Data relating to emissions of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) from industrial boilers

Siwatt Pongpiachana,*, Teeraporn Wiriwutikorn b, Phonethip Phetsomphou c, Kwanthip Jieam d, Khammanithip Vongxaye e, Ken Choviran f, Andrea Sbrilli g, Massimo Gobbig h, Carmela Centeno i

a NIDA Center for Research & Development of Disaster Prevention & Management, School of Social and Environmental Development, National Institute of Development Administration (NIDA), 118 Moo 3, Sereethai Road, Klong-Chan, Bangkapi, Bangkok, Thailand
b Hazardous Substance Division, Waste and Hazardous Substance Management Bureau, Pollution Control Department (PCD), 92 Soi Phahonyothin 7, Phahonyothin Rd., Sam Sen Nai, Phayathai, Bangkok, Thailand
c Division of ASEAN Cooperation on Environment, Lao National Mekong Committee Secretariat, Ministry of Natural Resources and Environment, Lao Democratic People’s Republic
d Olleen Co., Ltd., Factory 64 Moo 6 Rama II Rd., Bangtorad, Muang, Samutsakhon, Thailand
e Lao Agro Industry Co., Ltd., Ban Kern, M. Thourakhom, Vientiane Province, Lao Democratic People’s Republic
f Deputy Director, Department of Pollution Control Ministry of Environment, 48, Samdech Preah Sihanouk, Tonne Bassac, Chamkarmon, Phnom Penh, Cambodia
g Industrial Development Officer, Stockholm Convention Unit, Environmental Management Branch, Wagramerstrasse 5, A-1400 Vienna, Austria

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A B S T R A C T

Polychlorinated-dibenzo-para-dioxins (PCDDs) and Polychlorinated-dibenzofurans (PCDFs) contamination in ecosystems has been a major concern, however, no information is available about the atmospheric contents and emission profiles in different types of fuels from industrial boilers in Thailand, Lao PDR, and Cambodia. Nine air and bottom ash samples (n = 18) were collected from three industrial boilers using U.S.EPA Method 23 and U.S.EPA Method 8290, respectively. All samples were successfully quantified by two High Resolution Chromatography-High Resolution Mass Spectrometry (HRGC-HRMS) namely Waters Autospec Premier and Waters Autospec Ultima. This investigation elucidates the impacts of fuel type on the emissions of PCDDs and PCDFs from three different fuels.
industrial boilers. It appears plausible to affirm that fuel types play an important role on PCDD/PCDF emission levels from industrial boilers. The results of PCDD/PCDF concentrations should be considered as baseline data for promoting Best Available Technique (BAT) and Best Environmental Practise (BEP) in order to reduce dioxin emissions from industrial boilers in Southeast Asian countries.

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### Specifications table

| Subject area                  | Environmental Sciences                              |
|------------------------------|----------------------------------------------------|
| More specific subject area   | Environmental Chemistry                            |
| Type of data                 | Table, text file, graph, figure                    |
| How data was acquired         | Soxhlet extraction and High Resolution Chromatography-High Resolution Mass Spectrometry (HRGC-HRMS) (Waters Autospec Premier and Waters Autospec Ultima) [1] |
| Data format                  | Raw data, analysed.                                |
| Experimental factors         | PCDD/PCDF congeners were collected by using probe and hotbox system, console and sampling line, glassware kit, and Horizontal Modified Accessories Kit (APEX). Extraction is conducted in Soxhlet equipment with the appropriate solvent [2]. The clean-up procedure could be different from sample to sample, but a schematic of a typical process is given in Table 1. |
| Experimental features        | PCDD/PCDF congeners using HRGC-HRMS.               |
| Data source locations        | All samples were collected from industrial boilers located at the Great Honour Textile Factory Ltd. (GHT), OLEEN Company Limited (Oleen), and Lai Agro Industry Company Limited (LAI). GHT is an exporter from Cambodia, the company sell ladies and gentlemen knitted pullover. Oleen is The largest and modernest edible palm oil producer in Thailand with 100% Thai Investment of 850 Millions Baht. LAI is one of the leading canned sweet corn production company in Lao PDR. |
| Data accessibility           | Data available within article.                     |

### Value of the data

- Data can be employed as a base-line data for PCDD/PCDF concentration levels emitted from industrial boilers.
- There is always the possibility of environmental contamination with toxic substances such as PCDD/PCDF congeners, therefore, continuous air monitoring is obviously crucial for occupational health workers.
- Data displayed here may serve as benchmarks for other research groups focusing in the field of occupational safety and health, and toxicology to assess PCDD/PCDF congeners daily intakes by industrial emissions.
- The results of this dataset can be useful for United Nations Industrial Development Organization (UNIDO) to showcase the success of "Demonstration of BAT and BEP in Fossil Fuel-fired Utility and Industrial Boilers in Response to the Stockholm Convention on Persistent Organic Pollutants (POPs)".
1. Data

Tables 1–3 show descriptive statistics of selected PCDD/PCDF congeners collected from Oleen, LAI, and GHT, respectively. Tables 4–6 are demonstrating the bottom ash concentration of PCDD/PCDF congeners collected at Oleen, LAI, and GHT, respectively.

2. Experimental design, materials and methods

2.1. Dataset area

All samples were collected from industrial boilers located at the Great Honour Textile Factory Ltd. (GHT), OLEEN Company Limited (Oleen), and Lai Agro Industry Company Limited (LAI) (see Table S1 and Fig. S2–S4 in Supporting material). All fuels used in three industrial boilers of GHT, OLEEN, and LAI were cashew wood, anthracite coal, and heavy oil grade C, respectively.

2.2. Sample collection and analytical procedures

Sampling and analytical methods of PCDD/PCDFs, Total Suspended Particulate (TSP), air temperature, air pressure, air velocity, flow rate, moisture content, oxygen (O2), carbon monoxide (CO), carbon dioxide (CO2), sulphur dioxide (SO2), oxide of nitrogen (NOx as NO2) and total chloride are measured in 2015 and described in Table S2. All details of equipment for emission air measurement such as probe and hotbox system, console and sampling line, Method 5 glassware kit, and Method 23 Horizontal Modified Accessories Kit (APEX) are clearly explained in Tables S3 [3,4]. The information of traverse points number coupled with fraction of stacks diameter from inside wall to traverse point are fully described in Table S4. In addition, all details of methodologies (i.e. Method 1–4) for emission air measurement are comprehensively written in Tables S5 [5,6]. All chemical analyses of the PCDD/PCDFs were conducted at SGS environmental laboratories that have ISO 17025 accreditations and demonstrate the effectiveness to properly execute testing methods practices, inspection routines, data validation and employee competences. ISO 17025 is an international standard, which sets the general requirements for the competence of testing and calibration laboratories. In this study, 17 congeners of PCDD/PCDFs were qualitatively and quantitatively analyzed to include the following: 2,3,7,8-TCDD, 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, OCDD, 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8,9-HxCDF, 1,2,3,4,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, and OCDF. A clear description for dioxin analysis is given in Fig. S1 as a flowchart. In addition, the QA/QC requirements for exhaust air measurements were as follows: (i) the isokinetic rate must be examined, and the result must be during 90–110%; (ii) the sampling equipment must be checked for leaks and proper calibration; (iii) the sample control using chain of custody (COC) form must be used for sample delivery and control to and within the laboratory; (iv) field blank to checks to determine any contamination must be conducted. In addition, the QA/QC examinations of the analyses were conducted by calculating blanks and recoveries as clearly described in Table S1B. The average recovery rate of 13C labeled 2,3,7,8-chlorine substituted dioxins was 81.7 ± 9.38%. The precisions and accuracies were assured by using NIST (National Institute of Standards and Technology)-SRM (Standard Reference Material)-1649b urban dust. In addition, two HRGC-HRMS namely Waters Autospec Premier and Waters Autospec Ultima were used in this study. The QA & QC data for recovery efficiency of PCDD/PCDFs analysis were clearly displayed in Table S6.
Table 1
Atmospheric concentrations of PCDD/PCDF congeners (ng/Nm³) collected from Oleen.

| Parameters | TEF | Sampling date |
|------------|-----|---------------|
|            |     | 10/06/15 | 11/06/15 | 12/06/15 |
|            |     | ng/Nm³ at actual O2 | ng/Nm³ at 20 ºC and 7% O2 | ng/Nm³ at actual O2 | ng/Nm³ at 20 ºC and 7% O2 | ng/Nm³ at actual O2 | ng/Nm³ at 20 ºC and 7% O2 |
|            | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) |

**Determination of PCDD/PCDFs**

1.3 Total I-TEQ

1) 2,3,7,8-TCDD 1 0.0020 0.0020 0.0021 0.0011 0.0011 0.0012 0.0011 0.0011 0.0012
2) 1,2,3,7,8-PeCDD 0.5 0.0043 0.0021 0.0022 0.0013 0.0007 0.0007 < 0.0038 < 0.0019 < 0.0021
3) 1,2,3,4,7,8-HxCDD 0.1 0.0135 0.0014 0.0014 0.0012 0.0001 0.0001 0.0354 0.0010 0.0011
4) 1,2,3,6,7,8-HxCDD 0.1 0.0061 0.0006 0.0006 0.0011 0.0001 0.0001 0.0099 0.0001 0.0011
5) 1,2,3,7,8,9-HxCDD 0.1 0.0312 0.0031 0.0033 0.0008 0.0001 0.0001 0.0370 0.0007 0.0011
6) 1,2,3,4,6,7,8-HpCDD 0.01 < 0.0114 < 0.0001 < 0.0001 < 0.0116 < 0.00001 < 0.00001 < 0.0190 < 0.0002 < 0.0002
7) OCDD 0.001 < 0.0593 < 0.0001 < 0.0001 < 0.0116 < 0.00001 < 0.00001 < 0.0190 < 0.0002 < 0.0002
8) 2,3,7,8-TCDF 0.1 0.0059 0.0006 0.0006 < 0.0038 < 0.0004 < 0.0004 < 0.0038 < 0.0004 < 0.0004
9) 1,2,3,7,8-PeCDF 0.05 0.0138 0.0007 0.0007 0.0019 0.0001 0.0001 0.071 0.0004 0.0004
10) 2,3,4,7,8-PeCDF 0.5 0.0378 0.0189 0.0198 0.0444 0.0002 0.0024 0.0193 0.0096 0.0107
11) 1,2,3,4,7,8-HxCDF 0.1 0.0179 0.0018 0.0019 0.0034 0.0003 0.0004 0.0147 0.0015 0.0016
12) 1,2,3,6,7,8-HxCDF 0.1 0.0125 0.0012 0.0013 0.0038 0.0004 0.0004 0.0108 0.0011 0.0012
13) 2,3,4,6,7,8-HxCDF 0.1 0.0050 0.0005 0.0005 0.0011 0.0001 0.0001 < 0.0047 < 0.0005 < 0.0005
14) 1,2,3,7,8,9-HxCDF 0.1 0.0052 0.0005 0.0005 0.0008 0.0001 0.0001 < 0.0047 < 0.0005 < 0.0005
15) 1,2,3,4,6,7,8-HpCDF 0.01 0.0281 0.0003 0.0003 0.0170 0.0002 0.0002 < 0.0190 < 0.0002 < 0.0002
16) 1,2,3,4,7,8-HpCDF 0.01 < 0.0114 < 0.0001 < 0.0001 < 0.0030 < 0.0003 < 0.0003 < 0.0190 < 0.0002 < 0.0002
17) OCDF 0.001 < 0.0593 < 0.0001 < 0.0001 0.0179 0.0002 0.0002 < 0.0903 < 0.0001 < 0.0001

PCDD/PCDFs-TEQ 0.0337 0.0354 0.0055 0.0061 0.0207 0.0230

Remarks: Sm³ = Dry standard cubic meter for gas condition means at temperature of 20 ºC, pressure of 1 atm and dry basis. (United States Region) I-TEQ (International Toxicity Equivalence) = the value is calculated by using the toxicity equivalence factors (TEF).
Table 2
Atmospheric concentrations of PCDD/PCDF congeners (ng/Nm³) collected from LAI.

| Parameters | TEF | Sampling date |
|------------|----|---------------|
|            |    | 26/06/12      | 27/06/12      | 28/06/12      |
|            | ng/Nm³ at actual O₂ | at 20 °C and 7% O₂ | ng/Nm³ at actual O₂ at 20 °C and 7% O₂ | ng/Nm³ at actual O₂ |
|            | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) | (ng I-TEQ/Sm³) |
| Determination of PCDD/PCDFs | | | | |
| 18) 2,3,7,8-TCDD | 1 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0003 | < 0.0003 | < 0.0004 |
| 19) 1,2,3,7,8-PeCDD | 0.5 | 0.0011 | 0.0006 | 0.0006 | 0.0007 | 0.0004 | 0.0004 | 0.0004 | 0.0007 | 0.0003 | 0.0003 | 0.0004 |
| 20) 1,2,3,4,7,8-HxCDD | 0.1 | 0.0019 | 0.0002 | 0.0002 | 0.0009 | 0.0001 | 0.0001 | 0.0001 | 0.0009 | 0.0001 | 0.0001 | 0.0001 |
| 21) 1,2,3,6,7,8-HxCDD | 0.1 | 0.0029 | 0.0003 | 0.0003 | 0.0009 | 0.0001 | 0.0001 | 0.0001 | 0.0009 | 0.0001 | 0.0001 | 0.0001 |
| 22) 1,2,3,7,8,9-HxCDD | 0.1 | 0.0031 | 0.0003 | 0.0003 | 0.0009 | 0.0001 | 0.0001 | 0.0001 | 0.0009 | 0.0001 | 0.0001 | 0.0001 |
| 23) 1,2,3,4,6,7,8-HpCDD | 0.01 | 0.0250 | 0.0003 | 0.0003 | 0.0088 | 0.0001 | 0.0001 | 0.0001 | 0.0038 | 0.00004 | 0.0004 |
| 24) OCDD | 0.001 | 0.0309 | 0.0003 | 0.0003 | < 0.0187 | < 0.0002 | 0.0002 | 0.0182 | < 0.0002 | < 0.0002 |
| 25) 2,3,7,8-TCDF | 0.1 | 0.0016 | 0.0002 | 0.0002 | 0.0011 | 0.0001 | 0.0001 | 0.0001 | 0.0009 | 0.0001 | 0.0001 |
| 26) 1,2,3,7,8-PeCDF | 0.05 | 0.0018 | 0.0001 | 0.0001 | 0.0009 | 0.00005 | 0.0005 | 0.0005 | 0.0009 | 0.00003 | 0.0001 | 0.0002 |
| 27) 2,3,4,7,8-PeCDF | 0.5 | 0.0035 | 0.0017 | 0.0018 | 0.0006 | 0.0003 | 0.0003 | 0.0003 | 0.00003 | 0.00001 | 0.0002 |
| 28) 1,2,3,4,7,8-HxCDF | 0.1 | 0.0027 | 0.0003 | 0.0003 | 0.0013 | 0.0001 | 0.0001 | 0.0001 | 0.0009 | 0.0001 | 0.0001 |
| 29) 1,2,3,6,7,8-HxCDF | 0.1 | 0.0025 | 0.0003 | 0.0003 | 0.0010 | 0.0001 | 0.0001 | 0.0001 | 0.0009 | 0.0001 | 0.0001 |
| 30) 1,2,3,4,6,7,8-HxCDF | 0.1 | 0.0037 | 0.0004 | 0.0004 | 0.0016 | 0.0002 | 0.0002 | 0.0002 | 0.0009 | 0.0001 | 0.0001 |
| 31) 1,2,3,7,8,9-HxCDF | 0.1 | < 0.0009 | < 0.0001 | < 0.0001 | < 0.0009 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0009 | 0.0001 | 0.0001 |
| 32) 1,2,3,4,6,7,8-HpCDF | 0.01 | 0.0063 | 0.0001 | 0.0001 | 0.0004 | 0.000004 | 0.000005 | 0.000005 | 0.0035 | 0.000003 | 0.00004 |
| 33) 1,2,3,4,7,8,9-HpCDF | 0.01 | < 0.0037 | < 0.00004 | < 0.00004 | < 0.0036 | < 0.00004 | < 0.00004 | < 0.0035 | < 0.00003 | 0.00004 |
| 34) OCDF | 0.001 | 0.0236 | 0.00002 | 0.00002 | < 0.0187 | < 0.00002 | 0.00002 | < 0.0182 | < 0.00002 | < 0.0002 |
| PCDD/PCDFs-TEQ | | | | | | | | | | | | |
| Remarks: Sm³ = Dry standard cubic meter for gas condition means at temperature of 20 °C, pressure of 1 atm and dry basis. (United States Region) |
| ITEQ (International Toxicity Equivalence) = the value is calculated by using the toxicity equivalence factors (TEF). |
Table 3
Atmospheric concentrations of PCDD/PCDF congeners (ng/Nm³) collected from GHT.

| Parameters | TEF | Sampling date |
|------------|-----|---------------|
|            |     | 22/08/12      | 23/08/12 | 24/08/12 |
|            |     | ng/Nm³ at actual O₂  | ng/Nm³ at actual O₂  | ng/Nm³ at actual O₂  |
|            |     | at 20 °C and 7% O₂ | at 20 °C and 7% O₂ | at 20 °C and 7% O₂ |
|            |     | (ng I-TEQ/Sm³)       | (ng I-TEQ/Sm³)       | (ng I-TEQ/Sm³)       |
| Determination of PCDD/PCDFs | | | | |
| 1.3 Total I-TEQ | | | | |
| 35) 2,3,7,8-TCDD  | 1  | 0.0388 | 0.0388 | 0.1033 | 0.0114 | 0.0114 | 0.0561 | 0.0163 | 0.0163 | 0.0485 |
| 36) 1,2,3,7,8-PeCDD | 0.5 | 0.0707 | 0.0353 | 0.0941 | 0.0162 | 0.0081 | 0.0400 | 0.0278 | 0.0139 | 0.0412 |
| 37) 1,2,3,4,7,8-HxCDD | 0.1 | 0.0305 | 0.0030 | 0.0081 | 0.0065 | 0.0006 | 0.0032 | 0.0129 | 0.0013 | 0.0038 |
| 38) 1,2,3,6,7,8-HxCDD | 0.1 | 0.0513 | 0.0051 | 0.0137 | 0.0140 | 0.0014 | 0.0069 | 0.0245 | 0.0024 | 0.0073 |
| 39) 1,2,3,7,8,9-HxCDD | 0.1 | 0.0443 | 0.0044 | 0.0118 | 0.0112 | 0.0011 | 0.0055 | 0.0196 | 0.0020 | 0.0058 |
| 40) 1,2,3,4,6,7,8-HpCDD | 0.01 | 0.1537 | 0.0115 | 0.0041 | 0.0258 | 0.0003 | 0.0013 | 0.0586 | 0.0006 | 0.0017 |
| 41) OCDD | 0.001 | 0.0443 | 0.00004 | 0.0001 | < 0.0211 | < 0.00002 | < 0.0001 | < 0.0212 | < 0.00002 | < 0.0001 |
| 42) 2,3,7,8-TCDF | 0.1 | 0.3741 | 0.0374 | 0.0996 | 0.0959 | 0.0096 | 0.0473 | 0.1339 | 0.0134 | 0.0398 |
| 43) 1,2,3,7,8-PeCDF | 0.05 | 0.1801 | 0.0090 | 0.0240 | 0.0422 | 0.0021 | 0.0104 | 0.0702 | 0.0035 | 0.0104 |
| 44) 2,3,4,7,8-PCDF | 0.5 | 0.3049 | 0.1524 | 0.4059 | 0.0747 | 0.0374 | 0.1842 | 0.1225 | 0.0612 | 0.1819 |
| 45) 1,2,3,4,7,8-HxCDF | 0.1 | 0.1154 | 0.0115 | 0.0307 | 0.0233 | 0.0023 | 0.0115 | 0.0413 | 0.0041 | 0.0123 |
| 46) 1,2,3,6,7,8-HxCDF | 0.1 | 0.1122 | 0.0112 | 0.0299 | 0.0227 | 0.0023 | 0.0112 | 0.0425 | 0.0042 | 0.0126 |
| 47) 2,3,4,6,7,8-HxCDF | 0.1 | 0.1372 | 0.0137 | 0.0365 | 0.0277 | 0.0028 | 0.0136 | 0.0539 | 0.0054 | 0.0160 |
| 48) 1,2,3,7,8,9-HxCDF | 0.1 | 0.0236 | 0.0024 | 0.0063 | 0.0026 | 0.0003 | 0.0013 | 0.0212 | 0.0021 | 0.0063 |
| 49) 1,2,3,4,6,7,8-HpCDF | 0.01 | 0.1463 | 0.0015 | 0.0039 | 0.0221 | 0.0002 | 0.0011 | 0.0434 | 0.0004 | 0.0013 |
| 50) 1,2,3,7,8,9-HpCDF | 0.01 | 0.0333 | 0.0003 | 0.0009 | 0.0063 | 0.0001 | 0.0003 | 0.0113 | 0.0001 | 0.0003 |
| 51) OCDF | 0.001 | 0.0430 | 0.0004 | 0.0001 | < 0.0211 | < 0.00002 | < 0.0001 | < 0.0212 | < 0.00002 | < 0.0001 |
| PCDD/PCDFs-TEQ | | | | |
| | 0.3279 | 0.8730 | 0.0799 | 0.3938 | 0.1311 | 0.3893 |

Remarks: Sm³ = Dry standard cubic meter for gas condition means at temperature of 20 °C, pressure of 1 atm and dry basis. (United States Region)
I-TEQ (International Toxicity Equivalence) = the value is calculated by using the toxicity equivalence factors (TEF).
Table 4: Bottom ash concentrations of PCDD/PCDF congeners (ng/kg) collected from Oleen.

| Parameters | TEF | Sampling date | 10/06/15 | 11/06/15 | 12/06/15 |
|------------|-----|---------------|----------|----------|----------|
| Sampling Time | | | Quantity (ng/kg) | Quantity (ng I-TEQ/kg) | Quantity (ng/kg) | Quantity (ng I-TEQ/kg) | Quantity (ng/kg) | Quantity (ng I-TEQ/kg) |
| 1. Total PCDD<sup>a</sup> | | | 13.3, 16.3, 19.3 | 14.0, 17.0, 20.0 | 14.0, 17.0, 20.0 |
| 1) TCDDs | | | 86 | 440 | 36 |
| 2) PeCDDs | | | 42 | 140 | 12 |
| 3) HxCDDs | | | 18 | 41 | 11 |
| 4) HpCDDs | | | 4.2 | 4.5 | 2.3 |
| 2. Total PCDF<sup>b</sup> | | | 1.6 | 14 | < 1.0 |
| 1) TCDFs | | | < 0.90 | 2.0 | 1.5 |
| 2) PeCDFs | | | < 0.90 | 3.5 | 11 |
| 3) HxCDFs | | | 1.8 | 3.1 | 2.3 |
| 3. Total I-TEQ<sup>c</sup> | | | 1 | < 0.90 | < 0.90 | < 0.75 | < 0.75 | < 1.0 | < 1.0 |
| 1) 2,3,7,8-TCDD | | | 0.5 | < 0.90 | < 0.45 | < 0.75 | < 0.37 | < 1.0 | < 0.52 |
| 1,2,3,7,8-PeCDD | | | 0.01 | < 0.90 | < 0.090 | 0.88 | 0.088 | < 1.0 | < 0.10 |
| 2,3,4,6,7,8-HxCDD | | | 0.1 | < 0.90 | < 0.090 | 0.75 | < 0.075 | < 1.0 | < 0.10 |
| 1,2,3,7,8,9-HxCDD | | | 0.1 | < 0.90 | < 0.90 | 0.75 | < 0.075 | < 1.0 | < 0.10 |
| 2,3,4,6,7,8-HpCDD | | | 0.01 | 2.2 | 0.022 | 3.0 | 0.030 | < 1.7 | < 0.017 |
| 2,3,7,8-TCDF | | | 0.001 | 4.2 | 0.0042 | 3.5 | 0.0035 | < 3.5 | < 0.0035 |
| 1,2,3,7,8-PeCDF | | | 0.05 | < 0.90 | < 0.045 | 0.75 | < 0.037 | 1.0 | 0.052 |
| 2,3,4,7,8-PeCDF | | | 0.5 | < 0.90 | < 0.45 | 0.75 | < 0.37 | < 1.0 | < 0.52 |
| 1,2,3,4,7,8-HxCDF | | | 0.1 | < 0.90 | < 0.090 | 0.75 | 0.075 | < 1.0 | < 0.10 |
| 12) 1,2,3,6,7,8-HxCDF | | | 0.1 | < 0.90 | < 0.090 | 0.75 | < 0.075 | < 1.0 | < 0.10 |
| 13) 2,3,4,6,7,8-HxCDF | | | 0.1 | < 0.90 | < 0.090 | 0.75 | < 0.075 | < 1.0 | < 0.10 |
| 14) 1,2,3,7,8,9-HxCDF | | | 0.1 | < 0.90 | < 0.090 | 0.75 | < 0.075 | < 1.0 | < 0.10 |
| 15) 1,2,3,4,6,7,8-HpCDF | | | 0.01 | < 1.5 | < 0.015 | 1.9 | < 0.019 | < 1.7 | < 0.017 |
| 16) 1,2,3,4,7,8,9-HpCDF | | | 0.01 | < 1.5 | < 0.015 | 1.2 | < 0.012 | < 1.7 | < 0.017 |
| 17) OCDF | | | 0.001 | < 3.0 | < 0.0030 | 2.5 | < 0.0025 | < 3.5 | < 0.0035 |

<sup>a</sup> Polychlorinated Dibenzo-p-Dioxins.
<sup>b</sup> Polychlorinated Dibenzofurans.
<sup>c</sup> I-TEQ (International Toxicity Equivalence) = the value is calculated by using the toxicity equivalence factors (TEF).
### Table 5
Bottom ash concentrations of PCDD/PCDF congeners (ng/kg) collected from LAI.

| Parameters        | Quantity (ng/kg) | TEF | Quantity (ng I-TEQ/kg) |
|-------------------|------------------|-----|------------------------|
| 1. **Total PCDD**<sup>a</sup> |                  |     |                        |
| 1) TCDDs          | 0.79             |     |                        |
| 2) PeCDDs         | 0.93             |     |                        |
| 3) HxCDDs         | 1.6              |     |                        |
| 4) HpCDDs         | < 1.2            |     |                        |
| 2. **Total PCDF**<sup>b</sup> |                  |     |                        |
| 1) TCDFs          | 1.5              |     |                        |
| 2) PeCDFs         | 1.2              |     |                        |
| 3) HxCDFs         | 2.1              |     |                        |
| 4) HpCDFs         | 21               |     |                        |
| 3. **Total I–TEQ**<sup>c</sup> |                  |     |                        |
| 1) 2,3,7,8-TCDD   | < 0.73           | 1   | < 0.73                 |
| 2) 1,2,3,7,8-PeCDD| < 0.73           | 0.5 | < 0.36                 |
| 3) 1,2,3,4,7,8-HxCDD| < 0.73       | 0.1 | < 0.073                |
| 4) 1,2,3,6,7,8-HxCDD| < 0.73       | 0.1 | < 0.073                |
| 5) 1,2,3,7,8,9-HxCDD| < 0.73       | 0.1 | < 0.073                |
| 6) 1,2,3,4,6,7,8-HpCDD| < 1.2        | 0.01| < 0.012                |
| 7) OCDD           | 3.9              | 0.001| 0.0039                |
| 8) 2,3,7,8-TCDF   | < 0.73           | 0.1 | < 0.073                |
| 9) 1,2,3,7,8-PeCDF| < 0.73           | 0.05| < 0.036                |
| 10) 2,3,4,7,8-PeCDF| < 0.73          | 0.5 | < 0.36                 |
| 11) 1,2,3,4,7,8-HxCDF| < 0.73        | 0.1 | < 0.073                |
| 12) 1,2,3,6,7,8-HxCDF| < 0.73       | 0.1 | < 0.073                |
| 13) 2,3,4,6,7,8-HxCDF| < 0.73       | 0.1 | < 0.073                |
| 14) 1,2,3,7,8,9-HxCDF| < 0.73       | 0.1 | < 0.073                |
| 15) 1,2,3,4,6,7,8-HpCDF| 14          | 0.01| 0.14                   |
| 16) 1,2,3,4,7,8,9-HpCDF| 2.5         | 0.01| 0.025                  |
| 17) OCDF          | 440             | 0.001| 0.44                   |

<sup>a</sup> Polychlorinated Dibenzo-p-Dioxins.
<sup>b</sup> Polychlorinated Dibenzofurans.
<sup>c</sup> I-TEQ (International Toxicity Equivalence) = the value is calculated by using the toxicity equivalence factors (TEF).

### Table 6
Bottom ash concentrations of PCDD/PCDF congeners (ng/kg) collected from GHT.

| Sampling Date | 22/08/2012 | 23/08/2012 | 24/08/2012 |
|---------------|------------|------------|------------|
| Sampling Time | 14.00, 16.30, 18.00 | 10.30, 14.00, 16.00 | 10.30, 12.00, 14.30 |
| Parameters    | TEF        | Quantity (ng I-TEQ/kg) | Quantity (ng I-TEQ/kg) | Quantity (ng I-TEQ/kg) |
|---------------|------------|------------------------|------------------------|------------------------|
| 1. **Total PCDD**<sup>a</sup> |            |                        |                        |                        |
| 1) TCDDs      | –          | 31                     | < 0.75                 | 0.97                    |
| 2) PeCDDs     | –          | 26                     | < 0.75                 | < 0.75                  |
| 3) HxCDDs     | –          | 23                     | < 0.75                 | < 0.75                  |
| 4) HpCDDs     | –          | 13                     | < 1.2                  | < 1.2                   |
| 2. **Total PCDF**<sup>b</sup> |            |                        |                        |                        |
| 1) TCDFs      | –          | 130                    | 5.8                    | 7.5                     |
| 2) PeCDFs     | –          | 79                     | < 0.75                 | < 0.75                  |
| 3) HxCDFs     | –          | 53                     | 1.1                    | < 0.75                  |
| 4) HpCDFs     | –          | 27                     | < 1.2                  | < 1.2                   |
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Transparency document. Supplementary material

Transparency document associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.12.021.

Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at https://doi.org/10.1016/j.dib.2018.12.021.
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