005	nd	nd	nd	nd	20 [5]	0/47	0/47
	2006	nd	nd	nd	nd	16 [5]	0/48	0/48
	2007	nd	nd	nd	nd	9 [3]	0/48	0/48
	2008	nd	nd	nd	nd	7 [3]	0/48	0/48
	2009	nd	nd	nd	nd	7 [3]	0/49	0/49
Parlar-62	**Monitored year**	**Geometric mean**	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Surface Water (pg/L)	2003	nd	nd	nd	nd	300 [90]	0/36	0/36
	2004	nd	nd	nd	nd	90 [30]	0/38	0/38
	2005	nd	nd	nd	nd	70[30]	0/47	0/47
	2006	nd	nd	nd	nd	60 [20]	0/48	0/48
	2007	nd	nd	nd	nd	70 [30]	0/48	0/48
	2008	nd	nd	nd	nd	40 [20]	0/48	0/48
	2009	nd	nd	nd	nd	40 [20]	0/49	0/49

<Sediment>

Stocktaking of the detection of Parlar-26, Parlar-50 and Parlar-62 in sediment during FY2003~2009

Parlar-26	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2003	nd	nd	nd	nd	90 [30]	0/186	0/62
	2004	nd	nd	nd	nd	60 [20]	0/189	0/63
	2005	nd	nd	nd	nd	60 [30]	0/189	0/63
	2006	nd	nd	nd	nd	12 [4]	0/192	0/64
	2007	nd	nd	nd	nd	7 [3]	0/192	0/64
	2008	nd	nd	nd	nd	12 [5]	0/192	0/64
	2009	nd	nd	nd	nd	10 [4]	0/192	0/64
Parlar-50	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2003	nd	nd	nd	nd	200 [50]	0/186	0/62
	2004	nd	nd	nd	nd	60 [20]	0/189	0/63
	2005	nd	nd	nd	nd	90 [40]	0/189	0/63
	2006	nd	nd	nd	nd	24 [7]	0/192	0/64
	2007	nd	nd	nd	nd	30 [10]	0/192	0/64
	2008	nd	nd	nd	nd	17 [6]	0/192	0/64
	2009	nd	nd	nd	nd	12 [5]	0/192	0/64
Parlar-62	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2003	nd	nd	nd	nd	4,000 [2,000]	0/186	0/62
	2004	nd	nd	nd	nd	2,000 [400]	0/189	0/63
	2005	nd	nd	nd	nd	2,000 [700]	0/189	0/63
	2006	nd	nd	nd	nd	210 [60]	0/192	0/64
	2007	nd	nd	nd	nd	300 [70]	0/192	0/64
	2008	nd	nd	nd	nd	90 [40]	0/192	0/64
	2009	nd	nd	nd	nd	80 [30]	0/192	0/64

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2003~FY2009.

<Wildlife>

Stocktaking of the detection of Parlar-26, Parlar-50 and Parlar-62 in wildlife (bivalves, fish and birds) during FY2003~2009

Parlar-26	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2003	nd	nd	tr(39)	nd	45 [15]	11/30	3/6
	2004	nd	nd	tr(32)	nd	42 [14]	15/31	3/7
	2005	nd	nd	tr(28)	nd	47 [16]	7/31	4/7
	2006	tr(9)	tr(12)	25	nd	18 [7]	21/31	5/7
	2007	tr(7)	tr(8)	20	nd	10 [4]	26/31	6/7
	2008	tr(7)	tr(8)	22	nd	9 [3]	27/31	7/7
	2009	9	9	23	nd	7 [3]	27/31	7/7
Fish (pg/g-wet)	2003	tr(28)	tr(24)	810	nd	45 [15]	44/70	11/14
	2004	43	tr(41)	1,000	nd	42 [14]	54/70	13/14
	2005	tr(42)	53	900	nd	47 [16]	50/75	13/16
	2006	41	44	880	nd	18 [7]	70/80	15/16
	2007	24	32	690	nd	10 [4]	64/80	14/16
	2008	35	33	730	nd	9 [3]	79/85	17/17
	2009	25	20	690	nd	7 [3]	82/90	18/18
Birds (pg/g-wet)	2003	120	650	2,500	nd	45 [15]	5/10	1/2
	2004	70	340	810	nd	42 [14]	5/10	1/2
	2005	86	380	1,200	nd	47 [16]	5/10	1/2
	2006	48	290	750	nd	18 [7]	5/10	1/2
	2007	34	280	650	nd	10 [4]	5/10	1/2
	2008	38	320	1,200	nd	9 [3]	6/10	2/2
	2009	26	200	500	nd	7 [3]	6/10	2/2

Parlar-50	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2003	tr(12)	tr(12)	58	nd	33 [11]	17/30	4/6
	2004	tr(15)	nd	tr(45)	nd	46 [15]	15/31	3/7
	2005	nd	nd	tr(38)	nd	54 [18]	9/31	4/7
	2006	tr(10)	14	32	nd	14 [5]	24/31	6/7
	2007	9	10	37	nd	9 [3]	27/31	7/7
	2008	tr(7)	tr(6)	23	nd	10 [4]	23/31	6/7
	2009	9	9	31	nd	8 [3]	27/31	7/7
Fish (pg/g-wet)	2003	35	34	1,100	nd	33 [11]	55/70	14/14
	2004	60	61	1,300	nd	46 [15]	59/70	14/14
	2005	tr(52)	66	1,400	nd	54 [18]	55/80	13/16
	2006	56	52	1,300	nd	14 [5]	79/80	16/16
	2007	35	41	1,100	nd	9 [3]	77/80	16/16
	2008	44	45	1,000	nd	10 [4]	77/85	17/17
	2009	30	23	910	nd	8 [3]	85/90	18/18
Birds (pg/g-wet)	2003	110	850	3,000	nd	33 [11]	5/10	1/2
	2004	83	440	1,000	nd	46 [15]	5/10	1/2
	2005	100	480	1,500	nd	54 [18]	5/10	1/2
	2006	46	380	1,000	nd	14 [5]	5/10	1/2
	2007	34	360	930	nd	9 [3]	5/10	1/2
	2008	49	410	1,600	nd	10 [4]	5/10	1/2
	2009	29	250	620	nd	8 [3]	5/10	1/2

Parlar-62	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2003	nd	nd	nd	nd	120 [40]	0/30	0/6
	2004	nd	nd	nd	nd	98 [33]	0/31	0/7
	2005	nd	nd	nd	nd	100 [34]	0/31	0/7
	2006	nd	nd	nd	nd	70 [30]	0/31	0/7
	2007	nd	nd	nd	nd	70 [30]	0/31	0/7
	2008	nd	nd	nd	nd	80 [30]	0/31	0/7
	2009	nd	nd	nd	nd	70 [20]	0/31	0/7
Fish (pg/g-wet)	2003	nd	nd	580	nd	120 [40]	9/70	3/14
	2004	nd	nd	870	nd	98 [33]	24/70	7/14
	2005	nd	nd	830	nd	100 [34]	23/80	8/16
	2006	tr(30)	nd	870	nd	70 [30]	28/80	10/16
	2007	tr(30)	nd	530	nd	70 [30]	22/80	7/16
	2008	tr(30)	nd	590	nd	80 [30]	31/85	8/17
	2009	tr(20)	nd	660	nd	70 [20]	24/90	8/18
Birds (pg/g-wet)	2003	tr(96)	200	530	nd	120 [40]	5/10	1/2
	2004	tr(64)	110	280	nd	98 [33]	5/10	1/2
	2005	tr(78)	130	460	nd	100 [34]	5/10	1/2
	2006	70	120	430	nd	70 [30]	5/10	1/2
	2007	tr(60)	100	300	nd	70 [30]	5/10	1/2
	2008	tr(70)	130	360	nd	80 [30]	5/10	1/2
	2009	tr(40)	80	210	nd	70 [20]	5/10	1/2

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2003~FY2009.

<Air>

Stocktaking of the detection of Parlar-26, Parlar-50 and Parlar-62 in air during FY2003~2009

Parlar-26	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m³)	2003 Warm season	0.31	0.31	0.77	tr(0.17)	0.20 [0.066]	35/35	35/35
	2003 Cold season	tr(0.17)	tr(0.17)	0.27	tr(0.091)		34/34	34/34
	2004 Warm season	0.27	0.26	0.46	tr(0.17)	0.20 [0.066]	37/37	37/37
	2004 Cold season	tr(0.15)	tr(0.15)	0.50	tr(0.094)		37/37	37/37
	2005 Warm season	nd	nd	nd	nd	0.3 [0.1]	0/37	0/37
	2005 Cold season	nd	nd	nd	nd		0/37	0/37
	2006 Warm season	nd	nd	nd	nd	1.8 [0.6]	0/37	0/37
	2006 Cold season	nd	nd	nd	nd		0/37	0/37
	2007 Warm season	nd	nd	tr(0.3)	nd	0.6 [0.2]	18/36	18/36
	2007 Cold season	nd	nd	nd	nd		0/36	0/36
	2008 Warm season	tr(0.21)	0.22	0.58	tr(0.12)	0.22 [0.08]	37/37	37/37
	2008 Cold season	tr(0.11)	tr(0.12)	tr(0.20)	nd		36/37	36/37
	2009 Warm season	tr(0.18)	tr(0.19)	0.26	tr(0.11)	0.23 [0.09]	37/37	37/37
	2009 Cold season	tr(0.12)	tr(0.13)	0.27	nd		33/37	33/37

Parlar-50	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m³)	2003 Warm season	nd	nd	tr(0.37)	nd	0.81 [0.27]	2/35	2/35
	2003 Cold season	nd	nd	nd	nd		0/34	0/34
	2004 Warm season	nd	nd	nd	nd	1.2 [0.4]	0/37	0/37
	2004 Cold season	nd	nd	nd	nd		0/37	0/37
	2005 Warm season	nd	nd	nd	nd	0.6 [0.2]	0/37	0/37
	2005 Cold season	nd	nd	nd	nd		0/37	0/37
	2006 Warm season	nd	nd	nd	nd	1.6 [0.5]	0/37	0/37
	2006 Cold season	nd	nd	nd	nd		0/37	0/37
	2007 Warm season	nd	tr(0.1)	tr(0.2)	nd	0.3 [0.1]	29/36	29/36
	2007 Cold season	nd	nd	nd	nd		0/36	0/36
	2008 Warm season	nd	nd	tr(0.19)	nd	0.25 [0.09]	15/37	15/37
	2008 Cold season	nd	nd	nd	nd		0/37	0/37
	2009 Warm season	nd	nd	tr(0.1)	nd	0.3 [0.1]	11/37	11/37
	2009 Cold season	nd	nd	tr(0.1)	nd		1/37	1/37

Parlar-62	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m³)	2003 Warm season	nd	nd	nd	nd	1.6 [0.52]	0/35	0/35
	2003 Cold season	nd	nd	nd	nd		0/34	0/34
	2004 Warm season	nd	nd	nd	nd	2.4 [0.81]	0/37	0/37
	2004 Cold season	nd	nd	nd	nd		0/37	0/37
	2005 Warm season	nd	nd	nd	nd	1.2 [0.4]	0/37	0/37
	2005 Cold season	nd	nd	nd	nd		0/37	0/37
	2006 Warm season	nd	nd	nd	nd	8 [3]	0/37	0/37
	2006 Cold season	nd	nd	nd	nd		0/37	0/37
	2007 Warm season	nd	nd	nd	nd	1.5 [0.6]	0/36	0/36
	2007 Cold season	nd	nd	nd	nd		0/36	0/36
	2008 Warm season	nd	nd	nd	nd	1.6 [0.6]	0/37	0/37
	2008 Cold season	nd	nd	nd	nd		0/37	0/37
	2009 Warm season	nd	nd	nd	nd	1.6 [0.6]	0/37	0/37
	2009 Cold season	nd	nd	nd	nd		0/37	0/37

[10] Mirex (reference)

・ History and state of monitoring

Mirex was developed as an organochlorine insecticide chemical in the United States, and it was also used as a flame retardant. No domestic record of manufacture/import of the substance was reported since it was historically never registrated under the Agricultural Chemicals Regulation Law. The substance was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in September 2002.

Before FY 2001, the substance was measured in FY 1983 (in surface water and sediment) under the framework of “the Environmental Survey and Monitoring of Chemicals.”

Under the framework of the Environmental Monitoring, Mirex has been monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air in FY 2003 ~2009, and FY 2011.

No monitoring was conducted in FY 2012. For reference, the monitoring results up to FY 2011 are given below.

・ Monitoring results until FY 2011

<Surface Water>

Stocktaking of the detection of mirex in surface water during FY2003~2009,2011

Mirex	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2003	tr(0.13)	tr(0.12)	0.8	nd	0.3 [0.09]	25/36	25/36
	2004	nd	nd	1.1	nd	0.4 [0.2]	18/38	18/38
	2005	nd	nd	1.0	nd	0.4 [0.1]	14/47	14/47
	2006	nd	nd	0.07	nd	1.6 [0.5]	1/48	1/48
	2007	nd	nd	tr(0.5)	nd	1.1 [0.4]	2/48	2/48
	2008	nd	nd	0.7	nd	0.6 [0.2]	4/48	4/48
	2009	nd	nd	0.5	nd	0.4 [0.2]	8/49	8/49
	2011	nd	nd	0.8	nd	0.5 [0.2]	3/49	3/49

(Note) No monitoring was conducted in FY 2010.

<Sediment>

Stocktaking of the detection of mirex in sediment during FY2003~2009,2011

Mirex	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2003	2	tr(1.6)	1,500	nd	2 [0.4]	137/186	51/62
	2004	2	tr(1.6)	220	nd	2 [0.5]	153/189	55/63
	2005	1.8	1.2	5,300	nd	0.9 [0.3]	134/189	48/63
	2006	1.7	1.2	640	nd	0.6 [0.2]	156/192	57/64
	2007	1.5	0.9	200	nd	0.9 [0.3]	147/192	55/64
	2008	1.4	1.1	820	nd	0.7 [0.3]	117/192	48/64
	2009	1.4	1.3	620	nd	1.0 [0.4]	126/192	49/64
	2011	1.2	0.9	1,900	nd	0.9 [0.4]	42/64	42/64

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2003~FY2009.

(Note 2) No monitoring was conducted in FY 2010.

<Wildlife>

Stocktaking of the detection of mirex in wildlife (bivalves, fish and birds) during FY2003~2009,2011

Mirex	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2003	4.9	4.2	19	tr(1.6)	2.4 [0.81]	30/30	6/6
	2004	4.4	4.3	12	tr(1.1)	2.5 [0.82]	31/31	7/7
	2005	5.4	5.2	20	tr(1.9)	3.0 [0.99]	31/31	7/7
	2006	5	4	19	tr(2)	3 [1]	31/31	7/7
	2007	5	4	18	tr(2)	3 [1]	31/31	7/7
	2008	4	tr(3)	18	tr(2)	4 [1]	31/31	7/7
	2009	5.9	5.2	21	tr(1.7)	2.1 [0.8]	31/31	7/7
	2011	10	7.1	44	5.2	1.9 [0.8]	4/4	4/4
Fish (pg/g-wet)	2003	8.3	9.0	25	tr(1.7)	2.4 [0.81]	70/70	14/14
	2004	13	11	180	3.8	2.5 [0.82]	70/70	14/14
	2005	13	13	78	tr(1.0)	3.0 [0.99]	80/80	16/16
	2006	11	10	53	tr(2)	3 [1]	80/80	16/16
	2007	9	11	36	tr(1)	3 [1]	80/80	16/16
	2008	11	13	48	tr(1)	4 [1]	85/85	17/17
	2009	8.6	9.6	37	tr(0.9)	2.1 [0.8]	90/90	18/18
	2011	12	15	41	tr(1.3)	1.9 [0.8]	18/18	18/18
Birds (pg/g-wet)	2003	120	150	450	31	2.4 [0.81]	10/10	2/2
	2004	61	64	110	33	2.5 [0.82]	10/10	2/2
	2005	77	66	180	41	3.0 [0.99]	10/10	2/2
	2006	77	70	280	39	3 [1]	10/10	2/2
	2007	57	59	100	32	3 [1]	10/10	2/2
	2008	74	68	260	27	4 [1]	10/10	2/2
	2009	49	50	79	32	2.1 [0.8]	10/10	2/2
	2011	---	---	58	58	1.9 [0.8]	1/1	1/1

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2003~FY2009.

(Note 2) No monitoring was conducted in FY2010.

<Air>

Stocktaking of the detection of mirex in air during FY2003~2009,2011

Mirex	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2003 Warm season	0.11	0.12	0.19	0.047	0.0084	35/35	35/35
	2003 Cold season	0.044	0.043	0.099	0.024	[0.0028]	34/34	34/34
	2004 Warm season	0.099	0.11	0.16	tr(0.042)	0.05 [0.017]	37/37	37/37
	2004 Cold season	tr(0.046)	tr(0.047)	0.23	tr(0.019)		37/37	37/37
	2005 Warm season	tr(0.09)	tr(0.09)	0.24	tr(0.05)	0.10 [0.03]	37/37	37/37
	2005 Cold season	tr(0.04)	tr(0.04)	tr(0.08)	nd		29/37	29/37
	2006 Warm season	tr(0.07)	tr(0.10)	0.22	nd	0.13 [0.04]	29/37	29/37
	2006 Cold season	tr(0.07)	tr(0.07)	2.1	nd		27/37	27/37
	2007 Warm season	0.11	0.11	0.28	0.04	0.03 [0.01]	36/36	36/36
	2007 Cold season	0.04	0.04	0.09	tr(0.02)		36/36	36/36
	2008 Warm season	0.09	0.09	0.25	0.03	0.03 [0.01]	37/37	37/37
	2008 Cold season	0.05	0.04	0.08	0.03		37/37	37/37
	2009 Warm season	0.12	0.13	0.48	0.049	0.015 [0.006]	37/37	37/37
	2009 Cold season	0.058	0.054	0.18	0.030		37/37	37/37
	2011 Warm season	0.14	0.13	0.25	0.08	0.04 [0.01]	35/35	35/35
	2011 Cold season	0.07	0.07	0.11	tr(0.03)		37/37	37/37

(Note) No monitoring was conducted in FY 2010.

[11] HCHs

・ History and state of monitoring

HCHs were used as plant protection products, pesticides, household insecticides, and termitecides, etc. Even after their registration under the Agricultural Chemicals Regulation Law was expired in FY 1971, they continue to be used as termitecides and wood preservatives. *α*-HCH, *β*-HCH, and *γ*-HCH (synonym:Lindane) were adopted as target chemicals at the COP4 of the Stockholm convention on Persistent Organic Pollutants in May 2009. The substances were designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in April 2010.

Among many HCH isomers, *α*-HCH, *β*-HCH, *γ*-HCH (synonym: Lindane) and *δ*-HCH have been monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air.

Before FY 2001, the substances were measured in FY 1974 (in surface water, sediment and fish) under the framework of "the Environmental Survey and Monitoring of Chemicals." *α*-HCH and *β*-HCH had been the target chemicals, and surface water and sediment had been the monitored media during the period of FY 1986～1998 and FY 1986～2001, respectively. Under the framework of the Wildlife Monitoring, the substances were monitored in wildlife (bivalves, fish and birds) during the period of FY 1978～1996 and in FY 1998, FY 2000 and FY 2001 (*γ*-HCH (synonym:Lindane) and *δ*-HCH had not been monitored since FY 1997 and FY 1993, respectively.)

Under the framework of the Environmental Monitoring, *α*-HCH and *β*-HCH have been monitored in surface water, sediment, and wildlife (bivalves, fish and birds) since FY 2002. *α*-HCH and *β*-HCH have also been monitored in air, and *γ*-HCH (synonym:Lindane) and *δ*-HCH have been monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air since FY 2003.

・ Monitoring results

○ *α*-HCH, *β*-HCH, *γ*-HCH (synonym:Lindane) and *δ*-HCH

<Surface Water>

α-HCH: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.5pg/L, and the detection range was 9.5～2,200 pg/L.

β-HCH: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.5pg/L, and the detection range was 17～820 pg/L. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from lake areas was identified as statistically significant.

γ-HCH(synonym:Lindane): The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.4pg/L, and the detection range was 3.0～440 pg/L. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas, lake areas, river mouth areas and sea areas were identified as statistically significant and reduction tendency in specimens from the overall surface waters was also identified as statistically significant.

δ-HCH: The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 0.4pg/L, and the detection range was tr(0.5)～220 pg/L.

Stocktaking of the detection of α-HCH, β-HCH, γ-HCH (synonym: Lindane) and δ-HCH in surface water during FY2002~2012

α-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	86	76	6,500	1.9	0.9 [0.3]	114/114	38/38
	2003	120	120	970	13	3 [0.9]	36/36	36/36
	2004	150	145	5,700	13	6 [2]	38/38	38/38
	2005	90	81	660	16	4 [1]	47/47	47/47
	2006	110	90	2,100	25	3 [1]	48/48	48/48
	2007	76	73	720	13	1.9 [0.6]	48/48	48/48
	2008	78	75	1,100	9	4 [2]	48/48	48/48
	2009	74	73	560	14	1.2 [0.4]	49/49	49/49
	2010	94	75	1,400	14	4 [1]	49/49	49/49
	2011	67	60	1,000	11	7 [3]	49/49	49/49
	2012	65	56	2,200	9.5	1.4 [0.5]	48/48	48/48

β-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2002	210	180	1,600	24	0.9 [0.3]	114/114	38/38
	2003	250	240	1,700	14	3 [0.7]	36/36	36/36
	2004	260	250	3,400	31	4 [2]	38/38	38/38
	2005	200	170	2,300	25	2.6 [0.9]	47/47	47/47
	2006	200	160	2,000	42	1.7 [0.6]	48/48	48/48
	2007	170	150	1,300	18	2.7[0.9]	48/48	48/48
	2008	150	150	1,800	15	1.0 [0.4]	48/48	48/48
	2009	150	150	1,100	18	0.6 [0.2]	49/49	49/49
	2010	180	160	2,500	33	2.0 [0.7]	49/49	49/49
	2011	130	120	840	28	2.0 [0.8]	49/49	49/49
	2012	150	130	820	17	1.4 [0.5]	48/48	48/48

γ-HCH (synonym: Lindane)	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2003	92	90	370	32	7 [2]	36/36	36/36
	2004	91	76	8,200	21	20 [7]	38/38	38/38
	2005	48	40	250	tr(8)	14 [5]	47/47	47/47
	2006	44	43	460	tr(9)	18 [6]	48/48	48/48
	2007	34	32	290	5.2	2.1 [0.7]	48/48	48/48
	2008	34	32	340	4	3 [1]	48/48	48/48
	2009	32	26	280	5.1	0.6 [0.2]	49/49	49/49
	2010	26	22	190	tr(5)	6 [2]	49/49	49/49
	2011	23	20	170	3	3 [1]	49/49	49/49
	2012	22	21	440	3.0	1.3 [0.4]	48/48	48/48

δ-HCH	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	DetectionFrequency Sample	DetectionFrequency Site
Surface Water (pg/L)	2003	14	14	200	tr(1.1)	2 [0.5]	36/36	36/36
	2004	24	29	670	tr(1.4)	2 [0.7]	38/38	38/38
	2005	1.8	nd	62	nd	1.5 [0.5]	23/47	23/47
	2006	24	18	1,000	2.2	2.0 [0.8]	48/48	48/48
	2007	11	9.7	720	tr(0.7)	1.2 [0.4]	48/48	48/48
	2008	11	10	1,900	tr(1.1)	2.3 [0.9]	48/48	48/48
	2009	10	11	450	tr(0.7)	0.9 [0.4]	49/49	49/49
	2010	16	17	780	0.9	0.8 [0.3]	49/49	49/49
	2011	8.6	8.9	300	0.7	0.4 [0.2]	49/49	49/49
	2012	7.9	6.7	220	tr(0.5)	1.1 [0.4]	48/48	48/48

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2002.

<Sediment>

α-HCH: The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63valid sites adopting the detection limit of 0.5pg/g-dry, and the detection range was tr(1.1)～3,900 pg/g-dry. As results of the inter-annual trend analysis from FY 2002 to FY 2012, reduction tendencies in specimens from river areas was identified as statistically significant.

β-HCH: The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 0.6pg/g-dry, and the detection range was 3.7～8,300 pg/g-dry.

γ-HCH(synonym:Lindane): The presence of the substance in sediment was monitored at 63 sites, and it was detected at 61 of the 63 valid sites adopting the detection limit of 0.4pg/g-dry, and none of the detected concentrations exceeded 3,500pg/g-dry.

δ-HCH: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 62 of the 63valid sites adopting the detection limit of 0.3pg/g-dry, and none of the detected concentrations exceeded 3,100pg/g-dry.

Stocktaking of the detection of *α*-HCH, *β*-HCH, *γ*-HCH (synonym: Lindane) and *δ*-HCH in sediment during FY2002~2012

α-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	150	170	8,200	2.0	1.2 [0.4]	189/189	63/63
	2003	160	170	9,500	2	2 [0.5]	186/186	62/62
	2004	160	180	5,700	tr(1.5)	2 [0.6]	189/189	63/63
	2005	140	160	7,000	3.4	1.7 [0.6]	189/189	63/63
	2006	140	160	4,300	tr(2)	5 [2]	192/192	64/64
	2007	140	150	12,000	tr(1.3)	1.8 [0.6]	192/192	64/64
	2008	140	190	5,200	nd	1.6 [0.6]	191/192	64/64
	2009	120	120	6,300	nd	1.1 [0.4]	191/192	64/64
	2010	140	140	3,700	3.1	2.0 [0.8]	64/64	64/64
	2011	120	140	5,100	1.6	1.5 [0.6]	64/64	64/64
	2012	100	100	3,900	tr(1.1)	1.6 [0.5]	63/63	63/63
β-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2002	230	230	11,000	3.9	0.9 [0.3]	189/189	63/63
	2003	250	220	39,000	5	2 [0.7]	186/186	62/62
	2004	240	230	53,000	4	3 [0.8]	189/189	63/63
	2005	200	220	13,000	3.9	2.6 [0.9]	189/189	63/63
	2006	190	210	21,000	2.3	1.3 [0.4]	192/192	64/64
	2007	200	190	59,000	1.6	0.9 [0.3]	192/192	64/64
	2008	190	200	8,900	2.8	0.8 [0.3]	192/192	64/64
	2009	180	170	10,000	2.4	1.3 [0.5]	192/192	64/64
	2010	230	210	8,200	11	2.4 [0.8]	64/64	64/64
	2011	180	210	14,000	3	3 [1]	64/64	64/64
	2012	160	170	8,300	3.7	1.5 [0.6]	63/63	63/63
γ-HCH （synonym: Lindane）	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2003	51	47	4,000	tr(1.4)	2 [0.4]	186/186	62/62
	2004	53	48	4,100	tr(0.8)	2 [0.5]	189/189	63/63
	2005	49	46	6,400	tr(1.8)	2.0 [0.7]	189/189	63/63
	2006	48	49	3,500	tr(1.4)	2.1 [0.7]	192/192	64/64
	2007	42	41	5,200	tr(0.6)	1.2 [0.4]	192/192	64/64
	2008	40	43	2,200	tr(0.7)	0.9 [0.4]	192/192	64/64
	2009	38	43	3,800	nd	0.6 [0.2]	191/192	64/64
	2010	35	30	2,300	tr(1.5)	2.0 [0.7]	64/64	64/64
	2011	35	42	3,500	nd	3 [1]	62/64	62/64
	2012	30	29	3,500	nd	1.3 [0.4]	61/63	61/63

δ-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Sediment (pg/g-dry)	2003	42	46	5,400	nd	2 [0.7]	180/186	61/62
	2004	55	55	5,500	tr(0.5)	2 [0.5]	189/189	63/63
	2005	52	63	6,200	nd	1.0 [0.3]	188/189	63/63
	2006	45	47	6,000	nd	1.7 [0.6]	189/192	64/64
	2007	26	28	5,400	nd	5 [2]	165/192	60/64
	2008	41	53	3,300	nd	2 [1]	186/192	64/64
	2009	36	37	5,000	nd	1.2 [0.5]	190/192	64/64
	2010	39	40	3,800	1.3	1.2 [0.5]	64/64	64/64
	2011	37	47	5,000	nd	1.4 [0.5]	63/64	63/64
	2012	28	28	3,100	nd	0.8 [0.3]	62/63	62/63

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Wildlife>

α-HCH: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 1.2pg/g-wet, and the detection range was 4.0～340 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 18 of the 19 valid areas adopting the detection limit of 1.2pg/g-wet, and none of the detected concentrations exceeded 170 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 1.2pg/g-wet, and the detection range was 32～39 pg/g-wet. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendencies in specimens from bivalves was identified as statistically significant.

β-HCH: The presence of the substance in bivalves was monitored in 5 areas, and it was detected all 5 valid areas adopting the detection limit of 0.8pg/g-wet, and the detection range was 15～980 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 0.8pg/g-wet, and the detection range was 6.5～510 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 0.8pg/g-wet, and the detection value was 730～2,600 pg/g-wet.

γ-HCH(synonym:Lindane): The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 0.9pg/g-wet, and the detection range was 3.0～68 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 18 of the 19 valid areas adopting the detection limit of 0.9pg/g-wet, and none of the detected concentrations exceeded 43 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 0.9pg/g-wet, and the detection range was 6.3～19 pg/g-wet. As results of the inter-annual trend analysis from FY 2003 to FY 2012, reduction tendencies in specimens from fishes was identified as statistically significant.

δ-HCH: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 3 of the 5 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was 580 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 14 of the 19 valid areas adopting the detection limit of 1pg/g-wet, and none of the detected concentrations exceeded 12 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 1pg/g-wet, and the detection range was tr(2)～7 pg/g-wet.

Stocktaking of the detection of α-HCH, β-HCH , γ-HCH (synonym: Lindane) and δ-HCH in wildlife (bivalves,) during FY2002~2012

α-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2002	67	64	1,100	12	4.2 [1.4]	38/38	8/8
	2003	45	30	610	9.9	1.8 [0.61]	30/30	6/6
	2004	56	25	1,800	tr(12)	13 [4.3]	31/31	7/7
	2005	38	25	1,100	tr(7.1)	11 [3.6]	31/31	7/7
	2006	30	21	390	6	3 [1]	31/31	7/7
	2007	31	17	1,400	8	7 [2]	31/31	7/7
	2008	26	16	380	7	6 [2]	31/31	7/7
	2009	45	21	2,200	9	5 [2]	31/31	7/7
	2010	35	20	730	13	3 [1]	6/6	6/6
	2011	64	33	1,200	13	3 [1]	4/4	4/4
	2012	23	12	340	4.0	3.7 [1.2]	5/5	5/5
Fish (pg/g-wet)	2002	57	56	590	tr(1.9)	4.2 [1.4]	70/70	14/14
	2003	43	58	590	2.6	1.8 [0.61]	70/70	14/14
	2004	57	55	2,900	nd	13 [4.3]	63/70	14/14
	2005	42	43	1,000	nd	11 [3.6]	75/80	16/16
	2006	44	53	360	tr(2)	3 [1]	80/80	16/16
	2007	39	40	730	tr(2)	7 [2]	80/80	16/16
	2008	36	47	410	nd	6 [2]	84/85	17/17
	2009	39	32	830	tr(2)	5 [2]	90/90	18/18
	2010	27	39	250	tr(1)	3 [1]	18/18	18/18
	2011	37	54	690	tr(2)	3 [1]	18/18	18/18
	2012	24	32	170	nd	3.7 [1.2]	18/19	18/19
Birds (pg/g-wet)	2002	170	130	360	93	4.2 [1.4]	10/10	2/2
	2003	73	74	230	30	1.8 [0.61]	10/10	2/2
	2004	190	80	1,600	58	13 [4.3]	10/10	2/2
	2005	76	77	85	67	11 [3.6]	10/10	2/2
	2006	76	75	100	55	3 [1]	10/10	2/2
	2007	75	59	210	43	7 [2]	10/10	2/2
	2008	48	48	61	32	6 [2]	10/10	2/2
	2009	43	42	56	34	5 [2]	10/10	2/2
	2010	260	---	430	160	3 [1]	2/2	2/2
	2011	---	---	48	48	3 [1]	1/1	1/1
	2012	35	---	39	32	3.7 [1.2]	2/2	2/2

β-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Bivalves (pg/g-wet)	2002	88	62	1,700	32	12 [4]	38/38	8/8
	2003	78	50	1,100	23	9.9 [3.3]	30/30	6/6
	2004	100	74	1,800	22	6.1 [2.0]	31/31	7/7
	2005	85	56	2,000	20	2.2 [0.75]	31/31	7/7
	2006	81	70	880	11	3 [1]	31/31	7/7
	2007	79	56	1,800	21	7 [3]	31/31	7/7
	2008	73	51	1,100	23	6 [2]	31/31	7/7
	2009	83	55	1,600	27	6 [2]	31/31	7/7
	2010	89	56	1,500	27	3 [1]	6/6	6/6
	2011	130	68	2,000	39	3 [1]	4/4	4/4
	2012	65	37	980	15	2 [0.8]	5/5	5/5
Fish (pg/g-wet)	2002	110	120	1,800	tr(5)	12 [4]	70/70	14/14
	2003	81	96	1,100	tr(3.5)	9.9 [3.3]	70/70	14/14
	2004	110	140	1,100	tr(3.9)	6.1 [2.0]	70/70	14/14
	2005	95	110	1,300	6.7	2.2 [0.75]	80/80	16/16
	2006	89	110	1,100	4	3 [1]	80/80	16/16
	2007	110	120	810	7	7 [3]	80/80	16/16
	2008	94	150	750	tr(4)	6 [2]	85/85	17/17
	2009	98	130	970	tr(5)	6 [2]	90/90	18/18
	2010	81	110	760	5	3 [1]	18/18	18/18
	2011	100	140	710	4	3 [1]	18/18	18/18
	2012	72	100	510	6.5	2 [0.8]	19/19	19/19
Birds (pg/g-wet)	2002	3,000	3,000	7,300	1,600	12 [4]	10/10	2/2
	2003	3,400	3,900	5,900	1,800	9.9 [3.3]	10/10	2/2
	2004	2,300	2,100	4,800	1,100	6.1 [2.0]	10/10	2/2
	2005	2,500	2,800	6,000	930	2.2 [0.75]	10/10	2/2
	2006	2,100	2,400	4,200	1,100	3 [1]	10/10	2/2
	2007	2,000	1,900	3,200	1,400	7 [3]	10/10	2/2
	2008	2,400	2,000	5,600	1,300	6 [2]	10/10	2/2
	2009	1,600	1,400	4,200	870	6 [2]	10/10	2/2
	2010	1,600	---	2,800	910	3 [1]	2/2	2/2
	2011	---	---	4,500	4,500	3 [1]	1/1	1/1
	2012	1,400	---	2,600	730	2 [0.8]	2/2	2/2

γ-HCH (synonym:Lindane)	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Bivalves (pg/g-wet)	2003	19	18	130	5.2	3.3 [1.1]	30/30	6/6
	2004	tr(24)	tr(16)	230	nd	31 [10]	28/31	7/7
	2005	23	13	370	tr(5.7)	8.4 [2.8]	31/31	7/7
	2006	18	12	140	7	4 [2]	31/31	7/7
	2007	16	10	450	tr(4)	9 [3]	31/31	7/7
	2008	12	10	98	tr(3)	9 [3]	31/31	7/7
	2009	14	12	89	tr(3)	7 [3]	31/31	7/7
	2010	14	9	150	5	3 [1]	6/6	6/6
	2011	26	17	320	5	3 [1]	4/4	4/4
	2012	8.1	3.5	68	3.0	2.3 [0.9]	5/5	5/5
Fish (pg/g-wet)	2003	16	22	130	tr(1.7)	3.3 [1.1]	70/70	14/14
	2004	tr(28)	tr(24)	660	nd	31 [10]	55/70	11/14
	2005	17	17	230	nd	8.4 [2.8]	78/80	16/16
	2006	19	22	97	tr(2)	4 [2]	80/80	16/16
	2007	15	15	190	nd	9 [3]	71/80	15/16
	2008	13	16	96	nd	9 [3]	70/85	15/17
	2009	14	12	180	nd	7 [3]	81/90	17/18
	2010	9	13	56	tr(1)	3 [1]	18/18	18/18
	2011	12	15	160	tr(1)	3 [1]	18/18	18/18
	2012	7.8	12	43	nd	2.3 [0.9]	18/19	18/19
Birds (pg/g-wet)	2003	14	19	40	3.7	3.3 [1.1]	10/10	2/2
	2004	64	tr(21)	1,200	tr(11)	31 [10]	10/10	2/2
	2005	18	20	32	9.6	8.4 [2.8]	10/10	2/2
	2006	16	17	29	8	4 [2]	10/10	2/2
	2007	21	14	140	tr(8)	9 [3]	10/10	2/2
	2008	12	14	19	tr(5)	9 [3]	10/10	2/2
	2009	11	11	21	tr(6)	7 [3]	10/10	2/2
	2010	10	---	23	4	3 [1]	2/2	2/2
	2011	---	---	26	26	3 [1]	1/1	1/1
	2012	11	---	19	6.3	2.3 [0.9]	2/2	2/2

δ-HCH	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Site
Bivalves (pg/g-wet)	2003	7.4	tr(2.6)	1,300	nd	3.9 [1.3]	29/30	6/6
	2004	6.3	tr(2.1)	1,500	nd	4.6 [1.5]	25/31	6/7
	2005	5.4	tr(2.1)	1,600	nd	5.1 [1.7]	23/31	6/7
	2006	6	tr(2)	890	tr(1)	3 [1]	31/31	7/7
	2007	4	nd	750	nd	4 [2]	12/31	4/7
	2008	tr(3)	nd	610	nd	6 [2]	7/31	3/7
	2009	tr(4)	nd	700	nd	5 [2]	14/31	4/7
	2010	4	tr(2)	870	nd	3 [1]	5/6	5/6
	2011	9	tr(2)	1,400	tr(1)	3 [1]	4/4	4/4
	2012	3	tr(1)	580	nd	3 [1]	3/5	3/5
Fish (pg/g-wet)	2003	tr(3.6)	4.0	16	nd	3.9 [1.3]	59/70	13/14
	2004	tr(4.2)	tr(3.5)	270	nd	4.6 [1.5]	54/70	11/14
	2005	tr(3.2)	tr(3.1)	32	nd	5.1 [1.7]	55/80	12/16
	2006	4	3	35	nd	3 [1]	72/80	16/16
	2007	tr(3)	tr(2)	31	nd	4 [2]	42/80	10/16
	2008	tr(4)	tr(3)	77	nd	6 [2]	54/85	12/17
	2009	tr(3)	tr(3)	18	nd	5 [2]	57/90	13/18
	2010	tr(2)	tr(2)	36	nd	3 [1]	13/18	13/18
	2011	3	4	19	nd	3 [1]	14/18	14/18
	2012	tr(2)	tr(2)	12	nd	3 [1]	14/19	14/19
Birds (pg/g-wet)	2003	19	18	31	12	3.9 [1.3]	10/10	2/2
	2004	30	14	260	6.4	4.6 [1.5]	10/10	2/2
	2005	16	15	30	10	5.1 [1.7]	10/10	2/2
	2006	13	12	21	9	3 [1]	10/10	2/2
	2007	12	10	22	4	4 [2]	10/10	2/2
	2008	9	8	31	tr(3)	6 [2]	10/10	2/2
	2009	5	6	9	tr(3)	5 [2]	10/10	2/2
	2010	12	---	13	11	3 [1]	2/2	2/2
	2011	---	---	5	5	3 [1]	1/1	1/1
	2012	4	---	7	tr(2)	3 [1]	2/2	2/2

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived during FY2002 ~FY2009.

<Air>

α-HCH: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.7pg/m^3, and the detection range was 15～250 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.7pg/m^3, and the detection range was 4.4～120 pg/m^3.

β-HCH: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.12pg/m^3, and the detection range was 0.65～32 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.12pg/m^3, and the detection range was tr(0.26)～8.5 pg/m^3.

γ-HCH(synonym: Lindane): The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.32pg/m^3, and the detection range was 2.3～55 pg/m^3.For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.32pg/m^3, and the detection range was tr(0.63)～19 pg/m^3.

δ-HCH: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.03pg/m^3, and the detection range was tr(0.06)～20 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.03pg/m^3, and none of the detected concentrations exceeded 7.3 pg/m^3.

In addition, it was found that there were some problems in collection of HCHs because of some parts of the air sampler that was used between FY2003 and FY2008 were contaminated by HCHs and affected monitored concentration. Therefore all samples in the air were recognized as undetectable in calculation of data for that period.

Stocktaking of the detection of *α*-HCH, *β*-HCH, *γ*-HCH (synonym: Lindane) and *δ*-HCH in air during FY2009~2012

α-HCH	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2009 Warm season	58	58	340	19	0.12 [0.05]	37/37	37/37
	2009 Cold season	21	18	400	7.8		37/37	37/37
	2010 Warm season	46	51	280	14	1.4 [0.47]	37/37	37/37
	2010 Cold season	19	16	410	6.8		37/37	37/37
	2011 Warm season	43	44	410	9.5	2.5 [0.83]	35/35	35/35
	2011 Cold season	18	15	680	6.5		37/37	37/37
	2012 Warm season	37	37	250	15	2.1 [0.7]	36/36	36/36
	2012 Cold season	12	11	120	4.4		36/36	36/36

β-HCH	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2009 Warm season	5.6	5.6	28	0.96	0.09 [0.03]	37/37	37/37
	2009 Cold season	1.8	1.8	24	0.31		37/37	37/37
	2010 Warm season	5.6	6.2	34	0.89	0.27 [0.09]	37/37	37/37
	2010 Cold season	1.7	1.7	29	tr(0.26)		37/37	37/37
	2011 Warm season	5.0	5.2	49	0.84	0.39 [0.13]	35/35	35/35
	2011 Cold season	1.7	1.7	91	tr(0.31)		37/37	37/37
	2012 Warm season	5.0	5.5	32	0.65	0.36 [0.12]	36/36	36/36
	2012 Cold season	0.93	1.1	8.5	tr(0.26)		36/36	36/36

γ-HCH (synonym: Lindane)	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	17	19	65	2.9	0.06 [0.02]	37/37	37/37
	2009 Cold season	5.6	4.6	55	1.5		37/37	37/37
	2010 Warm season	14	16	66	2.3	0.35 [0.12]	37/37	37/37
	2010 Cold season	4.8	4.4	60	1.1		37/37	37/37
	2011 Warm season	14	17	98	2.7	1.6 [0.52]	35/35	35/35
	2011 Cold season	5.1	4.8	67	tr(1.1)		37/37	37/37
	2012 Warm season	13	15	55	2.3	0.95 [0.32]	36/36	36/36
	2012 Cold season	3.1	3.2	19	tr(0.63)		36/36	36/36

δ-HCH	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	1.3	1.3	21	0.09	0.04 [0.02]	37/37	37/37
	2009 Cold season	0.36	0.33	20	0.04		37/37	37/37
	2010 Warm season	1.4	1.3	25	0.11	0.05 [0.02]	37/37	37/37
	2010 Cold season	0.38	0.35	22	0.05		37/37	37/37
	2011 Warm season	1.1	1.1	33	0.11	0.063 [0.021]	35/35	35/35
	2011 Cold season	0.35	0.34	26	tr(0.050)		37/37	37/37
	2012 Warm season	1.0	1.3	20	tr(0.06)	0.07 [0.03]	36/36	36/36
	2012 Cold season	0.18	0.19	7.3	nd		35/36	35/36

[12] Chlordecone(reference)

・ History and state of monitoring

Chlordecone is a group of organochlorine insecticides. No domestic record of manufacture/import of the substance was reported since it was historically never registrated under the Agricultural Chemicals Regulation Law. Chlordecone was adopted as a target chemical at the Fourth Meeting of the Conference of Parties (COP4) on Stockholm convention on Persistent Organic Pollutants in May 2009.

Under the framework of the Environmental Monitoring, the substance was monitored in surface water, sediment and wildlife (bivalves, fish and birds) in FY 2008, and surface water, sediment and wildlife (bivalves, fish and birds) air in FY 2010～2011. For reference, the monitoring results up to FY 2011 are given below.

・ Monitoring results until FY 2011

<Surface Water>

Stocktaking of the detection of Chlordecone in surface water during FY2008, 2010, 2011

Chlordecone	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2008	nd	nd	0.76	nd	0.14 [0.05]	13/46	13/46
	2010	tr(0.04)	nd	1.6	nd	0.09 [0.04]	13/49	13/49
	2011	nd	nd	0.70	nd	0.20 [0.05]	15/49	15/49

(Note) No monitoring was conducted in FY2009.

<Sediment>

Stocktaking of the detection of Chlordecone in sediment during FY2008, 2010, 2011

Chlordecone	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2008	nd	nd	5.8	nd	0.42 [0.16]	23/129	10/49
	2010	nd	nd	2.8	nd	0.4 [0.2]	9/64	9/64
	2011	nd	nd	1.5	nd	0.40 [0.20]	9/64	9/64

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2008.

(Note 2) No monitoring was conducted in FY2009.

<Wildlife>

Stocktaking of the detection of Chlordecone in wildlife during FY2008, 2010, 2011

Chlordecone	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	nd	nd	nd	nd	5.6 [2.2]	0/31	0/7
	2010	nd	nd	nd	nd	5.9 [2.3]	0/6	0/6
	2011	nd	nd	nd	nd	0.5 [0.2]	0/4	0/4
Fish (pg/g-wet)	2008	nd	nd	nd	nd	5.6 [2.2]	0/85	0/17
	2010	nd	nd	nd	nd	5.9 [2.3]	0/18	0/18
	2011	nd	nd	nd	nd	0.5 [0.2]	0/18	0/18
Birds (pg/g-wet)	2008	nd	nd	nd	nd	5.6 [2.2]	0/10	0/2
	2010	nd	---	nd	nd	5.9 [2.3]	0/2	0/2
	2011	---	---	nd	nd	0.5 [0.2]	0/1	0/1

(Note 1) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2008.

(Note 2) No monitoring was conducted in FY2009.

<Air>

Stocktaking of the detection of Chlordecone in air during FY2010~2011

Chlordecone	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2010 Warm season	nd	nd	nd	nd	0.04 [0.02]	0/37	0/37
	2010 Cold season	nd	nd	nd	nd		0/37	0/37
	2011 Warm season	nd	nd	nd	nd	0.04 [0.02]	0/35	0/35
	2011 Cold season	nd	nd	nd	nd		0/37	0/37

[13] Hexabromobiphenyls(reference)

・ History and state of monitoring

Hexabromobiphenyls have been used as flame retardants for plastics products. Hexabromobiphenyls were adopted as target chemicals at the COP4 of the Stockholm convention on Persistent Organic Pollutants in May 2009 and designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in April 2010.

Under the framework of the Environmental Monitoring, the substance was monitored in surface water, sediment and wildlife (bivalves, fish and birds) in FY 2009 and air in FY 2010～2011. For reference, the monitoring results up to FY 2011 are given below.

・ Monitoring results until FY 2011

<Surface Water>

Stocktaking of the detection of Hexabromobiphenyls in surface water during FY2009~2011

Hexabromobiphenyls	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] Limit*	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2009	nd	nd	nd	nd	5.7 [2.2]	0/49	0/49
	2010	nd	nd	nd	nd	3 [1]	0/49	0/49
	2011	nd	nd	nd	nd	2.2 [0.9]	0/49	0/49

(Note 1) “ * “ indicates the sum value of the Quantification [Detection] limits of each congener in FY2009.
(Note 2) No monitoring was conducted in FY2012.

<Sediment>

Stocktaking of the detection of Hexabromobiphenyls in sediment during FY2009~2011

Hexabromobiphenyls	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] Limit**	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2009	nd	nd	12	nd	1.1 [0.40]	45/190	21/64
	2010	nd	nd	18	nd	1.5 [0.6]	10/64	10/64
	2011	nd	nd	6.3	nd	3.6 [1.4]	8/64	8/64

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.
(Note 2) “ ** “ indicates the sum value of the Quantification [Detection] limits of each congener in FY2009.
(Note 3) No monitoring was conducted in FY2012.

<Wildlife>

Stocktaking of the detection of Hexabromobiphenyls in wildlife (bivalves, fish and birds) during FY2009~2011

Hexabromobiphenyls	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] Limit**	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2009	nd	nd	tr(0.53)	nd	1.3 [0.43]	1/31	1/7
	2010	nd	nd	nd	nd	24 [10]	0/6	0/6
	2011	nd	nd	nd	nd	3 [1]	0/4	0/4
Fish (pg/g-wet)	2009	tr(0.49)	tr(0.43)	6.0	nd	1.3 [0.43]	46/90	12/18
	2010	nd	nd	nd	nd	24 [10]	0/18	0/18
	2011	nd	nd	3	nd	3 [1]	5/18	5/18
Birds (pg/g-wet)	2009	1.6	1.6	2.1	tr(1.2)	1.3 [0.43]	10/10	2/2
	2010	nd	---	nd	nd	24 [10]	0/2	0/2
	2011	---	---	3	3	3 [1]	1/1	1/1

(Note 1) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.
(Note 2) “ ** “ indicates the sum value of the Quantification [Detection] limits of each congener in FY2009.
(Note 3) No monitoring was conducted in FY2012.

<Air>

Stocktaking of the detection of Hexabromobiphenyls in air during FY2010~2011

Hexabromo biphenyls	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] Limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2010 Warm season	nd	nd	nd	nd	0.3 [0.1]	0/37	0/37
	2010 Cold season	nd	nd	nd	nd		0/37	0/37
	2011 Warm season	nd	nd	nd	nd	0.3 [0.1]	0/35	0/35
	2011 Cold season	nd	nd	nd	nd		0/37	0/37

(Note) No monitoring was conducted in FY2012.

[14] Polybromodiphenyl ethers（Br_4～Br_{10}）

・ History and state of monitoring

Polybrominated diphenyl ethers have been used as flame retardants for plastics products. Tetrabromodiphenyl ethers, Pentabromodiphenyl ethers, Hexabromodiphenyl ethers, and Heptabromodiphenyl ethers were adopted as target chemicals at the COP4 of the Stockholm convention on Persistent Organic Pollutants in May 2009.The substances were designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in April 2010.

Under the framework of the Environmental Monitoring, the substance was monitored in wildlife (bivalves, fish and birds) in FY 2008, and in surface water, sediment and wildlife (bivalves, fish and birds) and air in FY 2010～2012.

・ Monitoring results

○ Tetrabromodiphenyl ethers, Pentabromodiphenyl ethers, Hexabromodiphenyl ethers, Heptabromodiphenyl ethers, Octabromodiphenyl ethers, Nonabromodiphenyl ethers and Decabromodiphenyl ether

<Surface Water>

Tetrabromodiphenyl ethers: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 47 of the 48 valid sites adopting the detection limit of 1pg/L, and none of the detected concentrations exceeded 22 pg/L.

Pentabromodiphenyl ethers: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 32 of the 48 valid sites adopting the detection limit of 1pg/L, and none of the detected concentrations exceeded 20 pg/L.

Hexabromodiphenyl ethers: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 6 of the 48 valid sites adopting the detection limit of 1pg/L, and none of the detected concentrations exceeded 7 pg/L.

Heptabromodiphenyl ethers: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 9 of the 48 valid sites adopting the detection limit of 1pg/L, and none of the detected concentrations exceeded 10 pg/L.

Octabromodiphenyl ethers: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 16 of the 48 valid sites adopting the detection limit of 2pg/L, and none of the detected concentrations exceeded 35 pg/L.

Nonabromodiphenyl ethers: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 30 of the 48valid sites adopting the detection limit of 13pg/L, and none of the detected concentrations exceeded 320 pg/L.

Decabromodiphenyl ether: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 31 of the 48 valid sites adopting the detection limit of 220pg/L, and none of the detected concentrations exceeded 12,000 pg/L.

Stocktaking of the detection of Polybromodiphenyl ethers (Br_4～Br_{10}) in surface water during FY2009~2012

Tetrabromodiphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	17	16	160	nd	8 [3]	44/49	44/49
	2010	nd	nd	390	nd	9 [3]	17/49	17/49
	2011	11	10	180	nd	4 [2]	48/49	48/49
	2012	tr(3)	tr(3)	22	nd	4 [1]	47/48	47/48

Pentabromodiphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	11	12	87	nd	11 [4]	43/49	43/49
	2010	tr(1)	tr(1)	130	nd	3 [1]	25/49	25/49
	2011	5	4	180	nd	3 [1]	48/49	48/49
	2012	tr(1)	tr(1)	20	nd	2 [1]	32/48	32/48

Hexabromodiphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	tr(0.9)	tr(0.7)	18	nd	1.4 [0.6]	26/49	26/49
	2010	nd	nd	51	nd	4 [2]	16/49	16/49
	2011	tr(1)	nd	39	nd	3 [1]	21/49	21/49
	2012	nd	nd	7	nd	3 [1]	6/48	6/48

Heptabromodiphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	nd	nd	40	nd	4 [2]	9/49	9/49
	2010	nd	nd	14	nd	3 [1]	17/49	17/49
	2011	tr(1)	nd	39	nd	3 [1]	21/49	21/49
	2012	nd	nd	10	nd	4 [1]	9/48	9/48

Octabromodiphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	3.0	3.9	56	nd	1.4 [0.6]	37/49	37/49
	2010	tr(2)	tr(2)	69	nd	3 [1]	40/49	40/49
	2011	4	3	98	nd	2 [1]	44/49	44/49
	2012	tr(2)	nd	35	nd	4 [2]	16/48	16/48

Nonabromodiphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	tr(46)	tr(38)	500	nd	91 [30]	32/49	32/49
	2010	tr(17)	tr(13)	620	nd	21 [7]	39/49	39/49
	2011	33	24	920	nd	10 [4]	47/49	47/49
	2012	tr(21)	tr(19)	320	nd	40 [13]	30/48	30/48

Decabromodiphenyl ether	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2009	tr(310)	tr(220)	3,400	nd	600 [200]	26/49	26/49
	2010	tr(250)	tr(200)	13,000	nd	300 [100]	31/49	31/49
	2011	200	140	58,000	nd	60 [20]	45/49	45/49
	2012	tr(400)	tr(320)	12,000	nd	660 [220]	31/48	31/48

<Sediment>

Tetrabromodiphenyl ethers: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 60 of the 63 valid sites adopting the detection limit of 1pg/g-dry, and none of the detected concentrations exceeded 4,500 pg/g-dry.

Pentabromodiphenyl ethers: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 62 of the 63 valid sites adopting the detection limit of 0.9pg/g-dry, and none of the detected concentrations exceeded 2,900 pg/g-dry.

Hexabromodiphenyl ethers: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 48 of the 63 valid sites adopting the detection limit of 1pg/g-dry, and none of the detected concentrations exceeded 1,700 pg/g-dry.

Heptabromodiphenyl ethers: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 48 of the 63 valid sites adopting the detection limit of 2pg/g-dry, and none of the detected concentrations exceeded 4,400 pg/g-dry.

Octabromodiphenyl ethers: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 47 of the 63 valid sites adopting the detection limit of 6pg/g-dry, and none of the detected concentrations exceeded 15,000 pg/g-dry.

Nonabromodiphenyl ethers: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 52 of the 63 valid sites adopting the detection limit of 11pg/g-dry, and none of the detected concentrations exceeded 84,000pg/g-dry.

Decabromodiphenyl ether: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 60 of the 63 valid sites adopting the detection limit of 89pg/g-dry, and none of the detected concentrations exceeded 760,000pg/g-dry.

Stocktaking of the detection of Polybromodiphenyl ethers (Br_4～Br_{10}) in sediment during FY2009~2012

Tetrabromodiphenyl ethers:	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment (pg/g-dry)	2009	tr(60)	tr(44)	1,400	nd	69 [23]	131/192	51/64
	2010	35	38	910	nd	6 [2]	57/64	57/64
	2011	32	30	2,600	nd	30 [10]	47/64	47/64
	2012	27	37	4,500	nd	2 [1]	60/63	60/63
Pentabromodiphenyl ethers	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2009	36	24	1,700	nd	24 [8]	146/192	57/64
	2010	26	23	740	nd	5 [2]	58/64	58/64
	2011	24	18	4,700	nd	5 [2]	62/64	62/64
	2012	21	21	2,900	nd	2.4 [0.9]	62/63	62/63
Hexabromodiphenyl ethers	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2009	21	21	2,600	nd	5 [2]	139/192	53/64
	2010	23	23	770	nd	4 [2]	57/64	57/64
	2011	31	42	2,000	nd	9 [3]	52/64	52/64
	2012	15	19	1,700	nd	3 [1]	48/63	48/63
Heptabromodiphenyl ethers	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2009	30	25	16,000	nd	9 [4]	125/192	51/64
	2010	28	18	930	nd	4 [2]	58/64	58/64
	2011	29	32	2,400	nd	7 [3]	55/64	55/64
	2012	34	32	4,400	nd	4 [2]	48/63	48/63
Octabromodiphenyl ethers	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2009	210	96	110,000	nd	1.2 [0.5]	182/192	63/64
	2010	71	76	1,800	nd	10 [4]	60/64	60/64
	2011	57	64	36,000	nd	10 [4]	55/64	55/64
	2012	78	74	15,000	nd	19 [6]	47/63	47/63
Nonabromodiphenyl ethers	**Monitored year**	**Geometric mean***	**Median**	**Maximum**	**Minimum**	**Quantification [Detection] limit**	**Detection Frequency Sample**	**Detection Frequency Site**
Sediment (pg/g-dry)	2009	1,100	710	230,000	nd	9 [4]	181/192	64/64
	2010	360	430	26,000	nd	24 [9]	60/64	60/64
	2011	710	630	70,000	nd	23 [9]	62/64	62/64
	2012	360	380	84,000	nd	34 [11]	52/63	52/63

Decabromodiphenyl ether	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2009	6,000	4,800	880,000	tr(30)	60 [20]	192/192	64/64
	2010	5,100	4,200	700,000	nd	220 [80]	60/64	60/64
	2011	4,200	4,700	700,000	nd	40 [20]	62/64	62/64
	2012	5,700	6,300	760,000	nd	270 [89]	60/63	60/63

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.

<Wildlife>

Tetrabromodiphenyl ethers: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 7pg/g-wet, and the detection range was 24～190 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 7pg/g-wet, and the detection range was tr(10)～650 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 7pg/g-wet, and the detection range was 49～110 pg/g-wet.

Pentabromodiphenyl ethers: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 of the valid areas adopting the detection limit of 6pg/g-wet, and the detection range was tr(8)～67 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 17 of the 19 valid areas adopting the detection limit of 6pg/g-wet, and none of the detected concentrations exceeded 180 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 6pg/g-wet, and the detection range was 66～110 pg/g-wet.

Hexabromodiphenyl ethers: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 4pg/g-wet, and the detection range was tr(6)～130 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 18of the 19 valid areas adopting the detection limit of 4pg/g-wet, and none of the detected concentrations exceeded 320 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 4pg/g-wet, and the detection range was 72～320 pg/g-wet.

Heptabromodiphenyl ethers: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 3 of the 5 valid areas adopting the detection limit of 5pg/g-wet, and none of the detected concentrations exceeded 59 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 11 of the 19 valid areas adopting the detection limit of 5pg/g-wet, and none of the detected concentrations exceeded 120 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 5pg/g-wet, and the detection range was 14～280 pg/g-wet.

Octabromodiphenyl ethers: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 3pg/g-wet, and none of the detected concentrations exceeded 25 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 12 of the 19 valid areas adopting the detection limit of 3pg/g-wet, and none of the detected concentrations exceeded 160 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 3pg/g-wet, and the detection range was 40～420 pg/g-wet.

Nonabromodiphenyl ethers: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 3 of the 5 valid areas adopting the detection limit of 9pg/g-wet, and none of the detected concentrations exceeded 45 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 9 of the 19 valid areas adopting the detection limit of 9pg/g-wet, and none of the detected concentrations exceeded 54 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 2 valid areas adopting the detection limit of 9pg/g-wet, and the detection range was 67～150 pg/g-wet.

Decabromodiphenyl ether: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 50pg/g-wet, and none of the detected concentrations exceeded 480 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 11 of the 19 valid areas adopting the detection limit of 50pg/g-wet, and none of the detected concentrations exceeded 380 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 2 valid areas adopting the detection limit of 50pg/g-wet and the detection range was 240～260 pg/g-wet.

Stocktaking of the detection of Polybromodiphenyl ethers (Br_4～Br_{10}) in wildlife during FY2009~2012

Tetrabromodiphenyl ethers	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	73	61	380	20	5.9 [2.2]	31/31	7/7
	2010	59	73	310	nd	43 [16]	5/6	5/6
	2011	96	120	490	26	16 [6]	4/4	4/4
	2012	59	44	190	24	19 [7]	5/5	5/5
Fish (pg/g-wet)	2008	120	110	1,300	9.8	5.9 [2.2]	85/85	17/17
	2010	160	170	740	tr(16)	43 [16]	18/18	18/18
	2011	110	110	860	tr(9)	16 [6]	18/18	18/18
	2012	120	140	650	tr(10)	19 [7]	19/19	19/19
Birds (pg/g-wet)	2008	170	190	1,200	32	5.9 [2.2]	10/10	2/2
	2010	140	---	270	72	43 [16]	2/2	2/2
	2011	---	---	67	67	16 [6]	1/1	1/1
	2012	73	---	110	49	19 [7]	2/2	2/2

Pentabromodiphenyl ethers	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	32	27	94	tr(11)	16 [5.9]	31/31	7/7
	2010	32	37	98	tr(9)	14 [6]	6/6	6/6
	2011	51	60	160	tr(12)	15 [6]	4/4	4/4
	2012	28	24	67	tr(8)	18 [6]	5/5	5/5
Fish (pg/g-wet)	2008	30	37	280	nd	16 [5.9]	72/85	16/17
	2010	51	54	200	nd	14 [6]	16/18	16/18
	2011	39	39	300	nd	15 [6]	17/18	17/18
	2012	37	54	180	nd	18 [6]	17/19	17/19
Birds (pg/g-wet)	2008	150	130	440	52	16 [5.9]	10/10	2/2
	2010	150	---	200	120	14 [6]	2/2	2/2
	2011	---	---	110	110	15 [6]	1/1	1/1
	2012	85	---	110	66	18 [6]	2/2	2/2

Hexabromodiphenyl ethers	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	19	16	82	tr(5.3)	14 [5.0]	31/31	7/7
	2010	8	16	26	nd	8 [3]	4/6	4/6
	2011	38	41	81	20	10 [4]	4/4	4/4
	2012	21	23	130	tr(6)	10 [4]	5/5	5/5
Fish (pg/g-wet)	2008	46	51	310	nd	14 [5.0]	83/85	17/17
	2010	39	47	400	nd	8 [3]	16/18	16/18
	2011	53	50	430	nd	10 [4]	17/18	17/18
	2012	55	71	320	nd	10 [4]	18/19	18/19
Birds (pg/g-wet)	2008	140	120	380	62	14 [5.0]	10/10	2/2
	2010	110	---	140	86	8 [3]	2/2	2/2
	2011	---	---	96	96	10 [4]	1/1	1/1
	2012	150	---	320	72	10 [4]	2/2	2/2

Heptabromodiphenyl ethers	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	tr(8.5)	tr(7.6)	35	nd	18 [6.7]	20/31	7/7
	2010	nd	nd	tr(10)	nd	30 [10]	1/6	1/6
	2011	14	26	44	nd	11 [4]	3/4	3/4
	2012	tr(8)	tr(6)	59	nd	12 [5]	3/5	3/5
Fish (pg/g-wet)	2008	tr(11)	tr(8.1)	77	nd	18 [6.7]	44/85	10/17
	2010	nd	nd	40	nd	30 [10]	4/18	4/18
	2011	13	21	130	nd	11 [4]	13/18	13/18
	2012	tr(11)	18	120	nd	12 [5]	11/19	11/19
Birds (pg/g-wet)	2008	35	35	53	19	18 [6.7]	10/10	2/2
	2010	tr(19)	---	70	nd	30 [10]	1/2	1/2
	2011	---	---	44	44	11 [4]	1/1	1/1
	2012	63	---	280	14	12 [5]	2/2	2/2

Octabromodiphenyl ethers	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	nd	nd	10	nd	9.6 [3.6]	15/31	6/7
	2010	nd	nd	tr(10)	nd	11 [4]	2/6	2/6
	2011	7	9	29	nd	7 [3]	3/4	3/4
	2012	8	tr(7)	25	nd	8 [3]	4/5	4/5
Fish (pg/g-wet)	2008	tr(5.7)	nd	73	nd	9.6 [3.6]	35/85	7/17
	2010	tr(6)	nd	100	nd	11 [4]	8/18	8/18
	2011	tr(6)	tr(7)	150	nd	7 [3]	10/18	10/18
	2012	tr(7)	8	160	nd	8 [3]	12/19	12/19
Birds (pg/g-wet)	2008	42	41	64	30	9.6 [3.6]	10/10	2/2
	2010	41	---	65	26	11 [4]	2/2	2/2
	2011	---	---	66	66	7 [3]	1/1	1/1
	2012	130	---	420	40	8 [3]	2/2	2/2

Nonabromodiphenyl ethers	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	nd	nd	tr(23)	nd	35 [13]	5/31	1/7
	2010	tr(16)	tr(15)	60	nd	30 [10]	5/6	5/6
	2011	tr(12)	tr(11)	40	nd	22 [9]	3/4	3/4
	2012	tr(15)	25	45	nd	24 [9]	3/5	3/5
Fish (pg/g-wet)	2008	nd	nd	tr(15)	nd	35 [13]	2/85	2/17
	2010	nd	nd	40	nd	30 [10]	3/18	3/18
	2011	nd	nd	tr(15)	nd	22 [9]	5/18	5/18
	2012	nd	nd	54	nd	24 [9]	9/19	9/19
Birds (pg/g-wet)	2008	tr(21)	tr(20)	tr(33)	nd	35 [13]	9/10	2/2
	2010	32	---	50	tr(20)	30 [10]	2/2	2/2
	2011	---	---	62	62	22 [9]	1/1	1/1
	2012	100	---	150	67	24 [9]	2/2	2/2

Decabromodiphenyl ether	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2008	nd	nd	tr(170)	nd	220 [74]	8/31	3/7
	2010	nd	nd	tr(190)	nd	270 [97]	2/6	2/6
	2011	nd	nd	240	nd	230 [80]	1/4	1/4
	2012	120	170	480	nd	120 [50]	4/5	4/5
Fish (pg/g-wet)	2008	nd	nd	230	nd	220 [74]	5/76	4/16
	2010	nd	nd	tr(150)	nd	270 [97]	2/18	2/18
	2011	nd	nd	tr(90)	nd	230 [80]	2/18	2/18
	2012	tr(59)	tr(60)	380	nd	120 [50]	11/19	11/19
Birds (pg/g-wet)	2008	nd	nd	tr(110)	nd	220 [74]	4/10	1/2
	2010	nd	---	nd	nd	270 [97]	0/2	0/2
	2011	---	---	tr(170)	tr(170)	230 [80]	1/1	1/1
	2012	250	---	260	240	120 [50]	2/2	2/2

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2008.

<Air>

Tetrabromodiphenyl ethers: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 5.7pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 25 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 1.7 pg/m^3.

Pentabromodiphenyl ethers: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 30 of the 36 valid sites adopting the detection limit of 0.06pg/m^3, and none of the detected concentrations exceeded 2.4 pg/m^3.For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 26 of the 36 valid sites adopting the detection limit of 0.06pg/m^3, and none of the detected concentrations exceeded 0.77 pg/m^3.

Hexabromodiphenyl ethers: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 9 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 3.1 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 22 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 0.5 pg/m^3.

Heptabromodiphenyl ethers: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 6 of the 36 valid sites adopting the detection limit of 0.2pg/m^3, and none of the detected concentrations exceeded 1.8 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 8 of the 36 valid sites adopting the detection limit of 0.2pg/m^3, and none of the detected concentrations exceeded 0.7 pg/m^3.

Octabromodiphenyl ethers: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 29 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 1.2 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 30 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 1.2 pg/m^3.

Nonabromodiphenyl ethers: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 24 of the 36valid sites adopting the detection limit of 0.4pg/m^3, and none of the detected concentrations exceeded 5.1 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 30 of the 36 valid sites adopting the detection limit of 0.4pg/m^3, and none of the detected concentrations exceeded 4.7 pg/m^3.

Decabromodiphenyl ether: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 17 of the 36valid sites adopting the detection limit of 5pg/m^3, and none of the detected concentrations exceeded 31 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 28 of the 36 valid sites adopting the detection limit of 5pg/m^3, and none of the detected concentrations exceeded 73 pg/m^3.

Stocktaking of the detection of Polybromodiphenyl ethers (Br_4～Br_{10}) in air during FY2009~2012

Tetrabromo diphenyl ethers:	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	0.89	0.80	18	0.11	0.11 [0.04]	37/37	37/37
	2009 Cold season	0.40	0.37	7.1	tr(0.04)		37/37	37/37
	2010 Warm season	0.79	0.57	50	0.15	0.12 [0.05]	37/37	37/37
	2010 Cold season	0.40	0.35	25	tr(0.09)		37/37	37/37
	2011 Warm season	0.80	0.72	9.3	tr(0.11)	0.18 [0.07]	35/35	35/35
	2011 Cold season	0.36	0.34	7.0	nd		35/37	35/37
	2012 Warm season	0.7	0.7	5.7	nd	0.3 [0.1]	35/36	35/36
	2012 Cold season	tr(0.2)	tr(0.2)	1.7	nd		25/36	25/36

Pentabromo diphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	0.20	0.19	18	nd	0.16 [0.06]	33/37	33/37
	2009 Cold season	0.19	0.16	10	nd		29/37	29/37
	2010 Warm season	0.20	0.17	45	nd	0.12 [0.05]	35/37	35/37
	2010 Cold season	0.20	0.22	28	nd		34/37	34/37
	2011 Warm season	0.19	0.17	8.8	nd	0.16 [0.06]	31/35	31/35
	2011 Cold season	0.16	tr(0.14)	2.6	nd		31/37	31/37
	2012 Warm season	tr(0.13)	tr(0.12)	2.4	nd	0.14 [0.06]	30/36	30/36
	2012 Cold season	tr(0.09)	tr(0.09)	0.77	nd		26/36	26/36

Hexabromo diphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	tr(0.11)	tr(0.11)	2.0	nd	0.22 [0.09]	19/37	19/37
	2009 Cold season	tr(0.20)	0.22	27	nd		24/37	24/37
	2010 Warm season	tr(0.14)	tr(0.13)	4.9	nd	0.16 [0.06]	29/37	29/37
	2010 Cold season	0.24	0.27	5.4	nd		31/37	31/37
	2011 Warm season	tr(0.11)	tr(0.10)	1.2	nd	0.14 [0.05]	28/35	28/35
	2011 Cold season	0.16	0.18	1.7	nd		30/37	30/37
	2012 Warm season	nd	nd	3.1	nd	0.3 [0.1]	9/36	9/36
	2012 Cold season	tr(0.1)	tr(0.1)	0.5	nd		22/36	22/36

Heptabromo diphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	tr(0.1)	nd	1.7	nd	0.3 [0.1]	17/37	17/37
	2009 Cold season	tr(0.2)	0.3	20	nd		25/37	25/37
	2010 Warm season	tr(0.2)	tr(0.1)	1.4	nd	0.3 [0.1]	24/37	24/37
	2010 Cold season	0.3	0.4	11	nd		28/37	28/37
	2011 Warm season	tr(0.1)	tr(0.1)	1.1	nd	0.3 [0.1]	20/35	20/35
	2011 Cold season	tr(0.2)	tr(0.2)	2.3	nd		25/37	25/37
	2012 Warm season	nd	nd	1.8	nd	0.5 [0.2]	6/36	6/36
	2012 Cold season	nd	nd	0.7	nd		8/36	8/36

Octabromo diphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	tr(0.2)	0.3	1.6	nd	0.3 [0.1]	23/37	23/37
	2009 Cold season	0.3	0.4	7.1	nd		26/37	26/37
	2010 Warm season	0.25	0.30	2.3	nd	0.15 [0.06]	30/37	30/37
	2010 Cold season	0.40	0.52	6.9	nd		32/37	32/37
	2011 Warm season	0.24	0.31	1.9	nd	0.20 [0.08]	27/35	27/35
	2011 Cold season	0.35	0.44	7.0	nd		30/37	30/37
	2012 Warm season	tr(0.2)	tr(0.2)	1.2	nd	0.3 [0.1]	29/36	29/36
	2012 Cold season	0.3	0.4	1.2	nd		30/36	30/36

Nonabromo diphenyl ethers	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	tr(0.7)	tr(0.7)	3.0	nd	1.8 [0.6]	22/37	22/37
	2009 Cold season	tr(1.0)	tr(0.8)	3.9	nd		27/37	27/37
	2010 Warm season	nd	nd	24	nd	3.7 [1.2]	12/37	12/37
	2010 Cold season	tr(1.2)	tr(1.3)	7.1	nd		22/37	22/37
	2011 Warm season	tr(0.8)	0.9	3.9	nd	0.9 [0.4]	29/35	29/35
	2011 Cold season	1.1	1.1	14	nd		30/37	30/37
	2012 Warm season	tr(0.5)	tr(0.5)	5.1	nd	1.2 [0.4]	24/36	24/36
	2012 Cold season	tr(0.9)	tr(1.1)	4.7	nd		30/36	30/36

Decabromo diphenyl ether	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2009 Warm season	tr(7)	tr(9)	31	nd	16 [5]	28/37	28/37
	2009 Cold season	tr(10)	tr(11)	45	nd		29/37	29/37
	2010 Warm season	nd	nd	290	nd	27 [9.1]	10/37	10/37
	2010 Cold season	tr(11)	tr(12)	88	nd		21/37	21/37
	2011 Warm season	tr(8.2)	tr(9.0)	30	nd	12 [4.0]	31/35	31/35
	2011 Cold season	tr(8.4)	tr(9.0)	44	nd		29/37	29/37
	2012 Warm season	nd	nd	31	nd	16 [5]	17/36	17/36
	2012 Cold season	tr(10)	tr(12)	73	nd		28/36	28/36

[15] Perfluorooctane sulfonic acid (PFOS)

・ History and state of monitoring

Perfluorooctane sulfonic acid (PFOS) has been used as water repellent agent, oil repellent agent and surface acting agent. Perfluorooctane sulfonic acid (PFOS) was adopted as target chemicals at the COP4 of the Stockholm convention on Persistent Organic Pollutants in May 2009. The substance was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in April 2010.

Under the framework of the Environmental Monitoring, the substance was monitored in surface water, sediment and wildlife (bivalves, fish and birds) in FY 2009 , and air in FY 2010～2012.

The survey of the Perfluorooctane sulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) only monitored linear octyl Perfluorooctane sulfonic acid (PFOS) and linear octyl Perfluorooctanoic acid (PFOA).

・ Monitoring results

<Surface Water>

The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 12pg/L, and the detection range was 39～14,000 pg/L.

Stocktaking of the detection of Perfluorooctane sulfonic acid (PFOS) in surface water during FY2009~2012

Perfluorooctane sulfonic acid (PFOS)	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2009	730	580	14,000	tr(26)	37 [14]	49/49	49/49
	2010	490	380	230,000	tr(37)	50 [20]	49/49	49/49
	2011	480	360	10,000	tr(20)	50 [20]	49/49	49/49
	2012	550	510	14,000	39	31 [12]	48/48	48/48

<Sediment>

The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 4pg/g-dry, and none of the detected concentrations exceeded tr(7)～1,200 pg/g-dry.

Stocktaking of the detection of Perfluorooctane sulfonic acid (PFOS) in sediment during FY2009~2012

Perfluorooctane sulfonic acid (PFOS)	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2009	78	97	1,900	nd	9.6 [3.7]	180/190	64/64
	2010	82	100	1,700	tr(3)	5 [2]	64/64	64/64
	2011	92	110	1,100	nd	5 [2]	63/64	63/64
	2012	68	84	1,200	tr(7)	9 [4]	63/63	63/63

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.

<Wildlife>

The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 3pg/g-wet, and the detection range was tr(4)～160 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 3pg/g-wet, and the the detection range was tr(5)～7,300 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 3pg/g-wet, and the detection range was 63～410pg/g-wet.

Stocktaking of the detection of Perfluorooctane sulfonic acid (PFOS) in wildlife during FY2009~2012

Perfluorooctane sulfonic acid (PFOS)	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2009	24	28	640	nd	19 [7.4]	17/31	5/7
	2010	72	85	680	nd	25 [9.6]	5/6	5/6
	2011	38	44	100	16	10 [4]	4/4	4/4
	2012	27	21	160	tr(4)	7 [3]	5/5	5/5
Fish (pg/g-wet)	2009	220	230	15,000	nd	19 [7.4]	83/90	17/18
	2010	390	480	15,000	nd	25 [9.6]	17/18	17/18
	2011	82	95	3,200	nd	10 [4]	16/18	16/18
	2012	110	130	7,300	tr(5)	7 [3]	19/19	19/19
Birds (pg/g-wet)	2009	300	360	890	37	19 [7.4]	10/10	2/2
	2010	1,300	---	3,000	580	25 [9.6]	2/2	2/2
	2011	---	---	110	110	10 [4]	1/1	1/1
	2012	160	---	410	63	7 [3]	2/2	2/2

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.

<Air>

The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection range was 1.3～8.9 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection range was 1.0～5.9 pg/m^3.

Stocktaking of the detection of Perfluorooctane sulfonic acid (PFOS) in wildlife in FY2010~2012

Perfluorooctane sulfonic acid (PFOS)	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2010 Warm season	5.2	5.9	14	1.6	0.4 [0.1]	37/37	37/37
	2010 Cold season	4.7	4.4	15	1.4		37/37	37/37
	2011 Warm season	4.4	4.2	10	0.9	0.5 [0.2]	35/35	35/35
	2011 Cold season	3.7	3.8	9.5	1.3		37/37	37/37
	2012 Warm season	3.6	3.8	8.9	1.3	0.5 [0.2]	36/36	36/36
	2012 Cold season	2.7	3.0	5.9	1.0		36/36	36/36

[16] Perfluorooctanoic acid (PFOA)

・ History and state of monitoring

Perfluorooctanoic acids (PFOA) have been used as water repellent agent, oil repellent agent and surface acting agent. Perfluorooctanoic acids (PFOA) were adopted as target chemicals at the COP4 of the Stockholm convention on Persistent Organic Pollutants in May 2009.

The substances were measured in surface water, sediment and wildlife in FY 2002, 2003, 2004, 2005 under the framework of "the Environmental Survey and Monitoring of Chemicals".

The survey of the Perfluorooctane sulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) only monitored linear octyl Perfluorooctane sulfonic acid (PFOS) and linear octyl Perfluorooctanoic acid (PFOA). However, it remains possible that the survey in wildlife monitored branched-chain Perfluorooctane sulfonic acid (PFOS) and branched-chain Perfluorooctanoic acid (PFOA).

・ Monitoring results

<Surface Water>

The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 55pg/L, and the detection range was 240～26,000pg/L.

Stocktaking of the detection of Perfluorooctanoic acid (PFOA) in surface water during FY2009~2012

Perfluorooctanoic acid(PFOA)	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2009	1,600	1,300	31,000	250	59 [23]	49/49	49/49
	2010	2,700	2,400	23,000	190	60 [20]	49/49	49/49
	2011	2,000	1,700	50,000	380	50 [20]	49/49	49/49
	2012	1,400	1,100	26,000	240	170 [55]	48/48	48/48

<Sediment>

The presence of the substance in sediment was monitored at 63 sites, and it was detected at all 63 valid sites adopting the detection limit of 2pg/g-dry, and the detection range was 12～280 pg/g-dry.

Stocktaking of the detection of Perfluorooctanoic acid (PFOA) in sediment during FY2009~2012

Perfluorooctanoic acid(PFOA)	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2009	27	24	500	nd	8.3 [3.3]	182/190	64/64
	2010	28	33	180	nd	12 [5]	62/64	62/64
	2011	100	93	1,100	22	5 [2]	64/64	64/64
	2012	51	48	280	12	4 [2]	63/63	63/63

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.

<Wildlife>

The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 13pg/g-wet, and none of the detected concentrations exceeded 46 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 18 of the 19 valid areas adopting the detection limit of 13pg/g-wet, and none of the detected concentrations exceeded 86 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 13pg/g-wet, and the detection range was tr(26)～tr(28) pg/g- wet.

Stocktaking of the detection of Perfluorooctanoic acid (PFOA) in wildlife (bivalves, fish and birds) during FY2009~2012

Perfluorooctanoic acid(PFOA)	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2009	tr(20)	tr(21)	94	nd	25 [9.9]	27/31	7/7
	2010	28	33	76	nd	26 [9.9]	5/6	5/6
	2011	tr(19)	tr(22)	tr(40)	nd	41 [14]	3/4	3/4
	2012	tr(21)	tr(23)	46	nd	38 [13]	4/5	4/5
Fish (pg/g-wet)	2009	tr(23)	tr(19)	490	nd	25 [9.9]	74/90	17/18
	2010	tr(13)	tr(11)	95	nd	26 [9.9]	13/18	13/18
	2011	nd	nd	51	nd	41 [14]	7/18	7/18
	2012	tr(35)	tr(32)	86	nd	38 [13]	18/19	18/19
Birds (pg/g-wet)	2009	32	29	58	tr(16)	25 [9.9]	10/10	2/2
	2010	38	---	48	30	26 [9.9]	2/2	2/2
	2011	---	---	nd	nd	41 [14]	0/1	0/1
	2012	tr(27)	---	tr(28)	tr(26)	38 [13]	2/2	2/2

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2009.

<Air>

The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection range was 1.9～120 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection range was 1.6～48 pg/m^3.

Stocktaking of the detection of Perfluorooctanoic acid (PFOA) in air during FY2009~2012

Perfluorooctanoic acid (PFOA)	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2010 Warm season	25	26	210	4.0	0.5 [0.2]	37/37	37/37
	2010 Cold season	14	14	130	2.4		37/37	37/37
	2011 Warm season	20	18	240	tr(3.5)	5.4 [1.8]	35/35	35/35
	2011 Cold season	12	11	97	nd		36/37	36/37
	2012 Warm season	11	12	120	1.9	0.7 [0.2]	36/36	36/36
	2012 Cold season	6.9	6.0	48	1.6		36/36	36/36

[17] Pentachlorobenzene

・ History and state of monitoring

Pentachlorobenzene have been used as flame retardants and pesticide. It was historically never registered under the Agricultural Chemicals Regulation Law. The pentachlorobenzene is produced as a by-product when agricultural chemicals are produced. In addition, it is generated unintentionally at the time of combustion. Pentachlorobenzene was adopted as target chemicals at the COP4 of the Stockholm convention on Persistent Organic Pollutants in May 2009 and designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in April 2010.

Under the framework of the Environmental Monitoring, the substance was monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air in FY 2007,FY 2010～2012, and air in FY 2009.

・ Monitoring results

<Surface Water>

The presence of the substance in surface water was monitored at 48 sites, and it was detected at all 48 valid sites adopting the detection limit of 1pg/L, and the detection range was 3～170 pg/L.

Stocktaking of the detection of Pentachlorobenzene in surface water in FY2007 ,FY2010 and FY2011

Penta chloro benzene	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2007	nd	nd	nd	nd	3,300 [1,300]	0/48	0/48
	2010	8	5	100	tr(1)	4 [1]	49/49	49/49
	2011	11	11	170	2.6	2.4 [0.9]	49/49	49/49
	2012	14	11	170	3	3 [1]	48/48	48/48

<Sediment>

The presence of the substance in sediment was monitored at 63 sites, and it was detected at 62 of the 63 valid sites adopting the detection limit of 0.8pg/g-dry, none of the detected concentrations exceeded 1,100 pg/g-dry.

Stocktaking of the detection of Pentachlorobenzene in sediment in FY2007 ,FY2010 and FY2012

Penta chloro benzene	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2007	tr(46)	nd	2,400	nd	86 [33]	79/19	35/64
	2010	90	95	4,200	1.0	0.9 [0.3]	64/64	64/64
	2011	95	76	4,500	3	5 [2]	64/64	64/64
	2012	33	33	1,100	nd	2.5 [0.8]	62/63	62/63

(Note) “ * ” :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2007.

<Wildlife>

The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 2.7pg/g-wet, and the detection range was tr(5.8)～110 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at all 19 valid areas adopting the detection limit of 2.7pg/g-wet, and the detection range was tr(5.0)～190 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at all 2 valid areas adopting the detection limit of 2.7pg/g-wet, and the detection range was 46～130 pg/g-wet.

Stocktaking of the detection of Pentachlorobenzene in in wildlife (bivalves, fish and birds) in FY2007 ,FY2010 and FY2012

Penta chloro benzene	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2007	nd	nd	tr(150)	nd	180 [61]	1/31	1/7
	2010	18	16	110	5.9	1.9 [0.7]	6/6	6/6
	2011	28	16	260	10	4 [1]	4/4	4/4
	2012	16	9.7	110	tr(5.8)	8.1 [2.7]	5/5	5/5
Fish (pg/g-wet)	2007	nd	nd	480	nd	180 [61]	36/80	10/16
	2010	42	37	230	5.6	1.9 [0.7]	18/18	18/18
	2011	36	37	220	5	4 [1]	18/18	18/18
	2012	29	37	190	tr(5.0)	8.1 [2.7]	19/19	19/19
Birds (pg/g-wet)	2007	tr(140)	tr(140)	210	tr(89)	180 [61]	10/10	2/2
	2010	91	---	170	49	1.9 [0.7]	2/2	2/2
	2011	---	---	52	52	4 [1]	1/1	1/1
	2012	77	---	130	46	8.1 [2.7]	2/2	2/2

(Note) " * " :Arithmetic mean value was calculated for each point, from which the geometric mean value for all points was derived in FY2007.

<Air>

The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.6pg/m^3, and the detection range was 31～150 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.6pg/m^3, and the detection range was 27～120 pg/m^3.

Stocktaking of the detection of Pentachlorobenzene in air in FY2007 , FY2009～FY2011

Penta chloro benzene	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Air (pg/m^3)	2008 Warm season	85	83	310	18	12 [4.8]	78/78	26/26
	2008 Cold season	60	55	220	27		75/75	25/25
	2009 Warm season	63	64	210	20	6.4 [2.5]	111/111	37/37
	2009 Cold season	25	22	120	tr(5.0)		111/111	37/37
	2010 Warm season	68	73	140	36	1.2 [0.5]	37/37	37/37
	2010 Cold season	70	69	180	37		37/37	37/37
	2011 Warm season	61	60	140	30	2.1 [0.70]	35/35	35/35
	2011 Cold season	59	57	180	26		37/37	37/37
	2012 Warm season	58	57	150	31	1.8 [0.6]	36/36	36/36
	2012 Cold season	55	55	120	27		36/36	36/36

[18] Endosulfans

・ History and state of monitoring

Endosulfans have been used as an organochlorine insecticide chemical. Endosulfans were listed under the Convention at the COP5 of the Stockholm Convention on Persistent Organic Pollutants in April 2011.

Under the framework of the Environmental Monitoring, the substance was monitored in surface water, sediment, wildlife (bivalves, fish and birds) and air in FY2011 and FY 2012.

・ Monitoring results

○ α-Endosulfan, β-Endosulfan

<Surface Water >

α-Endosulfan: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 3 of the 48 valid sites adopting the detection limit of 10pg/L, and none of the detected concentrations exceeded 30 pg/L.

β-Endosulfan: The presence of the substance in surface water was monitored at 48 sites, and it was detected at 1 of the 48 valid sites adopting the detection limit of 9pg/L, and none of the detected concentrations exceeded tr(12)pg/L.

Stocktaking of the detection of α-Endosulfan and β-Endosulfan in surface water in FY2011～FY2012.

α-Endosulfan	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2011	nd	nd	180	nd	120 [50]	2/49	2/49
	2012	nd	nd	30	nd	27 [10]	3/48	3/48
β-Endosulfan	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2011	nd	nd	270	nd	22 [9]	8/49	8/49
	2012	nd	nd	tr(12)	nd	24 [9]	1/48	1/48

< Sediment >

α-Endosulfan: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 19 of the 63 valid sites adopting the detection limit of 5 pg/g-dry, and none of the detected concentrations exceeded 480 pg/g-dry.

β-Endosulfan: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 8 of the 63 valid sites adopting the detection limit of 5 pg/g-dry, and none of the detected concentrations exceeded 250 pg/g-dry.

Stocktaking of the detection of α-Endosulfan and β-Endosulfan in sediment in FY2011～FY2012

α-Endosulfan	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2011	tr(13)	tr(11)	480	nd	30 [10]	35/64	35/64
	2012	nd	nd	480	nd	13 [5]	19/63	19/63
β-Endosulfan	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2011	tr(5)	tr(4)	240	nd	9 [4]	38/64	38/64
	2012	nd	nd	250	nd	13 [5]	8/63	8/63

<Wildlife>

α-Endosulfan: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 24pg/g-wet, and none of the detected concentrations exceeded 200pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 6 of the 19 valid areas adopting the detection limit of 24pg/g-wet, and none of the detected concentrations exceeded tr(54) pg/g-wet. For birds, the presence of the substance was monitored in 2 areas and it was not detected at all 2 valid areas adopting the detection limit of 24pg/g-wet.

β-Endosulfan: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 5 pg/g-wet, and none of the detected concentrations exceeded 43 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 6 of the 19 valid areas adopting the detection limit of 5pg/g-wet, and none of the detected concentrations exceeded 15 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 1 of the 2 valid areas adopting the detection limit of 5pg/g-wet, and none of the detected concentrations exceeded tr(7)pg/g-wet.

Stocktaking of the detection of *α*-Endosulfan and *β*-Endosulfan in wildlife (bivalves, fish and birds) in FY2011～FY2012

α-Endosulfan	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	62	120	330	nd	50 [20]	3/4	3/4
	2012	tr(54)	tr(61)	200	nd	71 [24]	4/5	4/5
Fish (pg/g-wet)	2011	tr(20)	tr(20)	140	nd	50 [20]	10/18	10/18
	2012	nd	nd	tr(54)	nd	71 [24]	6/19	6/19
Birds (pg/g-wet)	2011	---	---	nd	nd	50 [20]	0/1	0/1
	2012	nd	---	nd	nd	71 [24]	0/2	0/2
β-Endosulfan	Monitored year	Geometric mean*	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	16	26	52	4	11 [4]	4/4	4/4
	2012	15	16	43	nd	14 [5]	4/5	4/5
Fish (pg/g-wet)	2011	nd	nd	37	nd	11 [4]	9/18	9/18
	2012	nd	nd	15	nd	14 [5]	6/19	6/19
Birds (pg/g-wet)	2011	---	---	nd	nd	11 [4]	0/1	0/1
	2012	nd	---	tr(7)	nd	14 [5]	1/2	1/2

<Air>

α-Endosulfan: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 5.3pg/m^3, and the detection range was tr(6.0)～98 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 15 of the 36 valid sites adopting the detection limit of 5.3pg/m^3, and none of the detected concentrations exceeded 19 pg/m^3.

β-Endosulfan: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 33 of the 36 valid sites adopting the detection limit of 0.4pg/m^3, and none of the detected concentrations exceeded 18 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 17 of the 36 valid sites adopting the detection limit of 0.4pg/m^3, and none of the detected concentrations exceeded 1.7pg/m^3.

Stocktaking of the detection of α-Endosulfan and β-Endosulfan in air in FY2011～2012

α-Endosulfan	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2011 Warm season	26	24	190	tr(7.8)	12 [4.0]	35/35	35/35
	2011 Cold season	tr(9.6)	tr(9.8)	45	nd		35/37	35/37
	2012 Warm season	23	22	98	tr(6.0)	16 [5.3]	36/36	36/36
	2012 Cold season	nd	nd	19	nd		15/36	15/36

β-Endosulfan	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2011 Warm season	2.1	1.8	11	nd	1.2 [0.39]	34/35	34/35
	2011 Cold season	tr(0.80)	tr(0.90)	8.3	nd		31/37	31/37
	2012 Warm season	1.3	1.3	18	nd	1.2 [0.4]	33/36	33/36
	2012 Cold season	nd	nd	1.7	nd		17/36	17/36

[19] 1,2,5,6,9,10-Hexabromocyclododecanes

・ History and state of monitoring

1,2,5,6,9,10-Hexabromocyclododecanes have been used as flame retardants for plastics products and fiber products. 1,2,5,6,9,10-Hexabromocyclododecanes was adopted as target chemicals at the COP6 of the Stockholm convention on Persistent Organic Pollutants in April～May 2013.

FY2011 was the first year for this Envronmental Monitoring series, and the substances were measured in the surface water and sediment in FY 2003 and wildlife (fish) in FY2004 under the framework of "The Initial Environmental Survey". The substances were measured in the surface water, sediment and wildlife (bivalves, fish and birds) in FY 2011, and sediment, wildlife (bivalves, fish and birds) and air in FY2012 uder the framework of the Environmental Monitoring.

・ Monitoring results

○ *α*-1,2,5,6,9,10-Hexabromocyclododecane, *β*-1,2,5,6,9,10-Hexabromocyclododecane, *γ*-1,2,5,6,9,10-Hexabromocyclododecane, *δ*-1,2,5,6,9,10-Hexabromocyclododecane, *ε*-1,2,5,6,9,10-Hexabromocyclododecane

<Surface Water >

Stocktaking of the detection of 1,2,5,6,9,10-Hexabromocyclododecanes in surface water in FY2011

α-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Surface Water (pg/L)	2011	nd	nd	6,300	nd	1,500 [600]	4/47	4/47
β-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Sample	Site
Surface Water (pg/L)	2011	nd	nd	1,300	nd	1,300 [500]	4/47	4/47
γ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Sample	Site
Surface Water (pg/L)	2011	nd	nd	65,000	nd	1,200 [500]	5/47	5/47
δ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Sample	Site
Surface Water (pg/L)	2011	nd	nd	nd	nd	790 [300]	0/47	0/47
ε-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Sample	Site
Surface Water (pg/L)	2011	nd	nd	nd	nd	740 [300]	0/47	0/47

(Note) No monitoring was conducted in FY2012.

< Sediment >

α-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 47 of the 63 valid sites adopting the detection limit of 70 pg/g-dry, and none of the detected concentrations exceeded 22,000 pg/g-dry.

β-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 29 of the 63 valid sites adopting the detection limit of 60 pg/g-dry, and none of the detected concentrations exceeded 8,900 pg/g-dry.

γ-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 52 of the 63 valid sites adopting the detection limit of 60 pg/g-dry, and none of the detected concentrations exceeded 55,000 pg/g-dry.

δ-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 5 of the 63 valid sites adopting the detection limit of 100 pg/g-dry, and none of the detected concentrations exceeded 680 pg/g-dry.

ε-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in sediment was monitored at 63 sites, and it was detected at 7 of the 63 valid site adopting the detection limit of 60 pg/g-dry, and none of the detected concentrations exceeded 310 pg/g-dry.

Stocktaking of the detection of 1,2,5,6,9,10-Hexabromocyclododecanes in sediment in FY2011~2012.

α-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment	2011	430	nd	24,000	nd	420 [280]	78/186	35/62
(pg/g-dry)	2012	310	280	22,000	nd	180 [70]	47/63	47/63
β-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment	2011	nd	nd	14,000	nd	250 [170]	48/186	21/62
(pg/g-dry)	2012	tr(93)	nd	8,900	nd	150 [60]	29/63	29/63
γ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment	2011	670	nd	570,000	nd	400 [260]	89/186	36/62
(pg/g-dry)	2012	420	330	55,000	nd	160 [60]	52/63	52/63
δ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment	2011	nd	nd	800	nd	350 [250]	11/186	6/62
(pg/g-dry)	2012	nd	nd	680	nd	300 [100]	5/63	5/63
ε-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Sediment	2011	nd	nd	tr(260)	nd	280 [210]	2/186	1/62
(pg/g-dry)	2012	nd	nd	310	nd	150 [60]	7/63	7/63

＜Wildlife＞

α-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 20pg/g-wet, and the detection range was 190～2,500pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 18 of the 19 valid areas adopting the detection limit of 20pg/g-wet, and none of the detected concentrations exceeded 8,700 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 1 of the 2 valid areas adopting the detection limit of 20pg/g-wet, and none of the detected concentrations exceeded 1,400 pg/g-wet.

β-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at 4 of the 5 valid areas adopting the detection limit of 10pg/g-wet, and none of the detected concentrations exceeded 90pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 8 of the 19 valid areas adopting the detection limit of 10pg/g-wet, and none of the detected concentrations exceeded 40 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was not detected at all

2 valid areas adopting the detection limit of 10pg/g-wet.

γ-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 10pg/g-wet, and the detection range was 30～910pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 16 of the 19 valid areas adopting the detection limit of 10pg/g-wet, and none of the detected concentrations exceeded 1,600 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 1 of the 2 valid areas adopting the detection limit of 10pg/g-wet, and none of the detected concentrations exceeded 190 pg/g-wet.

δ-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in bivalves was monitored in 5 areas, and it was not detected at all 5 valid areas adopting the detection limit of 20pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was not detected at all 19 valid areas adopting the detection limit of 20pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was not detected at all 2 valid areas adopting the detection limit of 20pg/g-wet.

ε-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in bivalves was monitored in 5 areas, and it wast detected at 1 of the 5 valid areas adopting the detection limit of 20pg/g-wet, and none of the detected concentrations exceeded tr(30) pg/g-wet. For fish, the presence of the substance was monitored in at 19 areas, and it was detected at 3 of the 19 valid areas adopting the detection limit of 20pg/g-wet. For birds, the presence of the substance was monitored in at 2 areas, and it was not detected at all 2 valid areas adopting the detection limit of 20pg/g-wet.

Stocktaking of the detection of 1,2,5,6,9,10-Hexabromocyclododecanes in wildlife (bivalves, fish and birds) in FY2011~2012

α-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	1,100	1,200	13,000	tr(86)	170 [70]	10/10	4/4
	2012	530	480	2,500	190	50 [20]	5/5	5/5
Fish (pg/g-wet)	2011	770	850	69,000	nd	170 [70]	41/51	16/17
	2012	510	560	8,700	nd	50 [20]	18/19	18/19
Birds (pg/g-wet)	2011	200	nd	530	nd	170 [70]	1/3	1/1
	2012	120	---	1,400	nd	50 [20]	1/2	1/2
β-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	tr(70)	tr(85)	240	nd	98 [40]	7/10	3/4
	2012	tr(25)	40	90	nd	40 [10]	4/5	4/5
Fish (pg/g-wet)	2011	nd	nd	760	nd	98 [40]	11/51	5/17
	2012	nd	nd	40	nd	40 [10]	8/19	8/19
Birds (pg/g-wet)	2011	nd	nd	nd	nd	98 [40]	0/3	0/1
	2012	nd	---	nd	nd	40 [10]	0/2	0/2
γ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	440	470	3,300	nd	210 [80]	8/10	4/4
	2012	170	180	910	30	30 [10]	5/5	5/5
Fish (pg/g-wet)	2011	210	tr(90)	50,000	nd	210 [80]	26/51	10/17
	2012	75	80	1,600	nd	30 [10]	16/19	16/19
Birds (pg/g-wet)	2011	tr(180)	nd	460	nd	210 [80]	1/3	1/1
	2012	31	---	190	nd	30 [10]	1/2	1/2

δ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	nd	nd	nd	nd	140 [60]	0/10	0/4
	2012	nd	nd	nd	nd	50 [20]	0/5	0/5
Fish (pg/g-wet)	2011	nd	nd	nd	nd	140 [60]	0/51	0/17
	2012	nd	nd	nd	nd	50 [20]	0/19	0/19
Birds (pg/g-wet)	2011	nd	nd	nd	nd	140 [60]	0/3	0/1
	2012	nd	---	nd	nd	50 [20]	0/2	0/2

ε-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Bivalves (pg/g-wet)	2011	nd	nd	nd	nd	140 [60]	0/10	0/4
	2012	nd	nd	tr(30)	nd	40 [20]	1/5	1/5
Fish (pg/g-wet)	2011	nd	nd	nd	nd	140 [60]	0/51	0/17
	2012	nd	nd	tr(30)	nd	40 [20]	3/19	3/19
Birds (pg/g-wet)	2011	nd	nd	nd	nd	140 [60]	0/3	0/1
	2012	nd	---	nd	nd	40 [20]	0/2	0/2

<Air>

α-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at all 36 valid sites adopting the detection limit of 0.2pg/m^3, and none of the detected concentrations exceeded 130 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.2pg/m^3, and none of the detected concentrations exceeded 63 pg/m^3.

β-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 30 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 29 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 18pg/m^3.

γ-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 31 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 280 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 35 of the 36 valid sites adopting the detection limit of 0.1pg/m^3, and none of the detected concentrations exceeded 84 pg/m^3.

δ-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was detected at 1 of the 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection value was 0.8 pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 1 of the 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection value was 1.1pg/m^3.

ε-1,2,5,6,9,10-Hexabromocyclododecane: The presence of the substance in air in the warm season was monitored at 36 sites, and it was not detected at all 36 valid sites adopting the detection limit of 0.2pg/m^3. For air in the cold season, the presence of the substance was monitored at 36 sites, and it was detected at 1 of the 36 valid sites adopting the detection limit of 0.2pg/m^3, and the detection value was tr(0.5)pg/m^3.

Stocktaking of the detection of 1,2,5,6,9,10-Hexabromocyclododecanes in air in FY2012

α-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2012 Warm season	1.7	2.2	130	nd	0.6 [0.2]	31/36	31/36
	2012 Cold season	2.9	3.0	63	nd		35/36	35/36

β-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2012 Warm season	0.5	0.5	29	nd	0.3 [0.1]	30/36	30/36
	2012 Cold season	0.8	0.8	18	nd		35/36	35/36

γ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2012 Warm season	1.6	1.7	280	nd	0.3 [0.1]	31/36	31/36
	2012 Cold season	2.1	1.8	84	nd		35/36	35/36

δ-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2012 Warm season	nd	nd	0.8	nd	0.4 [0.2]	1/36	1/36
	2012 Cold season	nd	nd	1.1	nd		1/36	1/36

ε-1,2,5,6,9,10-Hexabromocyclododecane	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency Sample	Detection Frequency Site
Air (pg/m^3)	2012 Warm season	nd	nd	nd	nd	0.6 [0.2]	0/36	0/36
	2012 Cold season	nd	nd	tr(0.5)	nd		1/36	1/36

[20] 2-(2H-1,2,3-Benzotriazol-2-yl)-4,6-di-tert-butylphenol

・ History and state of monitoring

2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol had been used as a ultraviolet absorbent for plastics products The substance was designated as a Class I Specified Chemical Substance under the Chemical Substances Control Law in April 2007.

FY2012 was the first year for this Envronmental Monitoring series, and the substance was measured in surface water in FY2005 under the framework of “the Initial Environmental Survey” and “the Environmental Survey for Exposure Study”, and in surface water, sediment and wildlife in FY 2006 under the framework of “The Detailed Environmental Survey”.

・ Monitoring results

<Surface Water>

The presence of the substance in surface water was monitored at 48 sites, and it was detected at 1 of the 48 valid sites adopting the detection limit of 39pg/L, and the detection value was tr(49) pg/L.

Stocktaking of the detection of 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol in surface water in FY2012

2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Surface Water (pg/L)	2012	nd	nd	tr(49)	nd	100 [39]	1/48	1/48

<Sediment>

The presence of the substance in sediment was monitored at 63 sites, and it was detected at 52 of the 63 valid sites adopting the detection limit of 8pg/g-dry, and none of the detected concentrations exceeded 4,500pg/g-dry.

Stocktaking of the detection of 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol in sediment in FY2012

2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Sediment (pg/g-dry)	2012	59	65	4,500	nd	20 [8]	141/187	52/63

<Wildlife>

The presence of the substance in bivalves was monitored in 5 areas, and it was detected at all 5 valid areas adopting the detection limit of 1.8pg/g-wet, and the detection range was 5.5～26 pg/g-wet. For fish, the presence of the substance was monitored in 19 areas, and it was detected at 17 of the 19 valid sites valid areas adopting the detection limit of 1.8pg/g-wet, and none of the detected concentrations exceeded 1,700 pg/g-wet. For birds, the presence of the substance was monitored in 2 areas, and it was detected at 1 of the 2 valid area adopting the detection limit of 1.8pg/g-wet, and none of the detected concentrations exceeded 12 pg/g-wet.

Stocktaking of the detection of 2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol in wildlife (bivalves, fish and birds) in FY2012

2-(2*H*-1,2,3-Benzotriazol-2-yl)-4,6-di-*tert*-butylphenol	Monitored year	Geometric mean	Median	Maximum	Minimum	Quantification [Detection] limit	Detection Frequency	
							Sample	Site
Bivalves (pg/g-wet)	2012	12	11	26	5.5	4.6 [1.8]	11/11	5/5
Fish (pg/g-wet)	2012	26	34	1,700	nd	4.6 [1.8]	49/57	17/19
Birds (pg/g-wet)	2012	tr(2.9)	tr(2.7)	12	nd	4.6 [1.8]	3/6	1/2