PROJECT

"VIETNAM POPS AND SOUND HARMFUL CHEMICALS MANAGEMENT"

FINAL REPORT ON CURRENT STATUS OF POPS, PTS MONITORING AND POPS, PTS MONITORING DATA IN VIETNAM




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ABBREVIATIONS

ASTM	American Society for Testing and Materials
BAT	Best Available Technologies
BET	Best Environmental Practices
COP	Conference of the Parties
DONRE	Department of Natural Resources and Environment
EPA	Environmental Protection Agency
GEF	Global Environment Facilities
GMP	Global Monitoring Plan
MARD	Ministry of Agriculture and Rural Development
MONRE	Ministry of Natural Resources and Environment
POPs	Persistent Organic Pollutants
QCVN	Vietnamese national technical regulations
QA/QC	Quality Assurance/ Quality Control
ROGs	Regional organization groups
TCVN	National standards of Vietnam
VEA	Vietnam Environment Administration
VILAS	Vietnam Laboratory Accreditation Scheme
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
WHO	World Health Organization

SUMMARY

The Government of Vietnam has ratified the Stockholm Convention on POPs in 2001. The Government has also developed, promulgated and revised Vietnam's implementation plan on the Stockholm Convention. The plan clearly indicates Vietnam's viewpoints and commitments to the international community on joint effort to safely manage POPs in order to protect the environment and community health.

The project "Vietnam POPs and Sound Harmful Chemicals Management Project" aims to further reduce environmental and human health risks by reducing production, use and emissions of POPs and other relevant hazardous chemicals. The project is funded by the Global Environment Facilities (GEF) through the United Nations Development Program (UNDP) and implemented by the Ministry of Natural Resources and Environment for three years (2016 - 2018). Activity for assessment of POPs/PTS monitoring capacities in Vietnam as reported hereafter is a part of the Component 2 in this project.

It should be noted that the purpose of POP monitoring activities is very diverse. It may be to achieve information on their levels in the environment, their levels of accumulation in animals, food chains or even their exposure level in people. However, the purpose of this assessment focuses more on issues relating to monitoring of POPs in the environmental compartments such as soil, sediment, water, air.

This is a report that summarizes data as well as information from several individual reports, which are produced in accordance with the terms of reference for these activities. The assessment activities have addressed several issues as following:

- Review Vietnam legal framework and regulations (governmental decrees, decisions, circulars, QCVN, TCVN) for (i) technical guidelines and standard methods for monitoring of POPs, (ii) their allowable levels in various environmental compartment, (iii) gap analysis and recommendations for improvement of the legal framework and regulation. Within the framework of this assessment, data and information from a number of researches on POPs have been reviewed and collected for demonstration of data mapping using website tools. Due to limitation of budget and time, this activity only selected

researches and publications officially published in peer reviewed journals. This approach may also ensure for more reliable and comparable data.

- Overview international regulations and experience for environmental monitoring of POPs from the United States, the European Union and the global monitoring programs of UNEP. After adequate analysis of the relevant technical issues in the global monitoring programs (increase of new POP chemicals, instrumental capacity, inter-laboratory practice, etc) which are also relevant for Vietnam, useful recommendations are suggested for improvement of future POPs environmental monitoring activities in Vietnam.
- Review networks of environmental monitoring laboratories in Vietnam to identify those with capacity for environmental monitoring of POPs. More details about capacity of such laboratories are assessed by reviewing database of the VILAS system with 593 laboratories registered for chemical testing, VIMCERTS system with 212 laboratories registered for environmental monitoring and analysis as well as further sending a hundred questionnaires to laboratories. Considering that VILAS system has broad and inadequate range of testing, while survey on questionnaire has insufficient number of response (only ten per cent), the assessment for POPs monitoring capacity was mainly based on the review of the VIMCERTS database. This system is believed to adequately reflect the network of laboratories, which operate in the environmental sector.
- In accordance with the term of reference, the report also provides useful recommendations for improvement of future POPs monitoring activities in Vietnam, recommendations to improve the quality the of country report to the Stockholm Convention as well as recommendations for effectiveness assessment of the implementation of Stockholm Convention in Vietnam.

1. General Introduction

1.1. Introduction about POPs

The Stockholm Convention on Persistent Organic Pollutants (POPs) was signed by the parties on 22 May 2001 in Stockholm. The Convention entered into force on May 17, 2004. So far, 182 countries and territories have ratified the Stockholm Convention.

The Stockholm Convention classifies POPs into three groups in Annexes A, B, and C consisting of: (i) chemicals to be eliminated from production and use (Annex A); (ii) chemicals whose production and use shall be restricted (Annex B); (iii) unintentionally produced chemicals (Annex C).

The Stockholm Convention included initially provisions for the safe management, reduction of emissions and for the complete destruction of 12 POPs, out of which nine listed in Annex A, one substance in Annex B and 03 substances in Annex C (in which Hexachlorobenzene is listed both under Annexes A and C).

Table 1.1. Initial POPs in the Stockholm Convention

STT	Name	Annex
1	Aldrin	A
2	Chlordane	A
3	Dieldrin	A
4	Endrin	A
5	Heptachlor	A
6	Hexachlorobenzene (HCB)	A and C
7	Mirex	A
8	Toxaphene	A
9	Polychlorinated Biphenyls (PCB)	A and C
10	DDT [1,1,1-trichloro-2,2-bis (4-chlorophenyl) ethane]	B
11	Polychlorinated dibenzo-p-dioxins (PCDD)	C
12	Polychlorinated dibenzofurans (PCDF)	C

The 4th Conference of the Parties (COP4), held from 4 to 8 May 2009, adopted the Decision SC-4/10 to SC-4/18 on amendments to Annex A, B, C of the Stockholm Convention to add 09 substances to the list of POPs. In 2011, the Fifth Conference of the Parties (COP5) added Endosulfan and its isomers to Annex A. At its sixth meeting held from 28 April to 10 May 2013, Annex A has been amended to list Hexabromocyclododecane in Annex A. At its seventh meeting held from 4 to 15 May 2015, Annexes A and C have been amended to list Hexachlorobutadiene, Pentachlorophenol and its salts and esters in Annex A and Polychlorinated naphthalenes in Annex A and C. At its eighth meeting held from 24 April to 5 May 2017, Annexes A and C have been amended to list Hexachlorobutadiene in Annex C, Decabromodiphenyl ether (commercial mixture, c-DecaBDE) and Short-chain chlorinated paraffins in Annex A. After the conclusion of the COP8 in 2017, additional 16 POPs (called as new POPs) were added to all three Annexes A, B and C.

Table 1.2. New POPs in the Stockholm Convention

STT	**Name**	**Annex**
1	Alpha hexachlorocyclohexane	A
2	Beta hexachlorocyclohexane	A
3	Chlordecone	A
4	Hexabromobiphenyl (HBB)	A
5	Hexabromocyclododecane (HBCDD)	A
6	Hexabromodiphenyl ether and Heptabromodiphenyl ether (commercial octabromodiphenyl ether)	A
7	Hexachlorobutadiene (HCBD)	A and C
8	Lindane	A
9	Pentachlorobenzene (PeCB)	A and C
10	Pentachlorophenol and its salts and esters (PCP),	A

11	Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F)	B
12	Polychlorinated naphthalene (PCN)	A and C
13	Technical Endosulfan and its related isomers	A
14	Tetrabromodiphenyl ether and Pentabromodiphenyl ether (commercial pentabromodiphenyl ether)	A
15	Decabromodiphenyl ether (Commercial mixture, c-DecaBDE)	A
16	Short-chain chlorinated paraffins (SCCPs)	A

In particular, 07 substances listed in Annex C are unintentional POPs (also known as UPOP) including: Hexachlorobenzene (HCB); Polychlorinated Biphenyls (PCBs); Polychlorinated dibenzo-p-dioxins (PCDD); Polychlorinated dibenzofurans (PCDF); Hexachlorobutadiene (HCBD); Pentachlorobenzene (PeCB); Polychlorinated naphthalene (PCN). Measures to mitigate and progressively eliminate UPOPs are outlined in Article 5 of the Stockholm Convention that requires all the Parties to seriously implement adequate actions.

Vietnam acceded to and ratified the Stockholm Convention on 22 July 2002, and became the 14th member of the Convention. In order to effectively implement the Stockholm Convention, the Prime Minister of Vietnam issued the "Decision No. 184/2006 / QD-TTg (August 10, 2006)" approving the first National Implementation Plan for the Stockholm Convention.

1.2. Introduction to the project and its component

The project " "Vietnam POPs and Sound Harmful Chemicals Management Project" aims to further reduce environmental and human health risks by reducing production, use and emissions of POPs and other relevant hazardous chemicals. The project is funded by the Global Environment Facilities (GEF) through the United Nations Development Program (UNDP) and is implemented by the

Ministry of Natural Resources and Environment for three years (2016 - 2018). The project is articulated in four components:

- Component 1: Develop and implement a policy framework for environmental safety management for POPs.
- Component 2: Monitoring and reporting POPs and PTS.
- Component 3: Management of POP contaminated areas.
- Component 4: Inventory of national baseline data on mercury and reduction of mercury emissions.

Under component 2, the project will support the establishment of a network of national POP/PTS monitoring laboratories in Vietnam. This component will also contribute to the report “State of the Environment in Vietnam”. The consultation package "Assessment of POPs/PTS monitoring capacities in Vietnam" is one of the activities of Component 2.

2. Objectives and Scope

The objective of the consultancy is to assess the capacity of POPs/PTS monitoring in Vietnam including the status of POP monitoring data. The assessment focuses more on provincial and national laboratories, which are under the Ministry of Natural Resources and Environment (MONRE) and the provincial Department of Natural Resources and Environment (DONRE).

3. Methodologies

To assess the environmental monitoring capacity of the laboratories system in Viet Nam, the consultant team adopted the following approach:

- Research available database on general assessment of laboratorial capacities implemented. Specifically, a database of two evaluating organizations, which carry out laboratory assessment activities: Bureau of Accreditation which provides quality accreditation namely VILAS and the Ministry of Natural Resources and Environment which provide quality

certificate namely VIMCERTS. It should be noted that while VILAS is for general analytical laboratories, VIMCERTS is only for those doing environmental monitoring under regulations of MONRE.

- Develop questionnaire to collect information feedback from laboratories; the information from feedback of the participating laboratories can be used for assessment of laboratorial facilities and POPs monitoring capacity. The questionnaire templates have been provided in Annex 2, whilst the result of the questionnaire survey is reported in Table 7.1.
- Collect data on POPs pollution which was officially published in order to build the database and pollution maps (The database has been attached as Annex 3)

4. Capacity of organization and management in POPs monitoring activities in Vietnam

4.1. Assessment of legal documents on POPs monitoring in Vietnam

Before Vietnam's accession to the Stockholm Convention, Viet Nam Government issued several regulations and legal documents related to POPs, PTSs, (in particular the regulations on pesticides) and mercury in the air, water and soil. For example: since 1999, Ministry of Science, Technology and Environment issued Decision No. 1972/1999/QD-BKHCNMT on promulgation of the technology for destruction of pesticides banned from use, and is still in effect, until now, including DDT.

Currently, in Vietnam, legal documents related to POPs monitoring are mainly focusing on TCVN, QCVN and some related fields such as environment, chemicals, construction, medicine etc. For new listed POPs, the database in Vietnam is still limited, this is also a fundamental difficulty for safety management of these compounds.

4.1.1. Environmental documents

Most of the documents related to the field of environmental monitoring are issued by Ministry of Natural Resources and Environment, as the monitoring field is mainly related to environmental norms and parameters. Mercury is a substance that is studied and regulated in various Vietnamese legal documents, including Circulars, Joint Circulars, Directives, Decrees, Decisions, TCVN/QCVN.

In 2011, the Ministry of Natural Resources and Environment issued a series of circulars related to the field of environmental monitoring, in which the monitoring parameters of each type of environment are mentioned in detail. Mercury (Hg) parameters are also covered in this Circular, POPs are only mentioned as organochlorine pesticides.

Table 4.1. Legal documents related to environmental monitoring issued by Ministry of Natural Resources and Environment

Class	**Code**	**Authority**	**Date of issue**	**Date of enforcement**	**Content**
Circular	28/2011/TT-BTNMT	BTN&MT	01/08/2011	15/09/2011	Technical guidelines for monitoring of ambient air and noise
Circular	29/2011/TT-BTNMT	BTN&MT	01/08/2011	15/09/2011	Technical guidelines for monitoring of surface water
Circular	30/2011/TT-BTNMT	BTN&MT	01/08/2011	15/09/2011	Technical guidelines for monitoring of ground water
Circular	31/2011/TT-BTNMT	BTN&MT	01/08/2011	15/09/2011	Technical guidelines for monitoring of sea water (including bottom sediment and marine organisms
Circular	32/2011/TT-BTNMT	BTN&MT	01/08/2011	15/09/2011	Technical guidelines for monitoring of rain water

Circular	33/2011/TT-BTNMT	BTN&MT	01/08/2011	15/09/2011	Technical guidelines for monitoring of soil quality

It can be seen that the Government of Vietnam is aware of the hazards and risks of POPs to the environment and human health through the issuance of Decree 179/2013/ND-CP on sanctioning of administrative violations in the field of environmental protection and most recently, Decree No. 155/2016/ND-CP on sanctioning of administrative violations in the field of environmental protection. For example, in Clause 9, Article 22, Decree No. 155/2016/ND-CP, the sanctioning level is up to VND 1 billion related to the act of "Transferring, giving, buying and selling POPs that must be phased out in accordance with the provisions of Annex A of the Stockholm Convention on Persistent Organic Pollutants "Burying, filling, dumping and discharging Persistent Organic Pollutants into the environment that must be phased out according to the provisions of Annex A of the Stockholm Convention on Persistent Organic Pollutants in contrast to the Laws not exceeding 3,000 kg" as well as the act of "Burying, dumping or discharging persistent organic substances which must be eliminated as prescribed in Annex A of the Stockholm Convention on Persistent Organic Pollutants into the environment in contravention of prevailing laws with an amount of less than 3,000 kg"

Recently, the Ministry of Natural Resources and Environment issued the Circular No. 24/2017/BTNMT on 1 September 2017 on technical regulations on environmental monitoring, in which Article 5, Section 1, Chapter II stipulates monitoring parameters, including total PCB and Dioxin/furan. In Articles 9, 13, 25, 33, the monitoring parameters also include Mercury (Hg), POPs such as organochlorine pesticides, PCBs, Dioxin-like PCB (dl-PCB) compounds and Dioxin/Furan. In addition, the method of monitoring these parameters is also stipulated in Article 15, 23, 26, 31 and 35 of the Circular.

4.1.2. Documents in the field of agriculture and rural development

17 POPs out of 28 have plant protection (pesticides) use while 12 have an industrial use. Most of them belong to Annex A of the Stockholm Convention. The POP compounds which belong to the group of pesticides are listed in the Table 4.2.

Mercury compounds are used as fungicides (for fungicides for seeds). In addition, mercury is also used in the production of fertilizers, herbicides, pesticides, etc. In Viet Nam however the use and registration of mercury for plant protection chemicals is banned.

Table 4.2. POP compounds which belong to the group of pesticides

Nr	**Chemical name**	**Annex**
1	Aldrin	A
2	Chlordane	A
3	Chlordecone	A
4	Dieldrin	A
5	Endrin	A
6	Heptachlor	A
7	Hexachlorobenzene (HCB)	A and C
8	Alpha hexachlorocyclohexane	A
9	Beta hexachlorocyclohexane	A
10	Lindane	A
11	Mirex	A
12	Pentachlorobenzene (PeCB)	C
13	Pentachlorophenol (PCP), related salts and este	A
14	Endosulfan	A
15	Toxaphene	A
16	DDT	B
17	PFOS, its salts and PFOS-F	B

The Ministry of Agriculture and Rural Development (formerly Ministry of Agriculture and Food Industry) was assigned to manage the plant protection chemicals, so the legal documents related to POPs in this area are mostly issued by this agency. For example, since 1992, Ministry of Agriculture and Food Industry issued Decision No. 23/BVTV-KHKT/QD dated 20 January 1992 on the addition of certain plant protection chemicals to the list of permitted, restricted and banned pesticides for use in Vietnam, of which Endosulfan and Lindane are on the use restricted list, while Mercury-containing drugs (Hg) and the following POPs: Aldrin, Chlordane, DDT, Dieldrin, Eldrin, Heptachlor and Hexachlorobenzene (HCB) are banned for use.

In 2013, the National Assembly promulgated the Law *41/2013/QH13 dated November 25, 2013* on Plant Protection and Quarantine, in which Point đ, Clause 2, Article 7 stipulates that Ministry of Agriculture and Rural Development is responsible to the Government for organizing the management of plant protection chemicals including registration, testing, production, sale, import, export, transportation, preservation, advertising, packaging, labeling, use, withdrawal, destruction, collecting and process and packing after use.

On 8 June 2015, the Ministry of Agriculture and Rural Development issued Circular No. 21/2015/TT-BNNPTNT on the management of plant protection chemicals, of which Article 6 on plant protection chemicals which are not permitted to register in Vietnam regulates the products in the banned list (Paragraph 1; 03/2016/TT-BNNPTNT) and the organic chlorine group (Point đ, Paragraph 3; 03/2016/TT-BNNPTNT). Therefore, not only POPs listed in Table 4.3 are prohibited from use, they are also prohibited from being registered in Vietnam.

In 2016, Ministry of Agriculture and Rural Development issued Circular No. 03/2016/TT-BNNPTNT promulgated the list of plant protection chemicals permitted for use or banned from use in Vietnam. To date it has been amended

twice namely by Circular 15/2017/TT-BNNPTNT and by Circular 06/2017/TT-BNNPTNT. In 2017, MARD issued Circular 24/2017/TT-BNNPTNT promulgating a list of harmonized system (HS) codes for exports and imports in which Appendix 2 lists HS codes for plant protection chemicals banned in Vietnam including POPs and Mercury (Hg). The list of plant protection products banned from use in Vietnam with HS code is shown as follows.

Table 4.3. The list of plant protection productions banned from use in Vietnam with HS code

STT	Code	Name
1	2903.82.00	Aldrin
2	2903.81.00	BHC, Lindane
3	2903.82.00	Chlordane
4	2903.92.00	DDT
5	2910.40.00	Dieldrin
6	2920.90	Endosulfan
7	2910.90 00	Endrin
8	2903.82.00	Heptachlor
9	2908.11.00	Pentachlorophenol
10	2852.10	Mercury (Hg)

In addition, recognizing the danger of pesticide residues that is affecting people and the environment, the Government of Vietnam issued Decision No. 1946/QD-TTg on approving the disposal and prevention plan of environmental pollution caused by pesticide stockpiles in the whole country. Besides guiding and directing the ministries and sectors to take measures to prevent environmental pollution, this decision also lists the sites of pesticide stockpiles which can potentially have bad affects on human health and cause environmental pollution in Annex 1 (list of persistent pesticide stockpiles which cause serious and

extremely serious pollution to the environment) and Appendix 2 (list of persistent pesticide stockpiles which potentially cause pollution to the environment).

4.1.3. Documents related to chemicals management

According to the Stockholm Convention, there are 12 POPs in the industrial chemical sector in total listed in Table 4.4.

In 1998, Prime Minister issued Directive No. 29/1998/CT-TTg on strengthening the management of plant protection chemicals use and POPs, which stipulates "Ban disposing the transformer oils, waste oils and PCB-containing products into the surrounding environment, limit and ban the use of PCB-containing industrial products. Strictly control to ensure the discharge and transportation of PCB-containing products in accordance with environmental sanitation regulations and regulations on hazardous waste management" Then, a number of regulations have also been developed to manage and control industrial POPs.

Table 4.4. The list of POPs used in the industry

STT	Name	Annex
1	Decabromodiphenyl ether	A
2	Hexabromobiphenyl (HBB)	A
3	Hexabromocyclododecane (HBCDD)	A
4	Hexabromodiphenyl and Heptabromodiphenyl ether (PBDE)	A
5	Hexachlorobutadiene (HCBD)	A and C
6	Hexachlorobenzene (HCB)	A and C
7	Pentachlorobenzene (PeCB)	A and C
8	Polychlorinated Biphenyls (PCB)	A
9	Polychlorinated naphthalene (PCN)	A
10	Short-chain chlorinated paraffins (SCCPs)	A

11	Tetrabromodiphenyl and Pentabromodiphenyl ether (PBDE)	A
12	Perfluorooctane sulfonic acid and its salts (PFOS), and perfluorooctane sulfonyl fluoride (PFOS-F)	B

It can be seen that the regulations for each substance and group of substances are very different. For example, PCBs are listed in group of restriction and ban in several documents such as the provisions of Decision No. 184/2006/QD-TTg , Decision 1598/2017/QD-TTg (the newly revised one of 184/2006/QD-TTg), QCVN07/2009/BTNMT (for hazardous wastes). Guideline for PCBs concentrations in sediment and wastewater are also issued. HCB is also listed in the Decision 1598/2017/QD-TTg and its maximum concentration in soil is available in QCVN 15/2008/BTNMT. Application of HCB for household, agriculture and health are prohibited. Meanwhile, there has been no technical guideline for environmental levels of some other substances such as PBDEs, HBCD, HCBD, PFOS, PFOSF and HBB

According to Circular No. 30/2011/TT-BCT dated 10 August 2011 by Ministry of Industry and Trade contemporarily regulating on the permitted content of some hazardous chemicals in electrical and electronic products, the hazardous chemicals are (Hg) and POPs such as Polybrominated biphenyl (PBB) and Polybrominated diphenyl ether (PBDE).

One of the POPs groups that the Stockholm Convention requires for management is POPs formed and unintentionally released (UPOPs) from heat processes or by-products, impurities in the manufacturing process of some chemicals and materials. At present, Dioxin and Furan are addressed in Decision No. 26/2016/QD-TTg on response to toxic chemical incidents (List of toxic chemicals) and Circular No. 07/2013/TT-BCT for registration of hazardous chemicals to produce products and goods in the industrial sector (List of dangerous chemicals).

4.1.4. Documents related to the health sector

Restrictions of the use of POPs and related chemicals in the health sector have been provided in Circular No. 25/2011/TT-BYT issued by Ministry of Health for the list of chemicals, insecticides and bactericides which can be used for households and medical purposes. Accordingly, POP compounds such as Aldrin, Lindane, Chlordance, Dieldrin, DDT, Heptachlor, Hexachlorobenzene, Mirex, and Toxaphene are prohibited for household and medical purposes.

4.2. Analysis and evaluation of the system of technical standard and regulations

Currently, technical guidelines such as TCVN/QCVN which are directly related to the monitoring of POPs are not many. Some monitoring guidelines and allowable concentrations of POP regulated in the TCVN/QCVN systems are available for soil, water and air. Details of the relevant TCVN/QCVN are available in the reviewing report for policy and regulatory documents on management of POPs in Vietnam (available in Vietnamese).

In 2009, Ministry of Science and Technology promulgated the Vietnamese Standard TCVN 6706: 2009 on Hazardous Wastes - Classification, Mercury and plant protection chemical as mentioned in Annex A - List of Hazardous Wastes and TCVN 8061: 2009 on Soil Quality - Determination of organochlorine plant protection chemicals and Polychlorinated biphenyls by Gas Chromatography and electron capture detector. In 2016, Ministry of Science and Technology promulgated TCVN 10883: 2016 for Determining Dioxin and Furan in Soil and Sediments by isotope dilution method.

However, in QCVN system, thresholds of some chemicals sometimes shown inadequacies and conflicts. For example, in QCVN15/ 2008/BTNMT on residues of plant protection chemicals in the soil, Aldrin has a maximum allowable limit of 0.01 mg/kg, but at QCVN 54: 2013/BTNMT on the remediation threshold for purposes of land use, Aldrin has a maximum allowable limit of 0.04 - 2.7 mg/kg.

Besides, it can be seen that Vietnam has technical regulations applied to toxic chemicals, but mostly focus on common protect plants chemicals, PCB and dioxin/furan..

5. Review of international regulations and experience in POP monitoring

5.1. Regulations of the Stockholm Convention

The provisions of the Stockholm Convention on the monitoring of POPs are specified in Article 11 - "Research, Development and Monitoring". It is stated in Clause 1 that "within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and appropriate cooperation on persistent organic pollutants". In particular, in point g of this clause, there is the issue of "harmonized methodologies for conducting inventory of generating sources and analytical techniques for measurement of releases". Vietnam needs the support and knowledge or experience sharing from advanced countries to enhance the capacity to monitor POP, PTS and mercury. Point f, Clause 2, Article 11 requires "Encourage and/or undertake cooperation with regard to storage and maintenance of information generated from research, development and monitoring."

Clause 2 of Article 16 on performance assessment stated that "In order to facilitate such evaluation, the Conference of the Parties shall, at its first meeting initiate the establishment of arrangements to provide itself with comparable monitoring data on the presence of the chemicals listed in Annexes A, B and C, as well as their regional and global environmental transport".

5.2. Regulation of European Union

The European Union (EU) is a signatory to the Stockholm Convention as well as to the UNECE Regional Convention on Transboundary Air Pollution. In order to strengthen the implementation of the provisions of the two Conventions, the EU's Regulation No. 850/2004 of 29 April 2004 was added to the previous

EU legislation on POP and linked to the provisions of International regulations on POPs. This regulation is effective among all the EU member states, and regulates the elimination of the production and use of POPs.

This regulation contains provisions relating to the production, commercializing and use of chemicals, the management of chemical and waste plants, and the measures to reduce unwanted POP emissions. In addition, member countries must establish POP inventory, develop national implementation plans, monitor and exchange information.

Article 12 of this Regulation requires the annual reports from Member Countries on the actual production and use of POP and 3-year reports on the implementation of the provisions of the Regulation.

5.3. Regulation of United States Environmental Protection Agency

The United States Environmental Protection Agency (US EPA) has issued testing methods for calculating, identifying the presence and concentration of physical and chemical pollutants; evaluation of characteristics and properties such as the toxicity of chemical compounds; or evaluate the effects of the compounds under different conditions. The methods at the Agency index are called EPA Methods. There are many different methods such as ASTM or US Pharmacopeia, but EPA Methods are the most widely accepted and used.

Laboratories in Vietnam have also applied EPA methods in the monitoring process. Most of the monitoring parameters were analyzed using EPA Methods, including POPs and Mercury (Hg).

According to Circular No. 24 of the Ministry of Natural Resources and Environment on environmental monitoring techniques for groundwater environment monitoring (under Section 3 of Circular No. 24/2017 / BTNMT) and Article 15 of the monitoring method, most monitoring parameters are applied EPA Methods:

- Mercury: US EPA Method 7470A and Method 200.8
- Organochlorine pesticides: US EPA Method 8081B and Method 8270D
- Dioxin/furan: US EPA Method 1613B
- Total PCB: US EPA Method 1668B, Method 8082A and Method 8270D.

5.4. Learning from the global POP monitoring program

By studying the international experience related to POP monitoring, we find that with the management and technical characteristics of Vietnam, perhaps the experiences from the Global POP Monitoring Programs will be useful for research and POPs monitoring capacity building in the future.

The global POP monitoring program also encountered two major issues: the fragmentation of regional management and the large gap in technical levels between regions. Vietnam has been facing these issues at certain extent and in smaller scale. Therefore, analyzing the issues of the Global POP monitoring program may provide useful experiences.

The goal of GMP is to provide comparable data from five UN regions to assess the effectiveness of the Convention's implementation based on a temporal trend assessment and long-distance transport of POPs in global environment. With the addition of new POPs such as PFOS, water has been added as the primary matrix for the polar POPs together with the previous matrices as human milk, blood and ambient air. The experience gained during the implementation of the two phases of GMP by 2015 demonstrates several challenges that need to be addressed to improve the POPs monitoring in the future.

5.4.1. Increasing quantity of new POPs

By the end of 2017, the list of POPs has increased from the initial 12 to 29 chemicals/groups and this number will continue to increase in the future. The emissions, environmental fate and environmental partitioning of new POPs also

differ from those of the original POPs. This requires modification of the monitoring strategies, such as changing the type of matrices, sampling techniques and analytical methodologies. For example, PFOS and related substances are hydrophilic and are more suitable for monitoring in water than in the air as well as in human blood than in human milk. Therefore, the growing number of POPs and candidate substances will lead to challenges for existing POP monitoring programs. In addition, it is important to understand the transport and the harmful effects of these POPs in order to fully explain environmental levels and trends.

5.4.2. Lack of technical capacity for POP monitoring

While GMP calls for production of comparable POP monitoring data from the five UN regions, the human resource capacities from the five regions is very different. In addition, the introduction of new POPs into the monitoring program requires further training in sampling techniques and analysis. Data collection in regions such as north America, Europe is not difficult, whereas in Africa, South America, Southeast Asia, Central Asia, these issues are extremely difficult.

5.4.3. Analytical capacities needed for POP analysis

GMP calls for monitoring the level of POPs contamination at background sites in order to detect changes in concentrations over time. However, the environmental levels of POPs in remote sites are very low and require the use of high resolution equipments to detect them. In addition, modern laboratories capable of analyzing all groups of POPs are limited in some regions. Most labs in developing countries, possess only basic equipment (HRGC/ECD and HRGC/LRMS) and these devices may not be suitable for the analysis of POPs that require more advanced analytical procedures such as PCDD/PCDF and PFOS. As a result, many developing countries rely on strategic partnerships with monitoring programs to support the POPs analysis of their monitoring samples.

Although this has been successful in providing the results needed for the early stages of GMP, the number of POPs and matrices are increasing the pressure on the existing monitoring programs. Capacity building and regional cooperation should therefore be strengthened to ensure the long-term sustainability of POPs monitoring in core media and others.

5.4.4. Inter-laboratory assessments

This is an important activity to improve the capacity of laboratories. Two inter-laboratory assessments in 2010/2011 and 2012/2013 were conducted by UNEP in order to assess the capacities and performances of analyzing major groups of POPs. The results of the program have shown that:

- Some labs provide underestimate values on real matrices such as fish and human milk. These are matrices with low POP concentrations and are affected by low fat levels.
- Most labs are biased for certain matrices.
- GC / ECD is the most common analytical instrument in most countries to detect OCPs. However, laboratories using GC/MS showed better performance. GC/ECD selectivity is lower than that of GC/MS so it is more error prone due to interferences.

5.4.5. Challenges with communication and information exchange

Successful implementation of GMP has been achieved through Regional organization groups (ROGs) and the Global coordination groups. ROGs, however, have experienced different regional challenges, such as personnel at national contact points, often changing and lacking updates on contact details, lack of responsiveness from the national SC contacts, poor infrastructure in some regions does not provide timely support for communication and dissemination of information on POPs.

5.4.6. Sample specimen banking needs

While a large amount of POP data is provided from GMP activities, the addition of new substances to Annexes A, B, and C or the need for data verification may require from retrospective analysis of samples to determine baseline concentrations and temporal trends. Currently, WHO provides sample specimen banks for human milk, however specimen banks are not common for other core media.

5.4.7. Financial difficulties for POPs monitoring

While the objective of GMP is to provide comparable and representative data from all regions, it is important to know that monitoring activities are costly and that the information collected so far is primarily from a small number of international programs. In some cases, the long-term sustainability of these monitoring programs is based on the support of contributing national monitoring programs. The long-term viability of these programs is important to ensure the integrity and comparability of long-term data.

5.4.8. Manage, achieve, and retrieve data

The collection of reliable and comparable data has been provided to policy makers, modelers and researchers worldwide in a harmonized database that is suitable for storing and presenting them on user-friendly interfaces. This POPs database is a useful resource that can be continually updated and improved to easily access information for assessing the level and trends of POPs pollution in different media.

It can also serve modelers in integrating assessments of pollution levels, emissions sources, fate and POPs transport. This has led to some challenges to ensure the comparability and linking data and databases from different programs with the central database.

5.4.9. Dealing with low detection limits in future monitoring

There is some evidence that concentrations of some POPs have declined to levels that are difficult to measure in major media. The question is whether to reduce the frequency of monitoring and these compounds needs to be explored further to provide guidance for future POP monitoring activities.

In order to ensure consistency and to provide comparable monitoring data for years, samples from all sites were analyzed in three well-known expert laboratories designated by UNEP. The samples will be analyzed with the same procedures, same accuracy and therefore the evaluation and comparison will be more accurate and convincing.

5.5. Lessons learned from international experience research

This is a brief overview of some initial issues relating POPs in the environmental monitoring including POPs residue. The consultants have also overviewed global POP monitoring activities coordinated by UNEP. By overview for international experience in POP monitoring, we recognize that with management and technical characteristics of Vietnam, the experiences gained from the Global POP Monitoring Program might be valuable for POP monitoring activities in Vietnam and gradual improvement of POP monitoring competence in the future. We would like to address some significant issues, which may need to be tackled, for better enhancement as follows:

1. Dispersion of regional management. The UNEP laboratories are located in a variety of areas, with the distinction of qualifications and development conditions. In order to create an effective network of labs, the UNEP Global monitoring program has established regional POP centers such as those in Japan and China. Regional POPs centers large laboratories, with higher levels of expertise, a good staff of professionals, and a strong commitment, appropriate vision and effective operation in promoting POP monitoring in relevant regions.

The regional center is the hub that connects regional laboratories in joint monitoring programs. UNEP master Laboratories in Europe is capable for providing regional centers with training and consultancy supports, which create the spillover effects of the operation in the network. In the worst case, regional centers are still able to provide basic monitoring data of a certain area to maintain the continuity of the larger POP monitoring programs. For Vietnam, there might be at least, one regional center acting as a hub in the north, central and the south. Consequently, POP monitoring data can at least be maintained on a broad enough scale to assess the impact of national POP control policies.

2. There is a large technical distinction between the laboratories in the monitoring system. There are laboratories in developed countries capable of analyzing most types of POPs in different matrices with high accuracy. There are, however, only laboratories capable of analysis for basic POPs such as organochlorine pesticides. To address this issue, the Global POP Monitoring Program allows the labs to participate in POPs monitoring programs in accordance with their capabilities. Laboratories in Vietnam also have very different qualifications. Therefore, consideration should be given to developing POP monitoring programs in which laboratories with different capacities can participate in the selection of appropriate POP groups for monitoring. Therefore, a national POPs monitoring program should be developed flexibly enough so that laboratories at different levels can participate and select appropriate POP groups for monitoring.

3. Vietnam has a system of legal document to provide guidance in POPs monitoring operation for local organizations. However, a comprehensive legal document system for POP monitoring is still lacking, and need to be further improved. Examples of compliance monitoring for new POPs (PBDE, PFOS, etc), unintended POPs (Dioxin, PCB, HCB);

4. The system of standard methods prescribed by Vietnam is not sufficient for all POPs, environmental matrices and analytical equipment. Therefore, there are an urgent requirement for Vietnam to research, update and amend the system of new monitoring methods through disseminating national technical regulations for different POPs monitoring. In the case of the issuance facing difficulties or time-consuming, qualified local labs may invite prominent experts to compile guidance documentation from reliable international sources.

5. Laboratory assessment can be conducted through a variety of methods, in which proficiency tests can provide the most accurate results. So far, there is not any lab in Vietnam that are certified to provide POPs certified reference materials as well as service for proficiency test. Learning from the Global POP monitoring program demonstrates that participating in proficiency testing programs helps labs better understand their own capacities and thereby selects appropriate POPs substances as well as planning for the gradual improvement building capacity in the future. The Environmental Monitoring Center of the Vietnam Environment Administration is currently the focal point in the national monitoring network for proficiency testing activities. Therefore, POPs proficiency test activities can be a component of national monitoring system.

6. The information and results of POP monitoring from many labs and research groups are limitedly shared. A number of researches published in international journals are sufficient to ensure the accuracy of the data. However, there are many monitoring results which have been presented without information on QA/QC methods and adequate testing procedure. This results in many difficulties in comparison and combination. The VEA, as the national contact of the Stockholm Convention, should be acted as a focal point for gathering, evaluating and archiving POP monitoring data from labs in the national monitoring network and from both local and international research groups.

7. In Vietnam, the implementation of retrospective researches to assess the pollution change of new POPs in the past is not feasible. However, it has been proved that POPs retrospective research is essential as the quantity of new POPs have been gradually increasing. Thus, planning for the establishment of an environmental sample bank is also important mission to periodically sample which will be used in the future when the labs have sufficient technical and capacity to conduct a retrospective research of new POPs such as short-chain chlorinated paraffins and some PFCs. More experience can be learned from operation of environmental specimen banks in The United States, Sweden, Germany, Japan.

6. Assessment for POPs monitoring data

6.1. Rules for collection of monitoring data

So far, a large number of POPs studies and surveys have been published locally and internationally in the form of official/unofficial reports, conference proceedings, articles in scientific journals and dissertations. The publication period of the reports extends from the 1990s to the present. In order ensure the reliability of the collected data, the consultant team has studied and set criteria for selection of references as follows:

- Time: the team selected the studies and reports officially published in the period 2000 – 2017;
- Source of references: reports which are officially published in scientific journals, official science websites and scientific books; the publications must be independently reviewed by the qualified reviewers (with scientific journals, this is the process done by anonymous reviewers).

- The report is acceptable for all POPs in the Stockholm Convention and for all environmental and biological samples; the report does not discriminate between domestic and international authors;

In the process of collecting and processing data, the team encountered several difficulties in comparing and synthesizing data such as the different expression of the content for mean and range of concentration; difference in analytical methods leads to variation of the method's detection limit; some studies did not provide specific coordinates of sampling location;

In order to unify the data with various expressions, the team has reviewed and agreed with some rules for the selection, processing and mapping data as follows:

- Regarding location, data to be mapped at scale of the provincial and city level;
- In terms of method, take reference for only quantitative results using standard gas chromatography with capillary separation column;
- Measurement units are converted (if necessary) to obtain same units in accordance with those set in relevant Vietnamese technical regulations and guideline (QCVN system);

6.2. General assessment for data

In the process of collecting data for POP mapping in Vietnam, we reviewed the studies and collected a total of 985 data on the concentration of POPs on the sample bases. According to statistics on the data map, the POP data is available in 29 provinces and cities in 5 regions (Mekong river delta, Southeast region, Red river delta, Northeast coast, Middle coast)

Data collected show that the studies were conducted in the following localities: Ha Noi, Hai Phong, Quang Ninh, Hung Yen, Thai Binh, Nam Dinh, Da Nang and some neighboring provinces (Hue, Ha Tinh, Quang Binh, Phu Yen),

Ho Chi Minh City and some neighboring provinces (Binh Duong, Dong Nai, Long An, Can Tho, An Giang, Vinh Long)

POPs data mostly focused on soil samples, sediment and surface water. Less data are available for ambient air, emissions and biological samples and human biological samples (human blood and breast milk)..

Soil samples:

+ For Aldrin, the concentration of this pesticide is quite low and only around 0.025 ng/g dry wt. (45)
+ For hexachlorocyclohexane isomers, one reference (32) showed beta-hexachlorocyclohexane is the most abundant (2.35 to 4.19 ng/g dry wt), followed by alpha-hexachlorocyclohexane (1.68 to 3.98 ng/g) and gama-hexachlorocyclohexane (0.56 to 0.97 ng/g)
+ For chlordane, this pesticide was not often included in the reviewed studies and only showed low concentration (0.01-2.5 ng/g dry wt) (3).
+ For Dieldrin, a reference showed its concentration from 0.025 to 5.28 ng/g dry wt (45) in areas of Hanoi city.
+ For HCB, (3, 45) references showed its concentration from 0.025 to 2.8 ng/g dry wt.
+ For DDTs, colected results showed that DDTs showed concentration from 0.02 (45) to 132 ng/g dry wt (Minh Dai Commune). Soil in open dumping sites also showed high DDTs level (1.1 to 83 ng/g dry wt) compared to those in regular control sites (0.41 to 4.3 ng/g dry wt)(03)
+ For PCBs, Reference (63) showed concentration from 0.67 to 18.6 ng/g dry wt in Binh Dinh; PCBs were also found in dumping site areas with concentration spanning from 0.45 to 190 ng/g (3); dioxin-like PCBs were also investigated and (1) reference showed concentration from 0.01 to 59

pg TEQ/g dry wt. The highest TEQ level was found in soil of a dumping site (1);

+ For PCDD/Fs, there are two types of surveys, one for Agent Orange hotspots such as airbases in Bien Hoa, Da Nang and Phu Cat cities and one for other general areas. While in the hotspots, PCDD/F concentration ranged from 6 pg TEQ/g to 1200 ng TEQ/g (82), the concentrations in general areas are only from 3 to 36 pg TEQ/g dry wt (74)

+ For PBDEs, they are one of the new POPs which is most investigated in soil (16, 17, 19, 40, 41, 63). PBDEs were found with the concentration from 0.03 to 63 ng/g dry wt in common soil while their maximum level in e-waste recycling areas could go up 9200 ng/g (Bui Dau Commune, 17)

+ For HCBD, this chemical was also found in some areas such as dumping sites (0.005-1.3 ng/g, 41) and in e-waste recycling communes (0.03-580 ng/g, 36)

Sediment samples:

+ Aldrin was found in various sediment yet with only low concentration from 0.05 to 10.86 ng/g (25, 27, 44, 47, 69, 73)

+ For hexachlorocyclohexane isomers, the alpha, beta and gamar isomers were found with concentrations mostly below 10 ng/g dry wt (6, 25, 27, 32, 43, 53, 69). beta-HCH is the most abundant (0.2 to 36 ng/g dry wt, 6), followed by alfa-HCH (0.05 to 4.8 ng/g, 32) and gama-HCH (0.05 to 1.4 ng/g).

+ For Chlordane, studies (4, 5, 9, 25, 69, 96) showed its concentration ranging from 0.004 to 19 ng/g dry wt. the highest level of Chlordane was found in Me Kong river (4).

+ For Dieldrin, its concentration ranged from 0.025 to 37 ng/g dry wt (9, 25, 27, 44, 73). The highest concentration was found in Cau Hai river, Thua Thien Hue province (73)

+ Eldrin was found with concentration ranging 0.05 to 7.6 ng/g dry wt (9, 27, 47, 73). The highest concentration of Eldrin was also found in Cau Hai river, Thua Thien Hue province (73)

+ DDTs were found with very wide range of the concentration (0.01 to 1100 ng/g dry wt) (4, 5, 6, 10, 23, 25, 27, 43, 53, 73, 78). It is interesting to observe that higher concentration of DDTs were found in sediment within urban areas (6)

+ HCB residues in sediment were studied by (4, 5, 6, 44, 96, 99). Its concentrations ranged from 0.006 to 22 ng/g dry wt. The highest concentration was found in areas of Hanoi city (22 ng/g, 6). It is also interesting to observe that HCB concentration in sediment is higher in the northern Vietnam compared to those in the southern (44).

+ PCBs contamination in sediment has been investigated in many surveys covering locations from northern to the middle and southern Vietnam (4, 8, 9, 23, 64, 65, 77, 79). PCB concentrations ranged widely from 0.04 to 1650 ng/g wt. It should be noted that the highest concentration (192-1650 ng/g) was found only recently in Da Nang (79). The dioxin-like PCBs were studied in a survey at e-waste recycling areas in Hung Yen and their concentration was from 0.0027 to 4.9 ng TEQ/g dry wt (14)

+ For PCDD/Fs, most of the results on PCDD/F contamination focused on the Agent Orange hotspots (72, 74, 82). The results showed very high concentration of PCDD/Fs in such areas (63-35,000 ng TEQ/g dry wt). On the other hand, PCDD/Fs in general areas showed concentrations below 20 ng TEQ/g dry wt (72, 8)

+ For the new POPs (HBCD and PBDEs), HBCD was analyzed in small number of sediment samples from Ho Chi Minh city with the concentration only from 0.1 to 1.9 ng/g dry wt (23). PBDEs were studied in much larger number of samples (16, 18, 23, 30, 31, 40, 63, 79). Their concentration also varied in a wide range (0.1-3800 ng/g dry wt). It should be noted that PBDE elevated concentrations were normally found in e-waste recycling areas (16, 17, 30).

Water samples:

+ For hexachlorocyclohexane, there are two studies recently reported their concentration in water samples (53, 73). In river water samples, Alpha hexachlorocyclohexane was found at level from 10 to 135 ng/L (73). On the other hand, sea water samples showed much lower level of alpha-, beta- and gama-hexachlorocyclohexane isomers spanning from 0.04 to 0.46 ng/L.

+ Chlordane was reported in one study (53) with concentration from 0.32 to 0.72 ng/L in Ba Lat river, Thai Binh. Similarly, Endrin was also found in one reference with concentration 0f 2.9 ng/L in water collected in Thua Thien Hue province (73).

+ Few studies reported concentration of DDTs in water samples (53, 73, 79). Their concentration varied from 0.1 to 290 ng/L in both sea water and river water. Higher levels of DDTs were also found in river water compared to those in sea water (53, 73).

+ HCB was reported in one study with concentration 0.1 to 0.24 ng/L in water from Ha Long Bay, Quan Ning province (53).

+ Contamination of PCBs in water was reported in four studies (51, 53, 75, 79). Their concentration ranged from 0.3 to 5200 ng/L. The elevated PCBs concentrations up to 5200 ng/L were found in Da Nang (79).

+ For new POPs, Perfluorooctane sulfonic acid and its salts were investigated in one study with water samples collected from Hanoi urban areas (105). Their concentration is relatively low and ranges from 0.4 to 1.65 ng/L. PBDEs were also detected in water with concentration from the detection limit to 52 ng/L (77, 79).

Emission samples (emission gas and solid waste)

+ There is one study dealing with emission gas samples from steel making plants and cement kiln (7). For emission gas, concentrations of PCDD/Fs were 0.033-0.837 ng TEQ/Nm3 for cement kilns, 0.166 ng TEQ/Nm3 for blast oxygen furnace and 0.048 ng TEQ/Nm3 for electric arc furnace. For solid waste, the concentrations were 0.37 to10.9, 325 and 342 ng TEQ/g dry wt for the above facilities, respectively. PCDD/Fs were also detected in solid waste collected from e-waste recycling facilities with concentration from 0.5 to 1.8 ng TEQ/g dry wt (37)
+ For PCBs, most of studies focus on solid waste collected from e-waste recycling facilities. Their concentration ranged from 0.036 to 2200 ng/g dry wt (34, 37, 38).
+ PBDEs (Tetrabromodiphenyl ethers and pentabromodiphenyl ethers) were also found in solid waste from recycling facilities and their concentration ranged from 8 to 8740 ng/ g dry wt (30, 34, 38).

Ambient air samples

+ There is one study dealing ambient air samples, showing concentrations of gamma hexachlorocyclohexane from 17.24 to 205.95 pg/m3; beta hexachlorocyclohexane from 7.36 to 60.43 pg/m3; alpha hexachlorocyclohexane from 32.72 to 500.91 pg/m3 (12). In this study, concentrations of chlordane, HCB and DDTs were also reported about 63 to 246 pg/m3, 124 to 651 and 160 to 2206 pg/m3, respectively.

+ PCBs were detected in ambient air at concentration from 57 to 1800 pg/m3 (34). The elevated levels (33-1800 pg/m3) were recorded at Bui dau e-waste recycling areas (34). In this study, PBDEs were also found with concentration from 4.6 to 720 pg/m3.

+ For PCDD/Fs, their concentrations varied from 8.3 to 139 fg I-TEQ/m3 (13).

Biological samples

+ For hexachlorocyclohexane isomers, in recent years, there are few studies focusing on their bioaccumulation in animals. Alpha hexachlorocyclohexane was found at level from 0.01 to 0.06 ng/g dry w; beta hexachlorocyclohexane from 0.01 to 0.13 ng/g dry wt; gama hexachlorocyclohexane from 0.1 to 0.41 ng/g (27). Besides, Endrin and Dieldrin were also found at concentration 0.04 to 0.2 ng/g and 0.6 ng/g, respectively. Chlordane was reported to be in range of 0.01 to 36 ng/g lipid wt (20, 81, 96).

+ DDTs were more abundant POP found in biological samples. Their concentration varied from 1.68 to 34000 ng/g lipid wt (11, 20, 27, 53, 81). The elevated concentrations were found in Lang Co, Thua Thien Hue province (20). Besides, HCB was reported at concentrations from 0.02 to 3.5 ng/g lipid wt in the same study (20).

+ PCBs were studied in several surveys (13, 20, 51, 53, 81). Their concentrations ranged from 0.91 to 450 ng/g lipid wt (20, 81) and 1.88 to 485 ng/g dry wt (51, 53, 81).

+ PCDD/Fs were analyzed in several biological samples and their concentration ranged from 0.03 to 249 pg TEQ/g lipid wt (55, 82, 92). Normally, concentrations of PCDD/Fs in the Agent Orange hotspots (2.4

to 249 ng/g)(82, 92) are higher than those in other areas (0.03 to 95 ng/g)(55).

+ PBDEs were found in several biological samples with concentration from 0.12 to 4.1 ng/g dry wt (81) and 7.5 to 1380 ng/g lipid wt (30, 52). The highest concentration of PBDEs was found in e-waste recycling area of Bui Dau Commune (30).

Mother milk samples

+ For hexachlorocyclohexane, alpha hexachlorocyclohexane was found at level from 0.39 to 2.5 ng/g lipid wt; beta hexachlorocyclohexane from 01.9 to 200 ng/g lipid wt; gama hexachlorocyclohexane 1.8 ng/g (2, 39). In the same studies, chlordane ranged from 0.14 to 13 ng/g lipid wt and HCb from 1.6 to 10 ng/g lipid wt.

+ DDTs were found in mother milk at relatively higher concentrations, varying from 46 to 6900 ng/g lipid wt (2, 39).

+ PCBs were reported with concentrations from 1.3 to 2000 ng/g lipid wt in several studies (2, 22, 35, 39, 42)

+ Concentrations of PBDEs in mother milk ranged from 0.24 to 250 ng/g lipid wt (26, 29, 30, 42). Elevated concentration (20 to 250 ng/g lipid wt) were found in e-waste recycling areas namely Bui Dau, Hung Yen (30).

Blood samples

+ Organochlorine pesticides such as HCB and DDTs were found in human blood samples in two studies (21 and 57) with concentration from 0.25 to 0.26 ng/ml and 1.18 to 87.55 ng/ml, respectively. Besides, PCBs were also found in the blood samples with concentrations varying from 0.7 to 0.92 ng/ml (13, 57).

+ PCDD/Fs were detected in blood samples collected from various locations and their concentrations ranged from 12 to 1230 pg TEQ/g lipid wt. The highest level of 1230 pg/g was found in Da Nang city and from a person having relating activities in Da Nang airbase, one of Agent Orange hotspots (26).

6.3. Preliminary assessment for temporal trend of POPs

In general, the lack of scientifically designed studies to assess the trends of POPs pollution is quite common for developing countries and Vietnam is no exception. The main reason is that there is still a lack of advanced knowledge, modern analytical equipment and a commitment to long-term financial support for research. However, on a small scale, two studies have attempted to analyze data to initially assess trends in POPs residuals in river and sediment in the Red River estuary and breast milk of women living in the suburbs of Ho Chi Minh City.

Researchers at the University of Natural Sciences (106) analyzed residues of DDT and gamma-HCH (lindane) as the two most widely used pesticides in Vietnam, in water and sediments from the mouth of the Red River. River water and sediment are collected at the same sites annually during both dry and rainy seasons and analyzed to assess trends for pollution in the period 1995-2001 (Figure 6.1). Domestic DDT residues were relatively low during 1995-1998 and relatively stable in recent years at less than 10 ng/L. Concentration in sediments also shows a downward trend but at a slower rate. The DDT residue in the sediment decreased about twice during the 1997-2000 period. It should be noted that the use of DDT for agricultural purposes was banned in Vietnam in 1995.

Reduced DDT concentrations across the country and sediment from the Red River indicate the impact of regulations on the restriction of POPs use to reducing

environmental pollution. Regarding the trend of lindane concentration in sediment, the results show that the concentration peaked in 1997 and then decreased in the period 1999-2001. In general, the results from water and sediment in recent years indicate a rapid decline in DDT and HCH in surface water, but a slower decline in sediment.

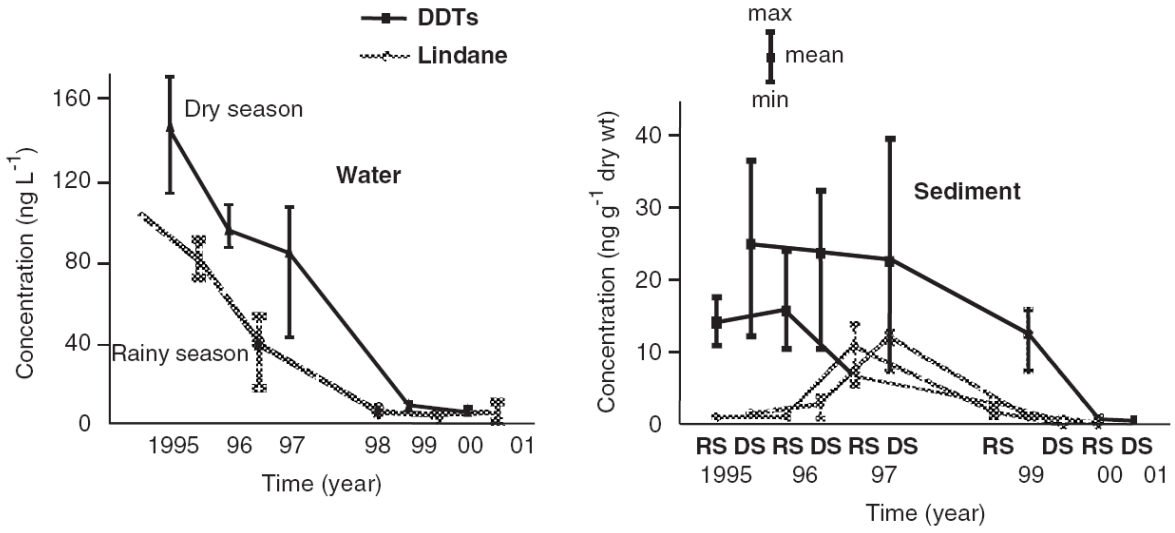

Fig. 6.1. *Occurrence of DDT and Lindane in water and sediment in Red River (Period 1995-2001; RS: rainy season, DS: dry season)*

In addition to studies on the trends of POPs levels in environmental samples, the trend of human exposure time is also an important issue to understand the long-term toxic effects on the population as a whole. Minh et al. (2) collected mother milk samples in 2001 and evaluated the reduction of human exposure to DDT and PCB for over 10-year period (1989-2001). First-order kinetics were used to estimate the rate of reduction of DDT and PCB in breast milk collected from Ho Chi Minh City.

An important factor to evaluate is the half-life decrease ($t_{1/2}$). This parameter is defined as the time in which the initial concentration is reduced to half. The mean concentration of p, p'-DDT decreased from 4,700 to 2,700 ng/g lipid over a 10-year period with $t_{1/2}$ for about 3 years. And p, p'-DDE decreased more slowly with $t_{1/2}$ over about 6 years.

Assuming that the trend of DDT is consistent, we can estimate that DDT accumulation in human milk may reach about 700 ng/g lipids in 2011 (Fig. 6.2) Decreasing trend of PCBs are slower than DDT (11-18 years for some main types such as CB-138, CB-153 and CB-180). This result is somewhat consistent with reports in Sweden showing that the half life of some PCBs varies from 11 to 17 years. Although, these studies were implemented more than a decade ago, there has been no replicated surveys for situation at the present time in order to confirm the suggested time trend. This is one of important issues that the national POPs monitoring programs in Vietnam need to address in the future.

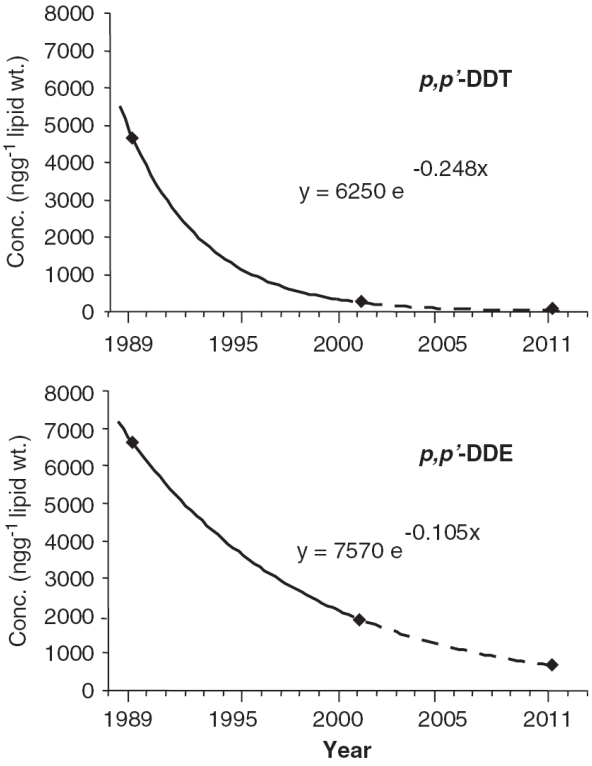

Fig. 6.2. *Comparison of DDT and DDE concentration in mother milk in Ho Chi Minh City (Minh et al., 2004)*

7. Assessment for environmental monitoring of POPs

Currently, in Vietnam there are two systems for accreditation of laboratorial abilities in the field of chemical and biological testing: the VILAS system managed by Bureau of Accreditation, Vietnam and the VIMCERTS

system managed by Ministry of Natural Resources and environment. Bureau of Accreditation, Vietnam is a full member of international organisation for accreditation bodies (ILAC) Mutual Recognition Arrangement.

In the management system of the Accreditation Office a total of 1070 laboratories have been certified VILAS standard ISO 17025. These laboratories operate in 7 areas of testing: Mechanical, Pharmaceutical, Electrical & Electronic, Measurement & Calibration, Non-Destructive, Chemistry and Biology. Of this, there are 593 laboratories operating in the field of chemical analysis (including indicators on chemical residues in the environment, in food, quality components of products ...). The number of laboratories registered for the analysis of pollutants POPs (mainly chemicals for plant protection, PCBs and dioxins) is 76 laboratories, accounting for about 13%.

As being mentioned elsewhere, in accordance with Degree 127/2014/ND-CP, Ministry of Natural Resources and Environment is in charge for carrying out evaluation and providing certificate of environmental monitoring services. The VIMCERTS certified laboratories have to meet requirements for technical staffs, instruments, methodologies, laboratorial waste management as well as other supporting facilities. At the end of 2017, there were 212 laboratories being given the certificate for environmental monitoring and analysis which is named as VIMCERTS. Among 212 VIMCERTS certified laboratories, there are 40 laboratories registering for POPs analysis accounted for 18.6% (mostly for organochlorine pesticides), including 5 private laboratories and 35 state laboratories.

Comparison between the two systems we can see a large difference between the number of POPs analysis subscribers in VILAS system (76 laboratories) and those in VIMCERTS system (40 laboratories). Specifically, the number of laboratories with VILAS for POPs analysis is about 2 times the number

of laboratories granted VIMCERTS. This difference is due to the different purpose and criteria of granting VILAS and VIMCERTS.

This is because, laboratories in the VILAS system can provide all kind of testing service including drugs, industrial products, environmental monitoring, etc. On the other hand, VIMCERT laboratories only provide testing service for environmental monitoring. Therefore, when assessing the monitoring capacity of POPs for environmental matrices, it may be preferable to carry out examination of laboratories in VIMCERTS system.

Under this activity, questionnaires were also sent to 130 laboratories for collecting relevant information. Unfortunately, despite the support of VEA, the number of collected questionnaires was only 14 which is about 10%. This number is insufficient for the capacity assessment and therefore, the assessment has been based mainly on laboratorial database of VIMCERTS system.

In process to assess POPs monitoring capacities, we examine and evaluate each stage of POP analysis including: environmental sampling; sample extraction, sample clean-up and quantitative analysis by specialized equipment;

7.1. Sampling capacity

The implementation of POP monitoring normally involves several steps: sampling, extraction (removal of POP from the sample base), cleaning of the extract (removal of contaminants, quantification of POP on the set) Although it is important to collect samples that represent the monitoring area, these activities are generally less complex than laboratory activities.

For environmental samples, sampling is usually not difficult because soil, sediment and water samplers are common. Most of the environmental monitoring laboratories under VIMCERTS are certified for environmental sampling. Tools and human resources for environmental sampling are used for general field work without separation because a sample can be used for analyzing a variety of

indicators. The procedures used for environmental sampling are generally in accordance with the Vietnamese TCVN system or other equivalent US or developed countries guidelines. For example, for water samples, TCVN 6663-6: 2008, TCVN 6663-3: 2008, TCVN 6663-1: 2011; For soil samples: TCVN 5297: 1995, TCVN 7538-2: 2005; For sediment samples TCVN 6663-13: 2000, TCVN 6663-15: 2004; For ambient air samples is TO9A of US EPA; For the emission sample of waste water, calculated as US EPA Method 23.

For the ambient air, the current national technical regulation system issued by Viet Nam does not provide any guidelines for POPs in the environmental air so that the monitoring laboratories do not register for this sector. Surveys and interviews show that ambient air sampling capacity is mainly used for scientific research. At present, there are 3 laboratories with capacity and experience in ambient air sampling for POP analysis: Center for Environmental Technology Research and Sustainable Development, Center for Environmental Monitoring (VEA) and Institute of Environmental Technology (Vietnam Academy of Sciences and Technology). The method used in the ambient air sampling is generally in accordance with the TO9A method prescribed by US EPA using a high volume sampling pump.

For emission samples, the current national technical regulation system by Vietnam provides for the allowable concentrations of total dioxin and furan (TEQ) in the emissions of some industrial activities (steel production, cement kiln, burning hazardous waste, burning domestic waste, burning medical waste). These are new regulations that have been introduced in recent years. There are several laboratories that have been certified for emission sampling for dioxin and furan monitoring, including three in the north and two in the south. The main method used is US EPA 23. In the near future, the number laboratories for emission sampling under these regulations may increase to serve the nationwide monitoring needs. As such, the requirements of national technical regulations can

be considered as a necessary and important condition for laboratories' investment to develop capacity in the sampling of emissions.

For human biological samples such as human blood samples and maternal milk samples, all environmental monitoring centers throughout the country are not registered for this sampling capacity. One of the reasons is that human-related issues need to be addressed in accordance with regulations of the Ministry of Health and therefore environmental monitoring laboratories often find it difficult to meet these requirements. There are a number of organizations that have implemented POPs analysis in breast milk samples or blood samples, such as the Environmental Monitoring Center, Center for Environmental Studies and Sustainable Development, but the sampling is often coordinated and conducted by other health care laboratories such as hospitals, local health facilities.

7.2. Capacities for sample extraction

Sample extraction is the next step in POP analysis. There are several methods used for sample extraction, the choice depends on the sample base and the availability of equipment and chemicals. Extraction methods and conditions of equipment capacity are described below.

- *Soxhlet extraction:*

Of the 212 laboratories of the VIMCERTS system and 26 of the recognized laboratories capable of analyzing POPs, there were 10 declared being capable of extracting using Soxhlet. This process is needed to extract POPs from solid matrices such as soil, sediment, and organisms. There is other method to extract solid samples with automatic devices called Pressurized Liquid Extraction (PLE).

Soxhlet is a relatively basic device in the sample handling step so that the fact that only less than half of the laboratories being equipped with this device is a major limitation on the development of POPs monitoring. As noted above, if there is no Soxhlet extraction, it will be difficult for a laboratory to effectively

perform the analysis of solid matrices such as soil, sediment, solid waste and organisms.

- *Liquid-liquid extraction:*

Liquid-liquid extraction is the most common method used in most environmental monitoring laboratories. The equipment required for this method is quite simple, including glass funnels of varying volumes (commonly from 500 to 2000 mL) and suitable shakers.

All laboratories with capacity for POPs analysis in the water samples are equipped with this method because beside POPs analysis, liquid-liquid extraction can also be used for extraction of many other pollutants in water.

- *Solid phase extraction (SPE):*

There was no record of SPE registration for POPs analysis in the sample. This suggests that the SPE method is not used because of inadequate implementation issues. The SPE method uses pre-packed columns that are manufactured and sold by foreign firms. Buying SPE columns requires high funding and time to order. In addition, these columns have a limit lifetime. Due to these limitations, the SPE method may not have been preferred for POP analysis in laboratories in Vietnam.

7.3. Capacities for sample clean-up

- *Silica gel & Florisil:*

Cleaning method using silica gel or florisil column is a necessary step prior to quantification on chromatography instruments. Especially for complicated sample matrices such as wastewater samples, soil samples, sludge samples and organism samples. Through our assessment, we have identified 26 VIMCERTS certified POPs using standard methods developed by the US EPA, which include silica gel and florisil clean-up step (US EPA 3620 for florisil, US EPA 3630 for silica gel)

- Method of cleaning with concentrated sulfuric acid:

This method uses a strong oxidizer, a sulfuric acid, to destroy impurities in the extract such as colorants and humic acids. This method is suitable for enhanced clean-up for POPs analysis such as DDT, PCB, Dioxin and Furan. However, this method is not suitable for less persistent POPs such as Aldrin, Diendril, Endrin, BHC. Few laboratories use this method for clean-up of samples for PCB and Dioxin analysis.

From the above-mentioned assessments, it can be summarized for some issues related to the clean-up method as the follows:

- Laboratories pay more attention to POP analysis in water and wastewater than in other environments such as soil, sludge and gases.
- Liquid-liquid extraction is the most widely used method in virtually all laboratories
- All laboratories use standard methods developed by the US Environmental Protection Agency (US.EPA) or Vietnam (TCVN), including cleaning steps (mainly by silica gel).
- The number of laboratories that have the ability to monitor POPs in soil, organisms, air and emissions is much less than that of water/wastewater samples.

7.4. Capacities for quantitative analysis of POPs

Quantitative POP analysis is a complex and highly demanding step in terms of expertise. Since concentrations of monitoring requirements are generally lower compared to other pollutants, POPs qualitative and quantitative analyzers require high accuracy, sensitivity and repeatability. It is therefore important for the qualitative and quantitative analyzes of POPs to have a high sensitivity and selectivity. Below is the equipment needed for qualitative and quantitative POPs analysis in the laboratory.

- *GC / ECD equipment:*

Evaluation of over 212 laboratories of the VIMCERTS system shows that there are 33 laboratories with GC/ECD. This equipment is relatively basic to use for quantitative analysis of POPs pesticides and PCB indicators.

These devices are also available at some laboratories that have not been licensed VIMCERTS for POPs monitoring. This shows that there are some laboratories that may meet requirement for quantitative instrument but do not meet other requirements for POPs analysis (such as having standards, analytical procedures, operation or lack of skilled manpower).

GC/ECD equipment is preferred because of its low investment cost, easy to operate and long service life. However, the limitation of this equipment is that only some simple POP compounds such as POP pesticides, PCB indicators are analyzed. When analyzing other compounds such as organophosphorus pesticides, they need gas chromatography with other detectors such as NPD or FTD. Because of this inconvenience, there is now a tendency to shift to a multipurpose device such as GC with mass spectrometry detector (GC/MS).

- *GC / MS and GC / MS-MS:*

Of the 212 laboratories evaluated, 40 laboratories were equipped with gas chromatography coupled with mass spectrometry (GC/MS or GC/MS-MS). These are modern and relatively versatile analytical instruments. Unlike the GC/ECD, GC/MS and GC/MS-MS are capable of quantitative analysis for POPs as well as other pollutant groups such as PAH, organic, volatile organic compounds (VOC).

Due to their multipurpose nature, the laboratories are now moving to invest in GC/MS and GC/MS-MS equipment rather than GC/ECD. With this device, laboratories are capable of analyzing more complex POPs groups such as brominated flame retardants (PBDEs), total PCBs, dioxin-like PCBs.

Thus, the potential for further development of the PBDE group is quite high because, in theory, in order to analyze PBDE group, one of the most important condition is to have a set of GC/MS.

However, it can be seen that even though the number of laboratories with GC/MS equipment is 40, the number of laboratories certified for POPs analysis in VIMCERTS system is only 26, meaning that there are 14 laboratories which have GC/MS but do not analyze POPs.

- *GC/MS-HR:*

In VIMCERTS system, there is 1 set of gas chromatography coupled with high resolution mass spectrometry detector (GC/MS-HR) which is qualified for analysis of Dioxin/Furan. GC/MS-HR is very expensive, so the cost of investing in such a device in Vietnam can amount to millions of US dollars. This device is used for quantitative analysis of dioxin and furan. However, it is also used for structural analysis of organic compounds.

- *LC/MS*

Of the total 212 licensed environmental monitoring laboratories (VIMCERTS), 16 laboratories have liquid chromatography coupling mass spectrometry detector (LC/MS). It is essential for the quantitative analysis of POPs containing fluorine and bromine compounds (PFOS and HBCD). However, there are no laboratories has registered to analyze these compounds. The reason is that there are no regulations in Vietnam that require monitoring of these compounds in the environment.

With the current equipment (LC/MS) capabilities, laboratories in the environmental monitoring system can develop the capacity to carry out analyzes of POPs containing fluorine and bromine groups (PFOS and HBCD). In addition, a laboratory of the University of Natural Sciences has initially developed the capacity of analyzing PFOS and PFOA compounds. However, this is a laboratory

of research and teaching. This laboratory does not register for service in the VIMCERTS system.

7.5. Capacities for mercury analysis

Of the 212 surveyed laboratories, 78 were certified for Hg analysis. Common sample for Hg analysis is surface water, sewage, groundwater, sediment and solid waste. The methods of Hg analysis are also quite diverse, however, there are two common methods using AAS and ICP (US EPA Method 7473; US EPA Method 200.8).

Number of laboratories with AAS device is 81 and those with ICP device is 17. Thus, there are several laboratories are capable of analyzing Hg in the environment. Hg monitoring in the environment has received great attention because the maximum concentration of Hg in many environmental compartments were issued under the Vietnamese National Technical Regulation system (QCVN).

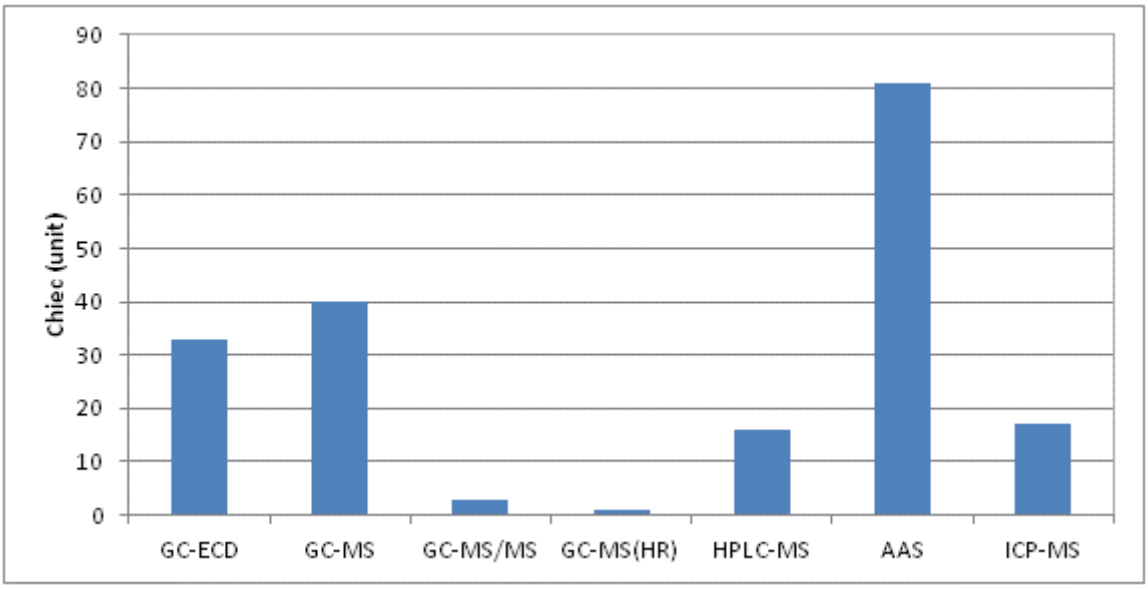

Fig. 7.1. *Number of quantitative instruments in laboratories*

7.6. Technical staffs for POPs analysis

In terms of personnel, in the environmental monitoring centers, the number of staff in the POPs division is commonly 1-2 people (except for few big laboratories such as the Center for Environmental Monitoring which belongs to MONRE). At present, there are three institutions to provide education in POPs analysis at university degree in Vietnam. They are Hanoi University of Science; Ho Chi Minh University of Science and Hue University. Vietnam Academy of Science also provides education on POPs analysis but mainly at postgraduate level.

Under framework of some projects, short-term training courses have been organized to provide training in POPs monitoring and analysis for selected target groups. For example, recently, the PCB sound management project organized a training for analysis of PCBs in transformer oil.

It is also observed that in provincial monitoring centers, most of the methods used are translated from those of foreign countries such as USA or international organizations. However, due to the lack of knowledge, the method transfer still encounters many problems leading to inaccurate implementation, omissions from the original methods.

7.7. Assessment from the questionnaire surveys

As mentioned above, there are 14 organizations which returned the questionnaires in the survey. With regarding location, there are 6 organizations in the north, 7 in south and only 1 in the middle of Vietnam. With regard to organization models, there is 1 private company, 5 provincial monitoring centers, 8 state research and state services organizations (Table 7.1).

a/ Sampling capacity

There is 1 private company namely Hoan Vu Ltd., based in Ho Chi Minh city, working in the analytical field. This company can do sampling for air, soil, sediment, water (meaning that surface water and wastewater) and ambient air.

There are 5 monitoring centers (number 2 - 6, Table 7.1) returned questionnaires, three of those in the northern Vietnam and 2 from the southern Vietnam. All centers can carry out sampling for water, soil and sediment; two centers belonging to Hai Phong province and Vietnam environment administration (VEA) can sample ambient air and the one of VEA can sample for other matrices such as emission gas, animals, mother milk.

There are eight state organizations in the assessment list including four research institutes (number 7-10) and four state service organizations (number 11-14). All of them can do sampling for soil, sediment and water; six among eight can do sampling for other matrices such as ambient air, emission gas and animals.

b/ Extraction and POPs quantification

Hoan Cau company can do analysis for organochlorine pesticides (OCPs) and PCBs using liquid-liquid extraction (for liquid samples), ultrasonic extraction (for soilid samples) and quantification by GC/MS following US EPA methods.

In provicial environmental monitoring centers, the analysis for OCPs in water are the most common test and implemented in all centers; Furthermore, one center in VEA can do analysis for other groups such as PCBs, PCDD/Fs, PBDEs and PFOS. For extraction method, common techniques are liquid-liquid extraction for water samples, ultrasonic and Soxhlet for soil and sediment. The one in VEA has a facility for pressurized liquid extraction (PLE). For quantification method, the most common equipment is GC/MS. The center in Bac Ninh has GC/ECD and the center in VEA has GC/MS high resolution which is for PCDD/Fs analysis. Four centers have certificates of ISO 17025 and

VIMCERTS and one center in Bac Ninh has only ISO 17025. USEPA methods are the most common reference methods, followed by TCVN.

In the groups of state research institutes and state service organizations, it seems that POPs monitoring and analysis is higher compared to the above group of the provincial monitoring centers, exception for the center in VEA.

Extraction using ultrasonic, Soxhlet and liquid-liquid are commonly used for solid samples and liquid samples, respectively. For quantification, GC/ECD and GC/MS are used for analysis of OCPs, PCBs and PBDEs (in two institutes); LC/MS is used in one organization (CETASD) for quantification of PFOS. None of them can do analysis for PCDD/Fs. Most organization (exception of CETASD, number 10) have certificate of ISO or VIMCERTS or both of those. It should be noted that one organization in Tien Giang has certificate for only environmental sampling activities with regard to POPs. USEPA methods are the most common reference methods, followed by TCVN.

c/ Technical staffs

In Hoan Cau private company, technical staffs include two with degree of Master of science (MSc) and three with degree of Bachelor of science (BSc).

In the provincial environmental monitoring centers, with regard to dgrees of technical staff, the center in VEA has 1 staff with PhD; the centers in VEA, Bac Ning and Hai Phong have 6, 1 and 2 staffs with MSc respectively. Number of other staffs is around 2, exception of the center in VEA with 12 staffs. Exception of the center in VEA, most of the centers generally, have less than 5 technical staffs being in charge for POPs monitoring and analysis.

In the state research and the state service organizations, this group has outstanding number of high degree staffs such as PhD and MSC. For example, the institute for environmental technology (number 9) has 21 PhD and 45 MSc; CETASD (number 10) has 3 PhD and 3 MSc; Center for environmental analysis

and technology transfer (Institute for agricultural environment) has 8 MSc and 4 BSc, etc. This is because these groups are more focused on research activities . In fact, in case of the institute for environmental technology, it is not known how many percentages of their high degree staffs are fully in charge for POPs monitoring activities such as in case of the institute for environmental technology?

Table 7.1: Summary of information from questionnaires which returned from 14 organizations

	Organization name	Sampling					Analysis (POPs in matrices)				Relevant methods			Certificate	Staff's degree (number)		
		air	water	soil	sedi	other	OCPs	PCBs	PCDD/Fs	New POP	ecxtraction	quantifi	reference		PhD	MSc	BCh
1	Hoan Vu company	x	x	x	x		ai, wa, so, se	ai, wa, so, se,			untrasoni; liquid-	GC/MS	USEPA	ISO, VIMCERTS		2	3
2	Center for environmental		x	x	x		wa, so, se				untrasoni; liquid-	GC/MS	USEPA, TCVN	ISO, VIMCERTS			2
3	Center for environmental monitoring, Ba Ria	x	x	x	x		wa				liquid- liquid	GC/MS	USEPA	ISO, VIMCERTS			2
4	Center for environmental		x	x			wa				liquid- liquid	GC/ECD	USEPA	VIMCERTS		2	2
5	Center for environmental	x	x	x	x		wa				liquid- liquid	GC/MSM S	USEPA	ISO, VIMCERTS		1	2
6	Center for environmental monitoring, Vietnam Environ.	x	x	x	x	em, mil, bio	ai, wa, so, se, mil	ai, wa, so, se, oil, milk	ai, wa, so, se, em, milk	so, se (PBDEs); wa (PFOS)	sohxlet liquid- liquid; PLE	GC/MS; GC/MSM S; GC/MS(H	USEPA, TCVN	ISO, VIMCERTS	2	6	12
7	Institute for environment and	x	x	x	x		wa, so, se				soxhlet, liquid-	GC/MS	USEPA	VIMCERTS		1	2
8	Center for environmental analysis and technology transfer,	x	x	x	x	em, bio	wa, so, se, oil				untrasoni; liquid- liquid	GC/MS	USEPA	ISO, VIMCERTS		8	4
9	Institute for environmental technology, Vietnam Academy for science	x	x	x	x	bio	wa, so, se, bio	wa, so, se		so (PBDE)	ultrasonic, sohxlet liquid- liquid	GC/MS, GC/MSM S	USEPA, TCVN	ISO, VIMCERTS	21	45	90

10	Center for environ technology and sustainable development		x	x	x	bio	wa, so, se, bio	wa, so, se, bio		wa, so, se, bio (PBDE, PFOS)	ultrasonic, sohxlet liquid-liquid	GC/ECD, GC/MS, LC/MS	USEPA		3	3	2
11	Center for biological technology and techniques, Tien Giang	x	x	x	x	em, bio								ISO, VIMCERTS		1	8
12	Center for analytical services and experiment, Can Tho Branch (CASE Can Tho)	x	x	x	x	em, bio	wa, bio				liquid-liquid,	GC/ECD, GC/MS	TCVN	ISO		4	23
13	Center for technique and technology application, Can Tho	x	x	x	x	bio	wa, so, ai, bio	wa, so, bio			soxhlet, liquid-liquid, spe	GC/ECD	USEPA, TCVN	ISO, VIMCERTS	1	8	6
14	Station for meteology and hydrology of the middle Vietnam		x	x			wa				liquid-liquid, spe	GC/ECD	USEPA, TCVN	ISO, VIMCERTS			4

Remarrk:

ai: air; wa: water; so: soil; se: sediment; bio: biota

em: emission gas; mil: mother milk

8. Comments and recommendation for POP monitoring improvement

Regarding the legal document system for POPs monitoring- As discussed above, this is an important issue, providing management requirements, creating the basis for professional laboratories for planning and implementation of POPs monitoring activities. Regarding the issue of POPs monitoring in the environment, the current legal document system consists of three major areas: the Vietnam national technical regulation system (QCVN), the Vietnam standards and quality system (TCVN) and general guidelines for selection of target compounds and standard monitoring methods issued in form of circulars by relevant ministries .

Currently the national technical regulations only set maximum allowable concentrations of some traditional POPs such as DDT, Aldrin, Dieldrin, Heptachlor, BHC in relevant environmental samples (soil, sediment, water, wastewater). There is no regulation for the monitoring of new POPs (PBDE, PFOS, etc) as well as insufficient regulations on monitoring of dioxin/furan and PCB (such as no regulation for those chemicals in water, waste water and ambient air). It is necessary to continue to study and supplement regulations in order to guide for a comprehensive POPs monitoring.

In 2017, the Ministry of Natural Resources and Environment issued very important circular (24/2017/TT-BTNMT) to set official environmental monitoring techniques and methods. This is a new circular is a combination of many previous circulars on environmental monitoring activities. However, in this circular, there are no provisions or guidelines for monitoring techniques of new POP such as PBDE, PFOS, HBCD. This lack of regulations will make it difficult to mobilize necessary resources to expand monitoring for new POPs. Additional regulations for this area should be investigated in the future.

Regarding the standard methods for implementing POPs monitoring: it is recognized that the standard methods prescribed in the TCVN system have some disadvantages such as lack of guiding methods for some POP groups, lack of updates to new techniques and new equipment. For example, there are no standard methods for new POPs analysis, lack of methods for air sampling, lack of updates on new extraction techniques, new quantitative instruments with higher sensitivity. Some research laboratories for new POPs often refer to the analytical procedures in developed countries such as the United States, the European Union, and Japan. However, these approaches will not be suitable for local laboratories because the fact they are in English represent a language barrier for local laboratory staff. For the future it would be necessary to translate the international standard methods in Vietnamese so that they can be more promptly adopted.

On the issue of training professional staff: generally speaking, technical staff for POPs monitoring has limited professional qualifications. Improving professional qualifications is essential and even more important than enhancing instrumental capacity. However, this issue has not been properly addressed. To solve this problem, the focus should be on self-training, development of adequate instruction manuals and standard procedures on POPs monitoring so that local staffs can gradually learn and improve themselves; Besides, short training courses focusing on POPs monitoring could be organized within the national conference annually organized for the environmental monitoring network in Vietnam; Encourage more training institutions for students to carry out researches, thesis ~~and theses~~ on POPs; Establish a forum, a network of POPs experts to share experiences and data.

On the issue of equipment for POP monitoring: According to our subjective assessment, many laboratories are very focused on investing equipment for POPs monitoring. However, uses of such expensive equipment are not always reasonable and effective. There may be some causes for this situation, such as

investment does not stick to current status and actual needs; restriction on professional qualifications of technical staff; insufficient supply of replacement materials and maintenance. This issue can be partially solved through the improvement staff qualifications, providing advice and guidance in knowledge sharing forums such as seminars and conferences.

On the use and sharing of POPs monitoring data: most of the research results on POPs published officially in prestigious journals are produced by research groups at universities or research institutes. These studies were conducted sporadically with different research purposes so the data lacked continuity and uniformity in terms of time and space. The use of these data to evaluate trends over time is very difficult. On the other hand, some monitoring laboratories carry out periodical monitoring, but only for the purpose of compliance (i.e. comparing with permitted concentration in QCVN). This approach thus set the limit of quantification (LOD) quite high and does not allow POPs to be quantified in the background medium at low concentrations which indeed is needed to assess temporal variation and time-trend of POPs concentration. For unofficial data published, the problem of data sharing is also difficult because no agency is focal point to gather such data provincial monitoring laboratories. In order to overcome these issues, a long-term research and environmental monitoring program with the specific objective of evaluating temporal variation of POPs concentration over a long period should be organized. Besides, organizing the focal point for collecting and storing annual POPs monitoring data from relevant monitoring programs as well as workshops and seminars on sharing data of POPs monitoring is needed.

Currently, the POP listed under the Stockholm Convention has risen to 28, more than double the original list of 12 substances. There is therefore a need to conduct baseline studies to assess their pollution on a large scale in order to add important substances to the regular monitoring list if necessary.

9. Recommendation for improving report to the Stockholm Convention

9.1. For improvement of country report to SC

As required by Article 15 of the Stockholm Convention, States Parties to the Convention shall implement the reporting regime on measures to implement the provisions of the Stockholm Convention and exchange information with the Parties to the Convention periodically, before the Conference of the Parties (COP) / workshop / working group meeting / technical group meeting, ...

As the National Focal Point for the implementation of the Stockholm Convention on POPs in Viet Nam, the Ministry of Natural Resources and Environment (MONRE) has implemented the provisions of Article 15 of the Stockholm Convention on Alert Mechanisms. These include collecting, aggregating, updating, exchanging information for reporting on POPs management in Vietnam. Annually, MONRE should synthesize information and reports from ministries, local authorities and relevant organizations about ongoing activities to implement Stockholm Convention and well as long term plans to address provisions of the "*National Implementation Plan of the Stockholm Convention on persistent organic pollutants to 2025 with vision to 2030*" which was newly updated and issued by the government.;

On 22/11/2010 and 21/4/2017, Vietnam has completed and sent to the Stockholm Convention Secretariat a second report and a third report as required in Article 15 of the Convention.

Currently, the Stockholm Convention adds new POPs and is accompanied by new requirements for the implementation of POPs management and reporting. Therefore, in order to ensure and enhance the good reporting required by the Stockholm Convention to Parties to the Convention, the expert group proposes some recommendations as follows:

- Continuing to update and improve the electronic reporting system so that member countries can make the reporting required by the Convention in a timely manner;
- Establish a technical team to review national reports to be submitted by member countries to the Secretariat to ensure quality of the report;
- Establish a database on the management, control and remediation of POPs pollution which can be extracted from the country reports so that Parties of the convention can assess, update and share information; .
- The country report for submission to the convention has some sectors which require repeated input of scattering information and thus potentially cause mistakes. It is suggested that the report is formatted in accordance with group of chemicals to improve continuity of the report content.
- It is the fact that Stockholm, Basel and Rotterdam convention have somewhat different requirements for reporting. However, it is advisable to design a reporting scheme which may such kinds of information in the country report.
- Continue to implement capacity building and training activities to assist developing countries and countries with economies in transition in preparing and submitting the country report as required in Article 15 of the Stockholm Convention.

9.2. Recommendation for effectiveness assessment of SC

Basing on Decision SC-8/18 "*Assessment of the effectiveness of the Stockholm Convention*" adopted at COP8 and the present capacity for the implementation of the Stockholm Convention in Viet Nam, some recommendations are made in order to improve effectiveness assessment for long-term implementation of Stockholm Convention in Vietnam as follows::

- Continue to develop and improve the policy and legal system to improve management capacity and update information on POPs management and

treatment, while promoting research activities in risk assessment, treatment of new POPs in major usages and pollution sources such as agriculture, health care, industry and unintentional emission (UPOP); .

- Strengthening capacity and technical assistance activities for priority areas as required by the Stockholm Convention and in accordance with the actual conditions of Vietnam.
- The government of Vietnam should actively participate in the development and implementation of the global monitoring plan to improve capacity and continue to support research, monitoring, risk assessment and data sharing;
- Strengthen the efforts to undertake important requirements of the revised NIP including the national inventory, revising legal frameworks, carrying out long-term POPs monitoring programs for important media such as air, water and maternal milk for addressing issue of temporal variation and time trend of POPs concentration;
- Continue to register separate exemptions as required by the Stockholm Convention;
- Mobilize the participation of the private sector (enterprises, associations, non-governmental organizations) in the implementation of the Stockholm Convention.
- Participate actively in regional activities to exchange, share and learn experiences on management and control of POPs;
- Continue to implement the reporting regime required by Article 15 of the Stockholm Convention;
- Exchange information on POPs with neighbor countries;
- Assess POPs monitoring capacity and set out phase out programs for POPs containing articles (e.g. plastic with flame retardants etc.);
- Set out a POPs alternative program to safer chemicals;
- Enhance public awareness on POPs;

- Apply Best Available Technologies (BAT) and Best Environmental Practices (BEP) for an environmentally sound management of POPs.

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80 Dao Dinh Thuan - Luận án Tiến sỹ - Trường Đại học sư phạm Hà Nội. Nghiên cứu đánh giá mức độ tồn lưu và nhận diện nguồn phát thải một số hợp chất hữu cơ khó phân hủy (POP) trong môi trường nước và bùn ở Thành phố Đà Nẵng

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LIST OF ANNEXES

ANNEX 1: List of VIMCERTS certified laboratories for POPs/PTS monitoring and analysis

No.	Name of Laboratory	Province	Registering Year	State/Private	Equipment for POPs quantification					Environment matrices and target POPs (HCBVTV: POP pesticides)							
					GC-ECD	GC MS	GC-MS HR	GC-MS-MS	HP LC-MS	Seawater	Groundwater	Waste water	Surface water	Air	Emissions	soil/ sediment / waste mud	Solid waste
VIMCERTS 001	Branch of Vietnam Petroleum Institute – Research and development center for petroleum safety and environment	Ho Chi Minh		Private													
VIMCERTS 002	Center of Environmental engineering and monitoring natural resources and environment, Binh Duong Natural Resources and Environment Department	Binh Duong	2016	State													
VIMCERTS 003	Center of Environmental Engineering and Monitoring of Dong Nai Province	Dong Nai	2015	State	x	x					HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 004	Technical resources and environmental company limited a member	Nghe an	2014	Private	x					HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 005	Nghe An center natural resouce and environment of monitoring	Nghe an	2016	State		x											
VIMCERTS 006	Environment Analysing and Technique Joint Stock Company	Ha Noi	2014	Private													
VIMCERTS 007	Company of Science and Technology	Ha Noi	2013	Private													
VIMCERTS 008	Center For Environmental Monitoring	Hai Phong	2014	State													

VIMCERTS 009	Institute for tropicalization and environment	Ho Chi Minh															
VIMCERTS 010	Company of Inspection Technique Vietnam Petroleum Safety	Ho Chi Minh		Private													
VIMCERTS 011	Environment Monitoring and Analysing Center Baria -Vung tau province	Ba ria - Vung tau	2014	State		x											
VIMCERTS 012	Center Analysing and Environment	Ha Noi	2013	Private													
VIMCERTS 013	Environment Monitoring and Analysing Center Kon Tum province	Kon Tum															
VIMCERTS 014	Binh Dinh center natural resouce and environment of monitoring	Binh Dinh															
VIMCERTS 015	Binh dinh analysis and experiment centrer	Binh Dinh	2015	State	x												
VIMCERTS 016	Natural Resources and Environment Monitoring and Analysis Centre	Thai Binh	2013	State		x				HCBVTV		HCBVTV	HCBVTV			HCBVTV	HCBVTV
VIMCERTS 017	Environment Monitoring and Analysing Center Hai Duong province	Hải Dương	2014	State		x											
VIMCERTS 018	Center for Environmental Monitoring and Protection	Tuyen Quang															
VIMCERTS 019	Quality Assurance and Testing Center	Can Tho	2016	State		x			x	HCBVTC		HCBVTV PCBs	HCBVTV			PCBs; HCBVTV	HCBVTV
VIMCERTS 020	Company for Sac Ky Hai Dang	Ho Chi Minh		Private		x			x		HCBVTV PCB	HCBVTV PCB	HCBVTV			HCBVTV PCB	
VIMCERTS 021	Center of Environmental Engineering and Monitoring of Quang tri Province	Quang Tri	2013	State	x								HCBVTV			HCBVTV	
VIMCERTS 022	Center of Environmental Engineering and Monitoring	Quang Binh		State													

VIMCERTS 023	Center natural resouce and environment of monitoring	Quảng Ninh	2014	State		x											
VIMCERTS 024	Center for Environmental Monitoring and Technology	Thai Nguyen	2014			x						HCBVTV	HCBVTV			HCBVTV (waste mud)	HCBVTV (hazardous wastei)
VIMCERTS 025	Station monitoring and analysis of working environment	Ha Noi			x	x			x		HCBVTV	HCBVTV	HCBVTV			PCB HCBVTV	
VIMCERTS 026	Consultation center for occupational safety health and environmental technology	Ho Chi Minh	2014	Private		x											
VIMCERTS 027	Center For Environmental Monitoring - Vietnam Environment Administration	Ha Noi	2017	State		x		x		HCBVTV	HCBVTV	HCBVTV PCB	HCBVTV		dioxin/furan	HCBVTV PCB dioxin/furan	dioxin/furan PCB, HCBVTV
VIMCERTS 028	Center for Natural Resources & Environmental Protection	Vinh Phuc		State													
VIMCERTS 029	Center of Environmental Engineering and Monitoring	Quang Ngai	2014	Private													
VIMCERTS 030	Vinacomin Informatics, Technology, Environment joint stock company	Ha noi	2015	Private													
VIMCERTS 031	Sonadezi service company	Dong Nai		Private													
VIMCERTS 032	Center for Environmental Technology - Institute for Environment and Resources	Ho Chi Minh	2014	State		x					HCBVTV	HCBVTV	HCBVTV			HCBVTV	HCBVTV
VIMCERTS 033	Center natural resouce and environment of monitoring Thua Thien Hue Province	Thua Thien Hue	2017	State	x												
VIMCERTS 034	CM join stock Company	Ha Noi	2014	Private													

VIMCERTS 035	Khanh Hoa center natural resouce and environment of monitoring	Khanh Hoa	2013	State													
VIMCERTS 036	Metoorology and hydrography station for the middle region	Da Nang	2013	State	x						HCBVTV	HCBVTV	HCBVTV				
VIMCERTS 037	Center for environmental technology and protection, Ministry of transport	Ha Noi	2014	State	x						HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 038	Center For Environmental Monitoring, Lao cai	Lao Cai	2014	State													
VIMCERTS 039	Company for Science and Technology and Environmental Analysis Southern	Ho Chi Minh	2016	Private		x				HCBVTC PCB	HCBVTC PCB	HCBVTC PCB	HCBVTV PCB			HCBVTC (Endrin) PCB	HCBVTV
VIMCERTS 040	Center For Environmental Monitoring Tay Ninh Province	Tay Ninh	2014	State													
VIMCERTS 041	Center for Monitoring and Technology Resources - Environment	An Giang	2014	State		x											
VIMCERTS 042	Science and technology progress application center	Quang Ninh	2013			x											
VIMCERTS 043	FPD analytical center	Quang Ninh	2014	Private	x					HCBVTV		HCBVTV	HCBVTV				
VIMCERTS 044	Center Analysis Research Environmental - Biển Đức Environmental Analysis Scientific Technological Corporation	Tp. HCM	2015	Private													
VIMCERTS 045	Company for Bach Viet Dong Nai Province	Dong Nai	2015	Private													
VIMCERTS 046	Center for Environment Monitoring and Analysing	Đak Lak	2014	State		x				HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	

VIMCERTS 047	The Center of Marine Environmental Monitoring and Analysis	Hai Phong	2014	State													
VIMERTS 048	Center of Environment Monitoring and analysing	Quang Nam	2014	State		x				HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 049	Center natural resouce and environment of monitoring Bac Ninh Province	Bac Ninh	2014	State													
VIMCERTS 050	Quang Ninh prventive Medicine Center	Quang Ninh															
VIMCERTS 051	Center for Geodesy and Environmental Monitoring	Quang Ngai	2014	State													
VIMCERTS 052	Center of Environment Technology and Management	Ho Chi Minh	2015	State		x					HCBVTV	HCBVTV	HCBVTV				
VIMCERTS 053	Center for Environmental Technology and Natural Resource Management	Ho Chi Minh															
VIMCERTS 054	Center for network of meteorology, hydrography and environment	Ha Noi	2013	State	x				x	HCBVTV	HCBVTV, PCBs	HCBVTV, PCBs	HCBVTV, PCBs				
VIMCERTS 055	School of Enviromental science and technology	Ha Noi	2014	State		x				HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 056	Center for environment consultancy and technolody	Ha Noi	2015	State													
VIMCERTS 057	Center natural resouce and environment of monitoring Lam Dong Province	Lam Dong	2014	State													
VIMCERTS 058	National Institute of Occupational and Environmental Health	Ha Noi	2014	State													
VIMCERTS 059	Transport Engineering Design Inc. (TEDI)	Ha Noi	2014	Private													

VIMCERTS 060	Center for Testing and Measurement	Quang Binh	2014	State													
VIMCERTS 061	Center of Environmental Engineering and Monitoring	Ha Tinh	2014	State													
VIMCERTS 062	Center for Technology Transfer and Application	Kien Giang	2014	State		x			x	HCBVTV	HCBVTV	HCBVTV	HCBVTV				
VIMCERTS 063	Institute of Regional Research and development	Ha Noi	2014	State													
VIMCERTS 064	Center for Environment and Applied Ecology	Ho chi Minh		Private													
VIMCERTS 065	Bộ Meteorology and hydrography station for southern region	Ho Chi Minh	2014	State	x					HCBVTV	HCBVTV	HCBVTV	HCBVTV				
VIMCERTS 066	Dai Viet company for investment and environment	Ho Chi Minh	2014	Private													
VIMCERTS 067	Center For Environmental Monitoring	Ninh Thuan	2014	State													
VIMCERTS 068	Center for analysing and Environment	Binh Duong	2014	State	x												
VIMCERTS 069	Institute for mining science and technology VINACOMIN	Ha Noi	2013	State													
VIMCERTS 070	New Technology Institute	Ha Noi	2015	State		x					HCBVTV	HCBVTV	HCBVTV				
VIMCERTS 071	Institute of Labor Protection and Environmental Protection Central	Da Nang	2013	Private													
VIMCERTS 072	Center for Environment and Cleaner Production	Ha Noi	2014	State													
VIMCERTS 073	Institute of Meteorology, Hydrology and Climate Change	Ho Chi Minh	2015	State					x								

VIMCERTS 074	Institute for irrigation planning of southern region	Ho Chi Minh	2014	State	x							HCBVTV	HCBVTV				
VIMCERTS 075	Phuong Nam center for environmental analysis and masurement, Vung Tau	Ba ria - Vung tau	2014	Private													
VIMCERTS 076	Tan Huy Hoang company for environmental services and consultation	Ho Chi Minh	2014	Private													
VIMCERTS 077	Center for environmental technology, Institute for environment and resources	Ho Chi Minh															
VIMCERTS 078	Quates 3	Ho Chi Minh	2014	State	x	x		x	x	HCBVTV	HCBVTV	HCBVTV	HCBVTV			PCB(mud) PBDE (mud)	PCB PBDE
VIMCERTS 079	Institute for environment technology, VN academy for science and technology	Ha Noi	2014	State	x	x			x		PCBs HCBVTV	PCBs HCBVTV	PCBs HCBVTV			PCBs HCBVTV	
VIMCERTS 080	Center For Environmental Monitoring	Lang Son	2014	State													
VIMCERTS 081	Center For Environmental Monitoring, Ha Nam	Ha Nam	2014	State	x								HCBVTV				
VIMCERTS 082	Center for environmental ânlysis and technology, Institute for agricultural environment	Ha Noi	2014	State		x				HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 083	Viện Nghiên cứu Da - Giầy thuộc Bộ Công thương	Ha Noi	2015	State					x								
VIMCERTS 084	MICCO company for mining chemicals	Ba ria - Vung tau	2014	Private													
VIMCERTS 085	Center for environmental technique, Da Nang	Da Nang	2015	State	x					HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	HCBVTV

VIMCERTS 086	Chugai Technos Company	Ho Chi Minh	2015	Private													
VIMCERTS 087	Việt Nam Institute for chemical industry	Ha Noi		State	x							HCBVTV PCB					PCB (hazardous waste)
VIMCERTS 088	Center for environmental remediation, Chemical Militery Division	Ha Noi	2015	State		x			x							x	
VIMCERTS 089	Center for environmental research and technology services	Ho Chi Minh	2015	Private													
VIMCERTS 090	Center for mining technology and environment, University for mining and geology	Ha Noi	2015	State													
VIMCERTS 091	Company for land use consultation and services	Ha Noi	2015	Private													
VIMCERTS 092	Center natural resouce and environment of monitoring -Son la Environment and Natural Resources Department	Sơn La	2014	State													
VIMCERTS 093	Quates 1	Ha Noi		State	x	x					HCBVTV PCB	HCBVTV PCB	HCBVTV			HCBVTV PCB	HCBVTV PCB
VIMCERTS 094	Center for training, consultation and protection of fishery environment	Hai Phong	2015	State													
VIMCERTS 095	Trung tâm Quan trắc và Điều tra môi trường phóng xạ, Liên đoàn Địa chất Xạ-Hiếm	Ha Noi	2015	State													
VIMCERTS 096	Center For Environmental Monitoring Bac Giang province	Bac Giang	2014	State		x						HCBVTV	HCBVTV				
VIMCERTS 097	Truong Son company for water and environment	Nghe an	2014	Private													

VIMCERTS 098	Da Phuong company	Vinh Long	2014	Private													
VIMCERTS 099	Institute for environmental science and public health	Ha Noi	2015														
VIMCERTS 100	Center For Environmental Monitoring Bac Kan Province	Bac Kan	2014	State													
VIMCERTS 101	Center for environmental consultation and research	Hồ Chí Minh	2014														
VIMCERTS 102	An Binh company for environmental technique and technology	Hà Nội	2014	Private													
VIMCERTS 103	Giang Center for application of advanced sciences and technologies, An Giang	An Giang	2014														
VIMCERTS 104	Center for research and application of environmental science and technologies	Hà Nội	2014	State													
VIMCERTS 105	T&T Company for environment and resources	Hà Tĩnh	2014	Private													
VIMCERTS 106	Institute of public health, Hochiminh	Thành phố Hồ Chí Minh	2014														
VIMCERTS 107	Center for technical standard of measurement and quality, Khanh Hoa	Khánh Hoà	2015	State													
VIMCERTS 108	Institute for water and environmental technology	Hồ Chí Minh	2015	State													
VIMCERTS 109	Center natural resouce and environment of monitoring Dong Thap Province	Đồng Tháp	2015	State													

VIMCERTS 110	Center for application of advanced science and technologies, Vinh Long	Vĩnh Long	2014	State													
VIMCERTS 111	Center For Environmental Monitoring, Nam Dinh Natural Resourses and Environment Department	Nam Dinh	2014	State													
VIMCERTS 112	Institute for environmental technique and technology	Hà Nội	2015	Private													
VIMCERTS 113	Institute for labour protection, Southern region	Hồ Chí Minh	2014	State	x						HCBVTV	HCBVTV	HCBVTV			HCBVTV	
VIMCERTS 114	Vietnam Japan center for environmental technology	Hà Nội															
VIMCERTS 115	Ha Noi center natural resouce and environment of monitoring	Hà Nội	2014	State	x	x				HCBVTV PCB		HCBVTV PCB	HCBVTV PCB				
VIMCERTS 116	Company for drilling solution and oil chemicals	Hà Nội	2015	Private													
VIMCERTS 117	Hai Au company for environmental consultation	Hồ Chí Minh	2015	Private													
VIMCERTS 118	Center natural resouce and environment of monitoring, Dak Nong Environment and Natural Resources Department	Đăk Nông	2014	State													
VIMCERTS 119	Quates 2	Đà Nẵng	2015	State	x	x		x	x	HCBVTV	HCBVTV PCB	HCBVTV PCB	HCBVTV PCB	HCBVTV PCB		HCBVTV PCB	HCBVTV
VIMCERTS 120	Center for environmental technology, Da Nag branch	Đà Nẵng	2014	State	x					HCBVTV	HCBVTV	HCBVTV	HCBVTV			HCBVTV	HCBVTV

VIMCERTS 121	Company for Vietnam Science anh Technology	Hà Nội	2015	Private													
VIMCERTS 122	Kimlong sustainable development and investment joint stock company	Hà Nội	2015	Private													
VIMCERTS 123	Center For Environmental Monitoring	Yen Bai	2015	State													
VIMCERTS 124	Goshu Kohsan Vietnam	Ha Noi	2015	Private													
VIMCERTS 125	Center for Environmental Monitoring and Protection (Donre)	Phu Tho	2014	State													
VIMCERTS 126	PT technology and environment joint stock company	Ha Noi	2015	Private													
VIMCERTS 127	Center for Environmental Monitoring and Protection	Thanh Hoa	2015	State													
VIMCERTS 128	Center for Science and Technology Application	Thua Thien Hue	2015	State													
VIMCERTS 129	Binh Thuan Technical Center for Standards Metrology and Quality, Binh Thuan	Binh Thuan	2014	State		x		x	x								
VIMCERTS 130	Center natural resouce and environment of monitoring Long An Province	Long An	2015	State													

VIMC ERTS 131	Center natural resouce and environment of monitoring Can Tho Province	Can Tho	2015	State		x											
VIMC ERTS 132	Center for Science and technology progress application and Accreditation	Ha Nam	2014	State													
VIMC ERTS 133	Counseling Center building - environment EZ - Branch Construction and investment joint stock company	Binh Dinh	2014	Private													
VIMC ERTS 134	Center for Information and technology application in Quang Nam - Department of Science and Technology of Quang Nam province	Quang Nam	2015	State													
VIMC ERTS 135	Toan Nguyen Company for Environment monitoring and technology	Ha Noi	2015	Private													
VIMC ERTS 136	Center for Research and Application of Technology on Environment - Vietnam association for conservation of nature and environment	Ha Noi	2015														
VIMC ERTS 137	Center for Environment and Energy	Ho Chi Minh	2015	Private													
VIMC ERTS 138	Institute for Environment and Resources - Vietnam National University, Ho Chi Minh City	Ho Chi Minh	2010	State	x	x			x								
VIMC ERTS 139	Company for Building and Environmental technology Transfer	Ha Noi	2015	Private													

VIMCERTS 140	Saigon Company for Environment consultant	Ho Chi Minh	2015	Private													
VIMCERTS 141	Center for Industrial Environment - National Institute of mining - metallurgy science and technology	Ha Noi	2015														
VIMCERTS 142	Center of research and monitoring of agricultural environment in Midle area and Highland	Đak Lak		State													
VIMCERTS 143	Environment Monitoring and Analysing Center	Ninh Bình	2015	State													
VIMCERTS 144	Center For Environmental Monitoring	Phu Yen	2015	State													
VIMCERTS 145	Center For Environmental Monitoring - Binh Thuan Natural Resourses and Environment Department	Binh Thuan	2015	State													
VIMCERTS 146	Hoang Anh Company for Trading and consultancy	Quang Ninh	2015	Private													
VIMCERTS 147	Center of Analytical Services and Experimentation of HCM City	Ho Chi Minh	2015	State		x	x		x	HCBVTV PCB PCDDs/ PCDFs	HCBVTV PCB PCDDs/ PCDFs	HCBVTV PCB PCDDs/ PCDFs	HCBVTV PCB PCDDs/ PCDFs		PCDDs/PCDFs	HCBVTV PCB PCDDs/PCDFs	HCBVTV PCB PCDDs/ PCDFs
VIMCERTS 148	Vinacontrol Environmental Assessment and Consultancy Joint Stock Company	Ha Noi		Private	x					HCBVTV		HCBVTV PCB	HCBVTV			HCBVTV	
VIMCERTS 149	Company for Petroleum Development and Environmental Technology	Ha Noi	2015	Private													
VIMCERTS 150	Company for urban drainage of Hanoi	Ha Noi	2016	Private													

VIMCERTS 151	Thang Long Industrial zone	Ha Noi	2015	Private													
VIMCERTS 152	IQC Company	Ha Noi	2016	Private													
VIMCERTS 153	Association for water resources survey, Southern region	Ho Chi Minh	2015	State													
VIMCERTS 154	Association for meteorology and hydrography survey, Hanoi	Ha Noi															
VIMCERTS 155	Center for nature resources and environmental monitoring, Hau Giang	Hau Giang	2015	State		x				HCBVTV	HCBVTV	HCBVTV PCB	HCBVTV			HCBVTV	
VIMCERTS 156	Center for analytical services and experiment, Branch in Can Tho	Ho Chi Minh		State	x	x			x								
VIMCERTS 157	Center for technical standard of measurement and quality, Ben Tre	Ben tre	2015	State													
VIMCERTS 158	Vĩnh Lộc Company for industrial zone development	Ho Chi Minh		Private													
VIMCERTS 159	Center for environmetal varification, Hanoi	Ha Noi	2016	State													
VIMCERTS 160	Asian Europe Company	Binh Duong	2015	Private													
VIMCERTS 161	Center for nature resources and environmental monitoring, Hung Yen	Hung yen	2015	State													
VIMCERTS 162	Mining association, Thanh Hoa	Thanh Hoa		State													
VIMCERTS 163	Thai Duong company for environmental monitoring and remediation	Ha Noi	2016	Private													

VIMCERTS 164	ENVITECH Company	Ha Noi	2015	Private													
VIMCERTS 165	Center for technique, nature resources and environment, Tra Vinh	Tra Vinh	2016	State													
VIMCERTS 166	Hanoi University for architecture , Institute for tropical architecture	Ha Noi	2016	State													
VIMCERTS 167	Hanoi University of construction	Ha Noi	2016	State					x								
VIMCERTS 168	Institute for meteorology and climate change	Ha Noi	2016	State	x	x											
VIMCERTS 169	Company for urban drainage Hochiminh city	Ho Chi Minh		Private													
VIMCERTS 170	Center for technical standard of measurement and quality, Thanh Hoa	Thanh Hoa	2016	State	x												HCBVTV
VIMCERTS 171	Center for environmental science and technology	Ha Noi	2016	Private	x	x											
VIMCERTS 172	New century company for environmental development	Ho Chi Minh		Private													
VIMCERTS 173	Phuong Nam center for environmental masurement	Dak lak	2014	Private													
VIMCERTS 174	Việt Nam Company for environmetal consultation and remediation	Ha Noi	2016	Private													
VIMCERTS 175	Warrantek Company	Can Tho		Private													
VIMCERTS 176	Center for natural resources and environmental monitoring, Cao Bang	Cao Bang	2015	State													

VIMC ERTS 177	Company for natural resources and environment Southern region	Ho Chi Minh	2016	Private													
VIMC ERTS 178	Center for industrial verification II	Ho Chi Minh	2016	State													
VIMC ERTS 179	Center for natural resources and environmental monitoring, Soc Trang	Soc Trang	2016	State													
VIMC ERTS 180	Center for technique and biological technology, Tien Gian	Tien Giang	2016	State													
VIMC ERTS 181	Center for natural resources and environmental monitoring, Kiên Giang	Kien Giang	2016	State													
VIMC ERTS 182	Viet nam association for nature and environment protection	Ho Chi Minh	2016	State													
VIMC ERTS 183	Company for mining consultation and construction	Ha Noi	2016	Private													
VIMC ERTS 184	Center for natural resouces and environmental monitoring, Lai Chau	Lai Chau	2016	State													
VIMC ERTS 185	Lien Minh Company for construction and environment	Ha Noi	2016	Private													
VIMC ERTS 186	Company for science and technology Thuan Thanh	Quang Nam	2016	Private													
VIMC ERTS 187	Research center for technology and industrial equipment	Ho Chi Minh	2016	State													
VIMC ERTS 188	Center for technique and environmental monitoring of Ca Mau	Ca Mau	2016	State													
VIMC ERTS 189	Company for chemical industry design CECO	Ha nOi	2016	State													

VIMCERTS 190	Company for consultation, construction and environment, Southern region	Ba ria - Vung tau	2016	Private													
VIMCERTS 191	Company for technology and services, Sai Gon	Ho Chi Minh		Private													
VIMCERTS 192	Center for technical standard of measurement and quality, Gia Lai	Gia Lai		State													
VIMCERTS 193	Center for technical standard of measurement and quality, Phu Yen	Phu Yen		State													
VIMCERTS 194	Center for experiment and science application, Dong Thap	Dong Thap	2016	State	x	x			x								
VIMCERTS 195	Center for environmental technique and chemical safety	Ha Noi		State													
VIMCERTS 196	Company for environment and green technology	Bac Ninh	2016	Private	x					HCBVTV	HCBVTV	HCBVTV					
VIMCERTS 197	Company for technique and standard QCVN	Ho Chi Minh		Private													
VIMCERTS 198	Center for environmental monitoring and modeling, Hanoi university of science	Ha Noi		Private													
VIMCERTS 199	Center for environmental monitoring, Vung Tau	Vung Tau		State													
VIMCERTS 200	Việt Nam Southern Institute for irrigation science	Ho Chi Minh		State													
VIMCERTS 201	Hà Nội Company for investment, construction and environment	Ha Noi		Private													
VIMCERTS 202	Institute for environmental science	Ha Noi		State													

VIMCERTS 203	Hoan Vu Company for science and technology	Ho Chi Minh		Private													
VIMCERTS 204	Institute for atomic research	Lam Dong		State		x					HCBVTV	HCBVTV	HCBVTV				
VIMCERTS 205	University for Economy, Technology and irrigation of the middle region	Quang Nam		Private													
VIMCERTS 206	Dat Viet Company for environment	Bac Giang		Private													
VIMCERTS 207	Institute for sustainable development	Ho Chi Minh		Private													
VIMCERTS 208	Company fgor Green Chemistry Vietnam	Ha Noi		Private													
VIMCERTS 209	Research center for application, technology and management of environment	Ho Chi Minh	2013	State	x												
VIMCERTS 210	Company for investment and environmental technology HQ	Ha Noi	2014	Private													
VIMCERTS 211	Center for application, technology and mângement of environment	Ho Chi Minh	2013	State	x												
VIMCERTS 212	Contruction and environmental technology company	Ha Noi	2015	Private													

List of VIMCERTS certified laboratories for Hg monitoring and analysis

KH	Name of Laboratory	Province	Registering Year	State/Private	Equipment for Hg		Environment matrices								
					AAS	ICP MS	Groupnd water	Sea water	Rain water	Waste water	Surface water	Ambient air	Emission	Soil/sediemnt	Waste
VIMCERTS 001	Branch of Vietnam Petroleum Institute – Research and development center for petroleum safety and environment	Ho Chi Minh		Private	x		x			x	x		x	x	
VIMCERTS 002	Center of Environmental engineering and monitoring natural resources and environment, Binh Duong Natural Resources and Environment Department	Binh Duong	2016	State	x		x			x	x		x	x	
VIMCERTS 003	Center of Environmental Engineering and Monitoring of Dong Nai Province	Dong Nai	2015	State	x		x			x	x		x	x	x
VIMCERTS 004	Technical resources and environmental company limited a member	Nghe an	2014	Private	x		x	x		x	x				
VIMCERTS 005	Nghe An center natural resouce and environment of monitoring	Nghe an	2016	State											
VIMCERTS 006	Environment Analysing and Technique Joint Stock Company	Ha Noi	2014	Private	x		x			x	x			x	
VIMCERTS 007	Company of Science and Technology	Ha Noi	2013	Private											

VIMCERTS 008	Center For Environmental Monitoring	Hai Phong	2014	State	x								x		
VIMCERTS 009	Institute for tropicalization and environment	Ho Chi Minh													
VIMCERTS 010	Company of Inspection Technique Vietnam Petroleum Safety	Ho Chi Minh		Private											
VIMCERTS 011	Environment Monitoring and Analysing Center Baria -Vung tau province	Ba ria - Vung tau	2014	State	x		x	x		x	x				
VIMCERTS 012	Center Analysing and Environment	Ha Noi	2013	Private											
VIMCERTS 013	Environment Monitoring and Analysing Center Kon Tum province	Kon Tum													
VIMCERTS 014	Binh Dinh center natural resouce and environment of monitoring	Binh Dinh					x			x	x				
VIMCERTS 015	Binh dinh analysis and experiment centrer	Binh Dinh	2015	State	x					x	x				
VIMCERTS 016	Natural Resources and Environment Monitoring and Analysis Centre	Thai Binh	2013	State	x		x	x		x	x			x	x
VIMCERTS 017	Environment Monitoring and Analysing Center Hai Duong province	Hải Dương	2014	State	x										
VIMCERTS 018	Center for Environmental Monitoring and Protection	Tuyen Quang													
VIMCERTS 019	Quality Assurance and Testing Center	Can Tho	2016	State	x	x	x	x		x	x		x	x	x

VIMCERTS 020	Company for Sac Ky Hai Dang	Ho Chi Minh		Private	x		x			x	x			x	x
VIMCERTS 021	Center of Environmental Engineering and Monitoring of Quang tri Province	Quang Tri	2013	State	x						x				
VIMCERTS 022	Center of Environmental Engineering and Monitoring	Quang Binh		State	x										
VIMCERTS 023	Center natural resouce and environment of monitoring	Quảng Ninh	2014	State	x										
VIMCERTS 024	Center for Environmental Monitoring and Technology	Thai Nguyen	2014		x	x				x	x	x		x	x
VIMCERTS 025	Station monitoring and analysis of working environment	Ha Noi			x		x			x	x				
VIMCERTS 026	Consultation center for occupational safety health and environmental technology	Ho Chi Minh	2014	Private	x		x			x	x				
VIMCERTS 027	Center For Environmental Monitoring - Vietnam Environment Administration	Ha Noi	2017	State	2	x	x	x	x	x	x		x	x	x
VIMCERTS 028	Center for Natural Resources & Environmental Protection	Vinh Phuc		State	x		x			x	x				
VIMCERTS 029	Center of Environmental Engineering and Monitoring	Quang Ngai	2014	Private	x		x	x		x	x			x	
VIMCERTS 030	Vinacomin Informatics, Technology, Environment joint stock company	Ha noi	2015	Private	x		x	x		x	x				
VIMCERTS 031	Sonadezi service company	Dong Nai		Private	x		x	x		x	x				
VIMCERTS 032	Center for Environmental Technology - Institute for Environment and Resources	Ho Chi Minh	2014	State	x	x	x			x	x			x	x
VIMCERTS 033	Center natural resouce and environment of monitoring Thua Thien Hue Province	Thua Thien Hue	2017	State	x		x	x		x	x		x	x	

VIMCERTS 034	CM join stock Company	Ha Noi	2014	Private											
VIMCERTS 035	Khanh Hoa center natural resouce and environment of monitoring	Khanh Hoa	2013	State	x		x			x				x	
VIMCERTS 036	Metoorology and hydrography station for the middle region	Da Nang	2013	State	x		x	x	x	x	x				
VIMCERTS 037	Center for environmental technology and protection, Ministry of transport	Ha Noi	2014	State											
VIMCERTS 038	Center For Environmental Monitoring	Lao Cai	2014	State	x						x				
VIMCERTS 039	Company for Science and Technology and Environmental Analysis Southern	Ho Chi Minh	2016	Private	x		x	x		x	x	x		x	x
VIMCERTS 040	Center For Environmental Monitoring Tay Ninh Province	Tay Ninh	2014	State	x					x	x			x	
VIMCERTS 041	Center for Monitoring and Technology Resources - Environment	An Giang	2014	State	x		x			x	x		x		
VIMCERTS 042	Science and technology progress application center	Quang Ninh	2013		x		x	x		x	x				
VIMCERTS 043	FPD analytical center	Quang Ninh	2014	Private	x		x	x	x	x	x				
VIMCERTS 044	Center Analysis Research Environmental - Biển Đức Environmental Analysis Scientific Technological Corporation	Tp. HCM	2015	Private											
VIMCERTS 045	Company for Bach Viet Dong Nai Province	Dong Nai	2015	Private	x		x	x	x	x	x		x	x	
VIMCERTS 046	Center for Environment Monitoring and Analysing	Đak Lak	2014	State	x		x	x	x	x	x			x	

VIMCERTS 047	The Center of Marine Environmental Monitoring and Analysis	Hai Phong	2014	State	x	x	x	x	x	x	x				
VIMCERTS 048	Center of Environment Monitoring and analysing	Quang Nam	2014	State		x	x	x	x	x	x			x	x
VIMCERTS 049	Center natural resouce and environment of monitoring Bac Ninh Province	Bac Ninh	2014	State	x					x	x				
VIMCERTS 050	Quang Ninh prventive Medicine Center	Quang Ninh													
VIMCERTS 051	Center for Geodesy and Environmental Monitoring	Quang Ngai	2014	State											
VIMCERTS 052	Center of Environment Technology and Management	Ho Chi Minh	2015	State		x			x	x	x			x	x
VIMCERTS 053	Center for Environmental Technology and Natural Resource Management	Ho Chi Minh			x		x			x	x			x	x
VIMCERTS 054	Center for network of meteorology, hydrography and environment	Ha Noi	2013	State	x		x	x	x	x	x				
VIMCERTS 055	School of Enviromental science and technology	Ha Noi	2014	State	x	x	x	x		x	x	x			
VIMCERTS 056	Center for environment consultancy and technolody	Ha Noi	2015	State											
VIMCERTS 057	Center natural resouce and environment of monitoring Lam Dong Province	Lam Dong	2014	State	x		x			x	x				
VIMCERTS 058	National Institute of Occupational and Environmental Health	Ha Noi	2014	State											
VIMCERTS 059	Transport Engineering Design Inc. (TEDI)	Ha Noi	2014	Private											
VIMCERTS 060	Center for Testing and Measurement	Quang Binh	2014	State											

VIMCERTS 061	Center of Environmental Engineering and Monitoring	Ha Tinh	2014	State			x	x		x					
VIMCERTS 062	Center for Technology Transfer and Application	Kien Giang	2014	State											
VIMCERTS 063	Institute of Regional Research and development	Ha Noi	2014	State		x	x	x		x	x				
VIMCERTS 064	Center for Environment and Applied Ecology	Ho chi Minh		Private											
VIMCERTS 065	Bộ Meteorology and hydrography station for southern region	Ho Chi Minh	2014	State											
VIMCERTS 066	Dai Viet company for investment and environment	Ho Chi Minh	2014	Private											
VIMCERTS 067	Center For Environmental Monitoring	Ninh Thuan	2014	State	x		x			x	x				
VIMCERTS 068	Center for analysing and Environment	Binh Duong	2014	State	x										
VIMCERTS 069	Institute for mining science and technology VINACOMIN	Ha Noi	2013	State											
VIMCERTS 070	New Technology Institute	Ha Noi	2015	State		x									
VIMCERTS 071	Institute of Labor Protection and Environmental Protection Central	Da Nang	2013	Private	x		x	x	x	x	x			x	
VIMCERTS 072	Center for Environment and Cleaner Production	Ha Noi	2014	State	x		x		x	x				x	x
VIMCERTS 073	Institute of Meteorology, Hydrology and Climate Change	Ho Chi Minh	2015	State	x										
VIMCERTS 074	Institute for irrigation planning of southern region	Ho Chi Minh	2014	State	x		x	x	x	x	x				

VIMCERTS 075	Phuong Nam center for environmental analysis and masurement, Vung Tau	Ba ria - Vung tau	2014	Private											
VIMCERTS 076	Tan Huy Hoang company for environmental services and consultation	Ho Chi Minh	2014	Private											
VIMCERTS 077	Center for environmental technology, Institute for environment and resources	Ho Chi Minh					x			x	x	x	x	x	
VIMCERTS 078	Quates 3	Ho Chi Minh	2014	State	x	x				x	x			x	x
VIMCERTS 079	Institute for environment technology, VN academy for science and technology	Ha Noi	2014	State	x		x	x		x	x		x	x	x
VIMCERTS 080	Center For Environmental Monitoring	Lang Son	2014	State											
VIMCERTS 081	Center For Environmental Monitoring, Ha Nam	Ha Nam	2014	State	x		x			x	x				
VIMCERTS 082	Center for environmental ânlysis and technology, Institute for agricultural environment	Ha Noi	2014	State	x		x	x	x	x	x				
VIMCERTS 083	Viện Nghiên cứu Da - Giầy thuộc Bộ Công thương	Ha Noi	2015	State											
VIMCERTS 084	MICCO company for mining chemicals	Ba ria - Vung tau	2014	Private											
VIMCERTS 085	Center for environmental technique, Da Nang	Da Nang	2015	State	x		x	x	x	x	x	x		x	x
VIMCERTS 086	Chugai Technos Company	Ho Chi Minh	2015	Private											
VIMCERTS 087	Việt Nam Institute for chemical industry	Ha Noi		State	x		x	x		x	x	x	x		

VIMCERTS 088	Center for environmental remediation, Chemical Militery Division	Ha Noi	2015	State	x										
VIMCERTS 089	Center for environmental research and technology services	Ho Chi Minh	2015	Private											
VIMCERTS 090	Center for mining technology and environment, University for mining and geology	Ha Noi	2015	State											
VIMCERTS 091	Company for land use consultation and services	Ha Noi	2015	Private											
VIMCERTS 092	Center natural resouce and environment of monitoring - Son la Environment and Natural Resources Department	Sơn La	2014	State											
VIMCERTS 093	Quates 1	Ha Noi		State	x	x	x		x	x	x	x	x	x	x
VIMCERTS 094	Center for training, consultation and protection of fishery environment	Hai Phong	2015	State											
VIMCERTS 095	Trung tâm Quan trắc và Điều tra môi trường phóng xạ, Liên đoàn Địa chất Xạ-Hiếm	Ha Noi	2015	State											
VIMCERTS 096	Center For Environmental Monitoring Bac Giang province	Bac Giang	2014	State	x		x			x	x				
VIMCERTS 097	Truong Son company for water and environment	Nghe an	2014	Private											
VIMCERTS	Da Phuong company	Vinh Long	2014	Private											

098															
VIMCERTS 099	Institute for environmental science and public health	Ha Noi	2015												
VIMCERTS 100	Center For Environmental Monitoring Bac Kan Province	Bac Kan	2014	State											
VIMCERTS 101	Center for environmental consultation and research	Hồ Chí Minh	2014												
VIMCERTS 102	An Binh company for environmental technique and technology	Hà Nội	2014	Private											
VIMCERTS 103	Giang Center for application of advanced sciences and technologies, An Giang	An Giang	2014												
VIMCERTS 104	Center for research and application of environmental science and technologies	Hà Nội	2014	State											
VIMCERTS 105	T&T Company for environment and resources	Hà Tĩnh	2014	Private											
VIMCERTS 106	Institute of public health, Hochiminh	Thành phố Hồ Chí Minh	2014												
VIMCERTS 107	Center for technical standard of measurement and quality, Khanh Hoa	Khánh Hoà	2015	State	x		x	x		x	x				
VIMCERTS 108	Institute for water and environmental technology	Hồ Chí Minh	2015	State											

VIMCERTS 109	Center natural resouce and environment of monitoring Dong Thap Province	Đồng Tháp	2015	State											
VIMCERTS 110	Center for application of advanced science and technologies, Vinh Long	Vĩnh Long	2014	State	x		x	x	x	x	x				
VIMCERTS 111	Center For Environmental Monitoring, Nam Dinh Natural Resourses and Environment Department	Nam Dinh	2014	State	x		x	x		x	x				
VIMCERTS 112	Institute for environmental technique and technology	Hà Nội	2015	Private											
VIMCERTS 113	Institute for labour protection, Southern region	Hồ Chí Minh	2014	State	x		x			x	x			x	
VIMCERTS 114	Vietnam Japan center for environmental technology	Hà Nội													
VIMCERTS 115	Ha Noi center natural resouce and environment of monitoring	Hà Nội	2014	State	x		x		x	x	x	x	x		x
VIMCERTS 116	Company for drilling solution and oil chemicals	Hà Nội	2015	Private											
VIMCERTS 117	Hai Au company for environmental consultation	Hồ Chí Minh	2015	Private											
VIMCERTS 118	Center natural resouce and environment of monitoring, Dak Nong Environment and Natural Resources Department	Đăk Nông	2014	State											
VIMCERTS	Quates 2	Đà Nẵng	2015	State	x	x	x	x		x	x	x	x	x	x

119															
VIMCERTS 120	Center for environmental technology, Da Nag branch	Đà Nẵng	2014	State	x		x	x	x	x	x	x		x	x
VIMCERTS 121	Company for Vietnam Science anh Technology	Hà Nội	2015	Private	x		x			x	x				
VIMCERTS 122	Kimlong sustainable development and investment joint stock company	Hà Nội	2015	Private											
VIMCERTS 123	Center For Environmental Monitoring	Yen Bai	2015	State											
VIMCERTS 124	Goshu Kohsan Vietnam	Ha Noi	2015	Private	x					x	x				
VIMCERTS 125	Center for Environmental Monitoring and Protection (Donre)	Phu Tho	2014	State											
VIMCERTS 126	PT technology and environment joint stock company	Ha Noi	2015	Private											
VIMCERTS 127	Center for Environmental Monitoring and Protection	Thanh Hoa	2015	State	x						x			x	
VIMCERTS 128	Center for Science and Technology Application	Thua Thien Hue	2015	State											
VIMCERTS 129	Binh Thuan Technical Center for Standards Metrology and Quality,	Binh Thuan	2014	State	x	x	x			x	x				

VIMCERTS 130	Center natural resouce and environment of monitoring Long An Province	Long An	2015	State											
VIMCERTS 131	Center natural resouce and environment of monitoring Can Tho Province	Can Tho	2015	State	x		x			x	x				
VIMCERTS 132	Center for Science and technology progress application and Accreditation	Ha Nam	2014	State											
VIMCERTS 133	Counseling Center building - environment EZ - Branch Construction and investment joint stock company	Binh Dinh	2014	Private											
VIMCERTS 134	Center for Information and technology application in Quang Nam - Department of Science and Technology of Quang Nam province	Quang Nam	2015	State											
VIMCERTS 135	Toan Nguyen Company for Environment monitoring and technology	Ha Noi	2015	Private											
VIMCERTS 136	Center for Research and Application of Technology on Environment - Vietnam association for conservation of nature and environment	Ha Noi	2015												
VIMCERTS 137	Center for Environment and Energy	Ho Chi Minh	2015	Private											
VIMCERTS 138	Institute for Environment and Resources - Vietnam National University, Ho Chi Minh City	Ho Chi Minh	2010	State											
VIMCERTS	Company for Building and Environmental technology Transfer	Ha Noi	2015	Private											

139															
VIMCERTS 140	Saigon Company for Environment consultant	Ho Chi Minh	2015	Private											
VIMCERTS 141	Center for Industrial Environment - National Institute of mining - metallurgy science and technology	Ha Noi	2015												
VIMCERTS 142	Center of research and monitoring of agricultural environment in Midle area and Highland	Đak Lak		State											
VIMCERTS 143	Environment Monitoring and Analysing Center	Ninh Bình	2015	State											
VIMCERTS 144	Center For Environmental Monitoring	Phu Yen	2015	State											
VIMCERTS 145	Center For Environmental Monitoring - Binh Thuan Natural Resourses and Environment Department	Binh Thuan	2015	State											
VIMCERTS 146	Hoang Anh Company for Trading and consultancy	Quang Ninh	2015	Private											
VIMCERTS 147	Center of Analytical Services and Experimentation of HCM City	Ho Chi Minh	2015	State	x	x	x	x	x	x	x		x	x	x
VIMCERTS 148	Vinacontrol Environmental Assessment and Consultancy Joint Stock Company	Ha Noi		Private	x		x	x	x	x	x	x		x	
VIMCERTS 149	Company for Petroleum Development and Environmental Technology	Ha Noi	2015	Private											

VIMCERTS 150	Company for urban drainage of Hanoi	Ha Noi	2016	Private											
VIMCERTS 151	Thang Long Industrial zone	Ha Noi	2015	Private											
VIMCERTS 152	IQC Company	Ha Noi	2016	Private											
VIMCERTS 153	Association for water resources survey, Southern region	Ho Chi Minh	2015	State	x		x	x		x	x				
VIMCERTS 154	Association for meteorology and hydrography survey, Hanoi	Ha Noi													
VIMCERTS 155	Center for nature resources and environmental monitoring, Hau Giang	Hau Giang	2015	State	x		x	x		x	x		x	x	x
VIMCERTS 156	Center for analytical services and experiment, Branch in Can Tho	Ho Chi Minh		State		x	x	x	x	x	x				
VIMCERTS 157	Center for technical standard of measurement and quality, Ben Tre	Ben tre	2015	State											
VIMCERTS 158	Vĩnh Lộc Company for industrial zone development	Ho Chi Minh		Private											
VIMCERTS 159	Center for environmetal varification, Hanoi	Ha Noi	2016	State											
VIMCERTS	Asian Europe Company	Binh Duong	2015	Private											

160															
VIMCERTS 161	Center for nature resources and environmental monitoring, Hung Yen	Hung yen	2015	State											
VIMCERTS 162	Mining association, Thanh Hoa	Thanh Hoa		State											
VIMCERTS 163	Thai Duong company for environmental monitoring and remediation	Ha Noi	2016	Private											
VIMCERTS 164	ENVITECH Company	Ha Noi	2015	Private											
VIMCERTS 165	Center for technique, nature resources and environment, Tra Vinh	Tra Vinh	2016	State											
VIMCERTS 166	Hanoi University for architecture , Institute for tropical architecture	Ha Noi	2016	State											
VIMCERTS 167	Hanoi University of construction	Ha Noi	2016	State											
VIMCERTS 168	Institute for meteorology and climate change	Ha Noi	2016	State	x		x	x		x	x			x	
VIMCERTS 169	Company for urban drainage Hochiminh city	Ho Chi Minh		Private											
VIMCERTS 170	Center for technical standard of measurement and quality, Thanh Hoa	Thanh Hoa	2016	State	x				x	x					

VIMCERTS 171	Center for environmental science and technology	Ha Noi	2016	Private											
VIMCERTS 172	New century company for environmental development	Ho Chi Minh		Private											
VIMCERTS 173	Phuong Nam center for environmental masurement	Dak lak	2014	Private											
VIMCERTS 174	Việt Nam Company for environmetal consultation and remediation	Ha Noi	2016	Private											
VIMCERTS 175	Warrantek Company	Can Tho		Private											
VIMCERTS 176	Center for natural resources and environmental monitoring, Cao Bang	Cao Bang	2015	State											
VIMCERTS 177	Company for natural resources and environment Southern region	Ho Chi Minh	2016	Private											
VIMCERTS 178	Center for industrial verification II	Ho Chi Minh	2016	State											
VIMCERTS 179	Center for natural resources and environmental monitoring, Soc Trang	Soc Trang	2016	State											
VIMCERTS 180	Center for technique and biological technology, Tien Gian	Tien Giang	2016	State	x		x	x		x	x		x	x	
VIMCERTS	Center for natural resources and environmental monitoring, Kiên Giang	Kien Giang	2016	State											

181															
VIMCERTS 182	Viet nam association for nature and environment protection	Ho Chi Minh	2016	State											
VIMCERTS 183	Company for mining consultation and construction	Ha Noi	2016	Private											
VIMCERTS 184	Center for natural resouces and environmental monitoring, Lai Chau	Lai Chau	2016	State											
VIMCERTS 185	Lien Minh Company for construction and environment	Ha Noi	2016	Private	x								x		
VIMCERTS 186	Company for science and technology Thuan Thanh	Quang Nam	2016	Private											
VIMCERTS 187	Research center for technology and industrial equipment	Ho Chi Minh	2016	State											
VIMCERTS 188	Center for technique and environmental monitoring of Ca Mau	Ca Mau	2016	State											
VIMCERTS 189	Company for chemical industry design CECO	Ha nOi	2016	State											
VIMCERTS 190	Company for consultation, construction and environment, Southern region	Ba ria - Vung tau	2016	Private											
VIMCERTS 191	Company for technology and services, Sai Gon	Ho Chi Minh		Private											

VIMCERTS 192	Center for technical standard of measurement and quality, Gia Lai	Gia Lai		State											
VIMCERTS 193	Center for technical standard of measurement and quality, Phu Yen	Phu Yen		State											
VIMCERTS 194	Center for experiment and science application, Dong Thap	Dong Thap	2016	State	x	x				x	x				
VIMCERTS 195	Center for environmental technique and chemical safety	Ha Noi		State											
VIMCERTS 196	Company for environment and green technology	Bac Ninh	2016	Private											
VIMCERTS 197	Company for technique and standard QCVN	Ho Chi Minh		Private											
VIMCERTS 198	Center for environmental monitoring and modeling, Hanoi university of science	Ha Noi		Private											
VIMCERTS 199	Center for environmental monitoring, Vung Tau	Vung Tau		State											
VIMCERTS 200	Việt Nam Southern Institute for irrigation science	Ho Chi Minh		State											
VIMCERTS 201	Hà Nội Company for investment, construction and environment	Ha Noi		Private											
VIMCERTS	Institute for environmental science	Ha Noi		State											

202															
VIMCERTS 203	Hoan Vu Company for science and technology	Ho Chi Minh		Private	x		x			x	x	x	x	x	
VIMCERTS 204	Institute for atomic research	Lam Dong		State	x		x			x	x				
VIMCERTS 205	University for Economy, Technology and irrigation of the middle region	Quang Nam		Private											
VIMCERTS 206	Dat Viet Company for environment	Bac Giang		Private											
VIMCERTS 207	Institute for sustainable development	Ho Chi Minh		Private											
VIMCERTS 208	Company fgor Green Chemistry Vietnam	Ha Noi		Private											
VIMCERTS 209	Research center for application, technology and management of environment	Ho Chi Minh	2013	State	x		x	x	x	x	x	x			
VIMCERTS 210	Company for investment and environmental technology HQ	Ha Noi	2014	Private											
VIMCERTS 211	Center for application, technology and mângement of environment	Ho Chi Minh	2013	State	x		x	x	x	x	x	x			
VIMCERTS 212	Contruction and environmental technology company	Ha Noi	2015	Private											

ANNEX 2: QUESTIONNAIR FOR POP MONITORING AND ANALYSIS

General information

Name of laboratory:			
Address:			
City			
Telephone:			
E-mail:			
Web Site:			
Contact person:			

Type of laboratory		
State ☐	Private ☐	Others ☐
Major funtions		
Size (in m2)		
General area:		m²
Area for POP:		m²
Year of establishment		
Year of starting POP analysis:		
HCBVTV: ; PCB: ; PCDD/PCDF: ; BFR: PFC:		

Relevant staffs

Degree [number of each level]	Ph.D: ; M.Sc.: ; Đại học:
Admin supporting staff [number]:	

Activities and equipment

Table 1: Major clients

Category (%)	State	Private	For research
National			
Foreign countries			
Intra-laboratory			

Table 2: Capacity for sampling

	Kind of samples							
	Emission gas	Soil	Sediment	Surface water	Wastewater	Ambient air	Biological samples	Others
By laboratory								
In cooperation with others								

Table 3: Methods for analysis of POPs in laboratory (written in formula):

Extraction method:

F = Solid phase (SPE)	L = Liquid/liquid
M = Microwave (PFE)	P = Pressurized fluid
S = Soxhlet	U = Ultrasonic

Instrumentation:

1 = Packed column + ECD or FID
2 = Capillary column + ECD
3 = Capillary column + MSD (LRMS)
4 = Capillary column + HRMS
5 = Capillary column + MS/MS
7 = Liquid chromatography + MS(MS)

For example: Soxhlet – Capillary column + ECD = S2

	Kind of sample							
POP	Emission gas	Transformer oil	Soil	Sediment	Wastewater	Surface water	Ambient air	Biological sample
OCPs								
Aldrin								
Chlordane								
Chlordecone								
Dieldrin								
DDT								
Endrin								
Heptachlor								
HCH (α, β, γ)								
Mirex								
Toxaphene (P 26, 50, 62)								
HCB, PeCBz								
PCB (7 indicator PCB)								
BFRs								
PBB								
PBDE								
Dioxin & dl-PCB								
dl-PCB (TEQ)								
PCDD/PCDF (TEQ)								
PFCs								
PFOS/PFOSF								

Table 4: Reference method for POP analysis (TCVN, EPA, EN, ASTM, In-house)

	Kind of sample					
POP	Emission gas	Transformer oil	Soil, Sediment, Solid product	Surface water/ Wastewater	Ambient air	Other biological sample
OCPs						
Aldrin, endrin, dieldrin						
Chlordane						
Chlordecone						
DDT						
Endosulfan						
Heptachlor						
HCH (α, β, γ)						
Mirex						
Toxaphene						
HCB, PeCBz						
PCB (7 indicator PCB)						
PFRs						
PBB						
PBDE						
Dioxin-like POPs						
dl-PCB (TEQ)						
PCDD/PCDF (TEQ)						
PsFC						
PFOS/PFOSF						

Table 5: Number of samples analyzed fer year in the last two years

	Emission gas	Transformer oil	Solid waste	Soil, Sediment	Wastewater	Products	Plant	Animal	Ambient air	Mother milk	Human blood	Water
POPs												
Aldrin												
Chlordane												
Chlordecone												
Dieldrin												
DDT												
Endosulfan												
Endrin												
Heptachlor												
HCH (α, β, γ)												
Mirex												
Toxaphene (P 26, 50, 62)												
HCB, PeCBz												
PCB (7 indicator PCB)												
BFRs												
PBB												
PBDE												
Dioxin-like POPs												
dl-PCB (TEQ)												
PCDD/PCDF (TEQ)												
PFCs												
PFOS/PFOSF												

Quality control

4.1 Application/Accredited by ISO17025? ☐ Yes/ ☐ No

4.2 Certified by VIMCERTS (Ministry of Enviro and nature resources)? ☐ Yes/ ☐ No

4.3 In-house procedure? ☐ Yes/ ☐ No

4.4 Using of proficiency test sample (PT)? ☐ Yes/ ☐ No

PT sample name ……..

Compounds and sample certified by VILAS & VIMCERTS

POP	Sample	VILAS/VIMCERT
POPs pesticides		
HCB		
PCB (7 indicator PCB)		
PBB		
PBDE		
dl-PCB (TEQ)		
PCDD/PCDF (TEQ)		
PFOS/PFOSF		

Name and date:

……

ANNEX 3: SUMMARY MATRIX OF POP/PTS MONITORING RESULTS IN VIETNAM

(Note: AR: Air sample; WA: Water; SO: Soil; SE: Sediment; EM: Emission samples (gas/solid waste); BIO: Biological sample; MIL: Mother milk; BLO: Human Blood)

No	PrOvince	Chemical	Matrix	Time	Value in reference	Unit	Ref. number	Notes
1	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	0.84	ng/l	105	Set river, p22, annex B
2	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	1.03-1.50	ng/l	105	lu river, p22, annex B
3	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	1.29	ng/l	105	Yen So lake, p22, annex B
4	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	0.63-0.64	ng/l	105	Kim Nguu river, p21, annex B
5	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	0.57	ng/l	105	West lake, p21, annex B
6	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	0.29-1.08	ng/l	105	To Lich river, p21, annex B
7	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2014	0.46-0.94	ng/l	105	Nhue river, p21, annex B
8	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	0.47	ng/l	105	West lake, p19, annex A

9	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	0.80-1.01	ng/l	13 (58) (90)	Set river, p20, annex A
10	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	0.59-1.26	ng/l	105	Lu river, p20, annex A
11	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	1.21	ng/l	105	Yen So lake, p20, annex A
12	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	0.60-1.14	ng/l	105	Song Kim Ngưu, p20, annex A
13	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	0.48-1.65	ng/l	105	Sông Tô Lịch, p19, annex A
14	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2013	0.18-0.54	ng/l	105	Song Nhue, p19, annex A
15	Việt Nam	PCDD (Dioxin)	MIL	1999-2003	13	pg/g TEQ lipid wt	28	p405
16	Việt Nam	PCDD (Dioxin)	BIO	2002	0.076	pg TEQ/g wet wt	26 (70) (102)	Vietnam exported shirmp. Table 3
17	Việt Nam	PCDD (Dioxin)	BIO	2002	0.47	pg TEQ/g wet wt	26 (70) (102)	Vietnam export fish, table 3
18	Việt Nam	PCDD/Fs	EM	2012	0.37-10.9	ng TEQ/ kg dry wt	7	Mean of three cement kiln plants. Table 3
19	Việt Nam	PCDD/Fs	EM	2012	325	ng TEQ/ kg dry wt	7	Blast oxygen furnace. Steel Making. Table 3
20	Việt Nam	PCDD/Fs	EM	2012	342	ng TEQ/ kg dry wt	7	Electric Arc Furnace. Steel making. Table 3

27	Việt Nam	PCDD/Fs	EM	2012	0.033-0.837	ng TEQ /Nm3	7	Cement Kiln. Table 2
28	Việt Nam	PCDD/Fs	EM	2012	0.166	ng TEQ /Nm3	7	Blast oxygen Furnace. Table 2
29	Việt Nam	PCDD/Fs	EM	2012	0.048	ng TEQ /Nm3	7	Electric Arc Furnace. Table 3
36	Ven biển miền Bắc (Northern Coast)	PCBs	SE	1995-1996	1.7	ng/g dry wt	05 (87)	Arochlor 1254 mixture. Table 3
37	Ven biển miền Bắc (Northern Coast)	Tổng HCH	SE	1999	1200-33700	ng/g dry wt	08 (56) (94)	p341
38	Ven biển miền Bắc (Northern Coast)	PCBs	SE	1999	0.470-28	ng/g dry wt	08 (56) (94)	p341
40	Ven biển miền Bắc (Northern Coast)	PCBs	SE	1995-1996	1.0-3.3	ng/g dry wt	04 (86)	as arochlor 1254 mixture. table 3.
41	Việt Nam	DDT	SE	2000	5.0-28.0	ng/g dry wt	10 (89)	Northern Vietnam. In agriculture areas. p29
42	Việt Nam	DDT	SO	2000	5.0-28.0	ng/g dry wt	10 (89)	Northern VIetnam. In agriculture. p29
43	Ven biển miền Bắc (Northern Coast)	DDT	SO	1999	6.2-10.4	ng/g dry wt	08 (56) (94)	p341

44	Ven biển miền Bắc (Northern Coast)	DDT	SE	1995-1996	5.5	ng/g dry wt	05 (87)	table 3
45	Ven biển miền Bắc (Northern Coast)	DDT	SE	1995-1996	3.0-7.3	ng/g dry wt	04 (86)	table 3
46	Việt Nam	PCBs	SE	2002-2008	0.367-44.7	ng/g dry wt	64	p1013
47	Khánh Hòa	HCB	BLO	2005	0.25	ng/ml	57	Dien Khanh(table 2) Giá trị số liệu là giá trị trung bình hình học
48	Khánh Hòa	HCB	BLO	2005	0.26	ng/ml	57	Nha Trang (table 2) Giá trị số liệu là giá trị trung bình hình học
49	Khánh Hòa	PCBs	BLO	2005	0.7	ng/ml	13 (58) (90)	Dien khánh (table 3) Giá trị số liệu là giá trị trung bình hình học (GM)
50	Khánh Hòa	PCBs	BLO	2005	0.92	ng/ml	57	Nha Trang (table 3) Giá trị số liệu là giá trị trung bình hình học (GM)
51	Khánh Hòa	PCBs	SE	2005-2008	2.32-5.38	ng/g dry wt	64	Cam Ranh (table 1)
52	Ninh Thuận	PCBs	SE	2005-2008	1.32-4.5	ng/g dry wt	64	Dam Nai (table 1)
53	Bình Thuận	PCBs	BIO	1994-2001	80	ng/g lipit wt	20 (68)	Phan Ri estuary (table 2)
54	Bình Thuận	HCB	BIO	1994-2001	0.9	ng/g lipit wt	20 (68)	Phan Ri estuary (table 2)
55	Bình Thuận	DDT	BIO	1994-2001	240	ng/g lipit wt	20 (68)	Phan Ri estuary (table 2)

56	Bình Thuận	Tổng HCH	BIO	1994-2001	2.9	ng/g lipit wt	20 (68)	Phan Ri estuary-Phan Ri (table 2)
57	Bình Thuận	Chlordane	BIO	1994-2001	11	ng/g lipit wt	20 (68)	Phan Ri estuary (table 2)
58	Đà Nẵng	PCDD/Fs	BLO	2006-2007	22.1-1230	pg TEQ /g lipid wt	74	Concentrations in human blood of those work in Sen Lake (table 2)
59	Đà Nẵng	PCDD/Fs	SE	2006-2007	63-6820	pg/g TEQ dry wt	74	Sen Lake (table 1, p25)
60	Đà Nẵng	PCDD/Fs	SO	2006-2007	3.1	pg/g TEQ dry wt	74	Hai Chau Garden (table 1, p25)
61	Đà Nẵng	PCDD/Fs	SO	2006-2007	3.8-36.2	pg/g TEQ dry wt	74	Thanh Khe Garden (table 1, p25)
62	Đà Nẵng	PCDD/Fs	SE	2006-2007	15.5-16.2	pg/g TEQ dry wt	74	Xuan Lake (N,S)
63	Đà Nẵng	PCDD/Fs	SO	2006-2007	5.0-5.3	pg/g TEQ dry wt	74	Dien Bien Phu Street
64	Đà Nẵng	PCDD/Fs	SO	2006-2007	31-1830	pg/g TEQ dry wt	74	Da Nang Airbase Perimeter (table 1)
65	Đà Nẵng	PCDD/Fs	SE	2006-2007	8580-27700	pg/g TEQ dry wt	74	Drainage System, Da nang airbase (table 1)
66	Đà Nẵng	PCDD/Fs	SO	2006-2007	169-6520	pg/g TEQ dry wt	74	Between Storage Area and Mixing and Loading Area, Da Nang airbase (table 1)
67	Đà Nẵng	PCDD/Fs	SO	2006-2007	20-106000	pg/g TEQ dry wt	74	Former Storage Area (SA), Da Nang Airbase (table 1)
68	Đà Nẵng	PCDD/Fs	SO	2006-2007	899-365000	pg/g TEQ dry wt	74	Former Mixing and Loading Area, Da Nang Airbase, Table 1
69	Đà Nẵng	PCDD/Fs	BLO	1991-1992	77-118	pg TEQ /g lipid wt	26 (70) (102)	table 1

70	Đà Nẵng	PCDD/Fs	AR	2010-2015	65.2±34	fg I-TEQ/m3	13 (58) (90)	p647
71	Bình Định	PCDF (Furan)	MIL	2008-2010	3.0-10.0	pg/g TEQ lipid wt	59 (93)	Phù Cát (table 2)
72	Hà Nam	PCDD (Dioxin)	MIL	2008-2010	1.2-4.1	pg/g TEQ lipid wt	59 (93)	Kim Bang (table 2)
73	Hà Nam	PCDF (Furan)	MIL	2008-2010	1-3.1	pg/g TEQ lipid wt	59 (93)	Kim Bang (table 2)
74	Đà Nẵng	PCDF (Furan)	MIL	2008-2010	2.0-12.0	pg/g TEQ lipid wt	59 (93)	Sơn trà (table 2)
75	Đà Nẵng	PCDD (Dioxin)	MIL	2008-2010	4.0-31.0	pg/g TEQ lipid wt	59 (93)	Sơn trà (table 2)
76	Đà Nẵng	PCDD (Dioxin)	MIL	2008-2010	3.0-39.0	pg/g TEQ lipid wt	59 (93)	Thanh Khe (table 2)
77	Đà Nẵng	PCDF (Furan)	MIL	2008-2010	2.0-26.0	pg/g TEQ lipid wt	59 (93)	Thanh khe (table 2)
78	Đà Nẵng	PCDF (Furan)	MIL	2008-2009	1.4-25.7	pg/g TEQ lipid wt	60	table 2
79	Đà Nẵng	PCDD (Dioxin)	MIL	2008-2009	1.9-39.8	pg/g TEQ lipid wt	60	table 2
80	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2004	0.01-14	ng/g dry wt	23 (97)	In river and estuary
81	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2004	6.5-15	ng/g dry wt	23 (97)	In urban area
82	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	1999-2007	1.2-430	ng/g dry wt	41	41b: Sum of mono to deca-BDE congeners (BDE 3, 28, 47, 99, 100, 153, 154, 183, 196, 197, 206, 207 and 209). In dumping site

83	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	1999-2007	0.02-0.42	ng/g dry wt	41	41b: Sum of mono to deca-BDE congeners (BDE 3, 28, 47, 99, 100, 153, 154, 183, 196, 197, 206, 207 and 209). In reference site
84	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	1999-2007	0.003-43	ng/g dry wt	41	41a: Sum of mono to hepta-BDE congeners (BDE 3, 15, 28, 47, 99, 100, 153, 154 and 183). In dumping site
85	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	1997-22007	0.003-0.28	ng/g dry wt	41	41a: Sum of mono to hepta-BDE congeners (BDE 3, 15, 28, 47, 99, 100, 153, 154 and 183). In reference site
86	Việt Nam	Hexabromocyclododecane (HBCD)	SO	1999-2007	0.005-0.3	ng/g dry wt	41	In dumping site
87	Việt Nam	Hexabromocyclododecane (HBCD)	SO	1999-2007	0.005-1.3	ng/g dry wt	41	In reference site
88	Đà Nẵng	PCDD/Fs	MIL	2011	49-414	pg/g TEQ lipid wt	13 (58) (90)	Phường Hòa Thuận Tây (table 2)
89	Đà Nẵng	PCDD/Fs	MIL	2011	90-292	pg/g TEQ lipid wt	54	Phường Chính Gián (table 2)
90	Đà Nẵng	PCDD/Fs	MIL	2011	117-237	pg/g TEQ lipid wt	54	Phường An Khê, Đà Nẵng (table 2)
91	Đà Nẵng	PCDD/Fs	MIL	2011	58-227	pg/g TEQ lipid wt	54	Phường khuê Trung, Đà Nẵng (table 2)
92	Việt Nam	PCBs	SE	2002	0.11-110	ng/g dry wt	25 (101)	
93	Việt Nam	DDT	SE	2002	0.19-140	ng/g dry wt	25 (101)	
94	Việt Nam	Chlordane	SE	2002	0.9	ng/g dry wt	25 (101)	

95	Hà Nam	PCDD/Fs	MIL	2008-2009	34	pg/g TEQ lipid wt	54	Kim bang District (table 3)
96	Đà Nẵng	PCDD/Fs	MIL	2011	189	pg/g TEQ lipid wt	54	Thanh Khe (An khe and Chinh Gian), table 3
98	Việt Nam	Hexachlorobenzene (HCB)	BIO	1994-2001	0.5-3.5	ng/g lipid wt	20 (68)	
100	Việt Nam	Tổng HCH	BIO	1994-2001	3.0-12.0	ng/g lipid wt	20 (68)	
101	Đà Nẵng	PCDD/Fs	MIL	2008-2009	148	pg/g TEQ lipid wt	54	Thanh Khe (table 3)
103	Việt Nam	DDT	BIO	1994-2001	220-34000	ng/g lipid wt	20 (68)	
105	Việt Nam	PCBs	BIO	1994-2001	21-450	ng/g lipid wt	20 (68)	
107	Việt Nam	Chlordane	BIO	1994 - 2001	5.0-36.0	ng/g lipid wt	20 (68)	
108	Việt Nam	Chlordane	AR	2012-2013	63-300(140±70)	pg/m3	12	In winter
109	Việt Nam	Chlordane	AR	2012-2013	50-442(170±120)	pg/m3	12	In summer
110	Quảng Ngãi	PCBs	SE	2005	2.55	ng/g dry wt	64	Table 1
111	Đà Nẵng	PCBs	WA	2013-2014	200-5200	ng/l	75	Cửa Đại, p148
112	Đà Nẵng	PCBs	SE	2013-2014	192-1750	ng/g dry wt	75	Cửa Đại, table 3, p149
113	Việt Nam	Hexachlorobenzene (HCB)	AR	2012-2013	124.59-752.45	pg/m3	12	In winter
114	Việt Nam	Hexachlorobenzene (HCB)	AR	2012-2013	304.26-998.25	pg/m3	12	In summer

115	Việt Nam	Tổng HCH	AR	2012-2013	99.39-459.97	pg/m3	12	In winter
116	Việt Nam	Tổng HCH	AR	2012-2013	59.47-625.37	pg/m3	12	In summer
117	Việt Nam	Gamma hexachlorocyclohexane	AR	2012-2013	24.15-205.95	pg/m3	12	In winter
118	Việt Nam	Gamma hexachlorocyclohexane	AR	2012-2013	17.24-121.78	pg/m3	12	In summer
119	Đà Nẵng	PCBs	SE	2013-2014	192-1648	ng/g dry wt	79	Cửa đại (p136)
120	Đà Nẵng	PCBs	SE	2013-2014	49.294-178.285	ng/g dry wt	79	Song Han (p134, table 3.47)
121	Việt Nam	Beta hexachlorocyclohexane	AR	2012-2013	14.38-60.43	pg/m3	12	In winter
122	Việt Nam	Beta hexachlorocyclohexane	AR	2012-2013	7.36-32.69	pg/m3	12	In summer
123	Việt Nam	Alpha hexachlorocyclohexane	AR	2012-2013	46.95-184.21	pg/m3	12	In winter
124	Việt Nam	Alpha hexachlorocyclohexane	AR	2012-2013	32.72-500.91	pg/m3	12	In summer
125	Việt Nam	DDT	AR	2012-2013	490.6-3923.3	pg/m3	12	In winter
126	Đà Nẵng	PCBs	WA	2013-2014	0-4081	ng/l	79	Cua dai (p113)
127	Việt Nam	DDT	AR	2012-2013	160.6-1734.1	pg/m3	12	In summer
128	Đà Nẵng	PCBs	WA	2013-2014	22.3-1688	ng/l	79	Song hàn (p113)
129	Đà Nẵng	PCBs	SE	2014	95.9-157	ng/g dry wt	77	Sông Hàn (p63, table 3.19)
130	Việt Nam	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2014	8-500	ng/g dry wt	30 (71) (103)	Northern Vietnam. Industrial factory.

131	Đà Nẵng	PCBs	SE	2004-2008	4.25-4.39	ng/g dry wt	64	
132	Đà Nẵng	PeCB	SE	2013-2014	0.127-9.072	ng/g dry wt	79	Cửa Đại (p136)
133	Đà Nẵng	PeCB	SE	2013-2014	0.083-74.295	ng/g dry wt	79	Song Han (p131)
134	Ven biển Đông Bắc Bộ (Northeast Coastal)	PCBs	SE	2003-2004	0.11-10.1	ng/g dry wt	9	In Ha Long Bay
135	Ven biển Đông Bắc Bộ (Northeast Coastal)	DDT	SE	2003-2004	1.22-274	ng/g dry wt	9	In Ha Long Bay
136	Ven biển Đông Bắc Bộ (Northeast Coastal)	Tổng HCH	SE	2003-2004	0.85	ng/g dry wt	9	In Ha Long Bay
137	Ven biển Đông Bắc Bộ (Northeast Coastal)	Chlordane	SE	2003-2004	0.75	ng/g dry wt	9	In Ha Long Bay
138	Ven biển Đông Bắc Bộ (Northeast Coastal)	Dieldrin	SE	2003-2004	1.05	ng/g dry wt	9	Ha Long Bay

139	Ven biển Đông Bắc Bộ (Northeast Coastal)	Endrin	SE	2003-2004	0.01	ng/g dry wt	9	In Ha Long Bay
140	Ven biển Đông Bắc Bộ (Northeast Coastal)	Dieldrin	SE	2003-2004	0.21	ng/g dry wt	9	In Hai Phong Bay
141	Ven biển Đông Bắc Bộ (Northeast Coastal)	PCBs	SE	2003-2004	0.45-14.9	ng/g dry wt	9	In Hai Phong Bay
142	Đà Nẵng	PeCB	WA	2013-2014	0-13	ng/l	79	Cửa Đại (p107)
143	Đà Nẵng	PeCB	WA	2013-2014	0-5	ng/l	79	Sông Hàn (p107)
144	Đà Nẵng	DDT	SE	2013-2014	1.140-7.497	ng/g dry wt	79	Cửa Đại (p128)
145	Ven biển Đông Bắc Bộ (Northeast Coastal)	DDT	SE	2003-2004	1.76-126	ng/g dry wt	9	In Hai Phong Bay
146	Ven biển Đông Bắc Bộ (Northeast Coastal)	Tổng HCH	SE	2003-2004	0.15-1	ng/g dry wt	9	Hai Phong Bay

147	Ven biển Đông Bắc Bộ (Northeast Coastal)	Chlordane	SE	2003-2004	0.1	ng/g dry wt	9	Hai Phong Bay
148	Đà Nẵng	DDT	WA	2013-2014	14.7-290	ng/l	79	Song Cửa Đại (p103)
149	Ven biển Đông Bắc Bộ (Northeast Coastal)	Aldrin	SE	2003-2004	0.03	ng/g dry wt	9	In Hai Phong Bay
150	Đà Nẵng	DDT	WA	2013-2014	0.1-78	ng/l	79	Song Han (p99)
151	Ven biển Đông Bắc Bộ (Northeast Coastal)	Chlordane	SE	2004	0.04	ng/g dry wt	9	In Ba Lat Estuary
152	Đà Nẵng	DDT	SE	2013-2014	0.976-23.556	ng/g dry wt	79	Song Han (p124)
153	Ven biển Đông Bắc Bộ (Northeast Coastal)	Tổng HCH	SE	2004	0.03-0.26	ng/g dry wt	9	In Ba Lat estuary
154	Ven biển Đông Bắc Bộ (Northeast Coastal)	DDT	SE	2004	0.31-1.46	ng/g dry wt	9	In Ba Lat Estuary

155	Ven biển Đông Bắc Bộ (Northeast Coastal)	PCBs	SE	2004	0.04-0.26	ng/g dry wt	9	Ba Lat Estuary
156	Đà Nẵng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	30.8	ng/g dry wt	30 (71) (103)	Open landfill dumping site, table 1
157	Đà Nẵng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	WA	2014	40.1-52.1	ng/l	77	Song Han, table 3.20, p67
158	Đà Nẵng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	WA	2013-2014	4.2-39.8	ng/l	79	Song Han, n=10, p117
159	Đà Nẵng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2013-2014	42.6-185.4	ng/g dry wt	79	Cua Dai, table 3.50
160	Đà Nẵng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2013-2014	24.9-69.3	ng/g dry wt	79	Song Han, table 3.49
161	Đà Nẵng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	WA	2013-2014	0-44.0	ng/l	79	Cửa Đại n=14, p120
162	Phú Yên	PCBs	SE	2005-2008	2.34-4.15	ng/g dry wt	64	Ô Loan (table 1)
163	Bình Định	PCDD (Dioxin)	MIL	2008-2010	4.0-15.0	pg/g TEQ lipid wt	59 (93)	Phu Cat (p416-421)
164	Bình Định	PCBs	BIO	1994-2001	26	ng/g lipid wt	20 (68)	Thi Nai (table 2)
165	Bình Định	PCBs	SE	2005-2008	3.36-44.7	ng/g dry wt	64	Thi Nai (table 1)
166	Bình Định	PCBs	SO	2010	0.67-18.6	ng/g dry wt	63	Thi Nai Legoon (table 1)
167	Bình Định	PCBs	SE	2010	0.71-6.4	ng/g dry wt	63	Thi Nai lagoon (table 1)
168	Bình Định	HCB	BIO	1994-2001	2.3	ng/g lipid wt	20 (68)	Thi Nai (table 2)
169	Bình Định	DDT	BIO	1994-2001	220	ng/g lipid wt	20 (68)	Thi Nai (table 2)

170	Bình Định	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2010	0.21-4.02	ng/g dry wt	63	Thi Nai (table 1)
171	Bình Định	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2010	9.62	ng/g dry wt	63	Thi Nai (table 1) IDL: lower than detection limits
172	Bình Định	Tổng HCH	BIO	1994-2001	6.3	ng/g lipid wt	20 (68)	Thi Nai (table 2)
173	Bình Định	Chlordane	BIO	1994-2001	36	ng/g lipid wt	20 (68)	Thi Nai (table 2)
174	TT Huế	PCDD (Dioxin)	SE	2004	980±1100	ng/g dry wt	15 (62) (95)	table 2
175	Hà Tĩnh	PCDF (Furan)	MIL	2002-2003	2.15	pg/g TEQ lipid wt	61	table 2
176	Quảng Trị	PCDF (Furan)	MIL	2002-2003	4.66	pg/g TEQ lipid wt	61	table 2
177	TT Huế	PCDF (Furan)	SE	2004	26±11	ng/g dry wt	15 (62) (95)	
178	TT Huế	PCDD/Fs	BLO	1991-1992	23-57	pg TEQ /g lipid wt	26 (70) (102)	
179	TT Huế	PCDD/Fs	SE	2002	192-2912	ng/g dry wt	72	Tam giang - Cầu Hai (p2303)
180	TT Huế	PCBs	BIO	2009	13.43-147.57	ng/g lipid wt	51 (76) (104)	Phá Tam Giang - Cầu Hai (p201)
181	TT Huế	PCBs	SE	2009	0.59-5.35	ng/g dry wt	51 (76) (104)	Phá Tam Giang - Cầu hai (p201)
182	TT Huế	PCBs	WA	2009	21.44-111.99	ng/l	51 (76) (104)	Phá Tam Giang - Cầu Hai (p201)
183	TT Huế	PCBs	SE	2002	0.46	ng/g dry wt	20 (68)	p296
184	TT Huế	PCBs	SE	2002	2.85-24.5	ng/g dry wt	65	Cau Hai (table 4)
185	TT Huế	PCBs	SE	2002	2.03-24.7	ng/g dry wt	65	Tam Giang (table 4)
186	TT Huế	PCBs	SE	2002-2007	1.4-24.5	ng/g dry wt	64	Cau hai (E.107-52-57'/N.16-18-28') table 1

187	TT Huế	PCBs	SE	2002-2007	5.04-22.9	ng/g dry wt	64	Tam Giang (E.107-29-25'/N16-37-51') table 1
188	Quảng Trị	PCDD (Dioxin)	MIL	1999	3	pg/g TEQ lipid wt	67	Hong Van (p10)
189	Quảng Trị	PCDD (Dioxin)	MIL	1999	9.6	pg/g TEQ lipid wt	67	Hong thuong (p10)
190	Quảng Trị	PCDD (Dioxin)	MIL	1999	7.3	pg/g TEQ lipid wt	67	Hong Lam (p10)
191	Quảng Trị	PCDD (Dioxin)	MIL	1999	14.6	pg/g TEQ lipid wt	67	A So (p10)
192	Quảng Trị	PCDD (Dioxin)	MIL	2002-2003	4.3	pg/g TEQ lipid wt	61	
195	Ven biển miền Trung (Offshore central Coast)	PCDD (Dioxin)	SE	1996-2012	200-460	pg/g dry wt	08 (56) (94)	Depth 0-40 cm. Table 2
196	Ven biển miền Trung (Offshore central Coast)	PCDF (Furan)	SE	2015-2016	0.39-2.9	pg/g dry wt	08 (56) (94)	p343-344
197	Ven biển miền Trung (Offshore central Coast)	DDT	SE	2015-2016	15.1-79.1	pg/g dry wt	08 (56) (94)	p343. table 1
198	Ven biển miền Trung (Offshore central Coast)	Tổng HCH	SE	2015-2016	20.7-53.9	pg/g dry wt	08 (56) (94)	p343. table 1

199	Ven biển miền Trung (Offshore central Coast)	PCBs	SE	2015-2016	36.2-158	pg/g dry wt	08 (56) (94)	p343. table 1
200	TT Huế	PCDD/Fs	SE	2010	192-2910	pg/g dry wt	08 (56) (94)	Central Vietnam Coastal. Piazza et al, 2010. p343.
201	Hà Tĩnh	PCDD (Dioxin)	MIL	2002-2003	1.89	pg/g TEQ lipid wt	61	table 2
202	Ven biển miền Trung (Offshore central Coast)	PCBs	SE	2013	0.08	ng/g dry wt	78	Ven bờ biển giáp hà tĩnh quãng bình (E107055'/N17030', độ sau 0-40cm
203	Ven biển miền Trung (Offshore central Coast)	PCBs	SE	2013	0.042	ng/g dry wt	78	Ven bờ biển bắc Nghệ An-Nam Thanh Hóa (E107004'/N19022'
204	Ven biển miền Trung (Offshore central Coast)	PCBs	SE	2013	0.163	ng/g dry wt	78	Ven bờ biển Nam nghệ an, Bắc Hà Tĩnh (table 3.10)
205	Ven biển miền Trung (Offshore central Coast)	DDT	SE	2013	0.046	ng/g dry wt	78	Ven bờ biển giáp hà tĩnh-quảng bình, E107055'/N17030', độ sau 0-40cm (table 3.10)
206	Ven biển miền Trung (Offshore	DDT	SE	2013	0.062	ng/g dry wt	78	Ven bờ biển Nam nghệ An- bắc Hà Tĩnh (table 3.10)

	central Coast)							
207	Ven biển miền Trung (Offshore central Coast)	DDT	SE	2013	0.034	ng/g dry wt	78	ven biển bắc nghệ An, E107004'/N19022' (table 3.10)
208	Ven biển miền Trung (Offshore central Coast)	Tổng HCH	SE	2013	0.048	ng/g dry wt	78	Ven bờ biển giáp Hà Tĩnh - Quãng Bình BD400, E.107055'/N.17030', độ sâu 0-40cm (table 3.10)
209	Ven biển miền Trung (Offshore central Coast)	Tổng HCH	SE	2013	0.047	ng/g dry wt	78	Ven bờ biển Nam Nghệ An -Bắc Hà Tĩnh (BD228), table 3.10
210	TT Huế	PCBs	BIO	1994-2001	380	ng/g lipid wt	20 (68)	Lang co, table 2
211	Hà Tĩnh	PCBs	BIO	1994-2001	190	ng/g lipid wt	20 (68)	ron river estuary Ky Anh (table 2)
212	Hà Tĩnh	HCB	BIO	1994-2001	1.6	ng/g lipid wt	20 (68)	ron river estuary Ky Anh (table 2)
213	Hà Tĩnh	DDT	BIO	1994-2001	470	ng/g lipid wt	20 (68)	ron river estuary Ky Anh (table 2)
214	TT Huế	HCB	BIO	1994-2001	3.5	ng/g lipid wt	20 (68)	lang Co (table 2)
215	Đồng Bằng sông Mekong	DDT	SE	2007	0.01-110	ng/g dry wt	10 (89)	p29

	(Mekong river Delta)							
216	TT Huế	DDT	BIO	1994-2001	34000	ng/g lipid wt	20 (68)	Lang Co (table 2)
217	TT Huế	Tổng HCH	BIO	1994-2001	10	ng/g lipid wt	20 (68)	Lang co, table 2
218	Hà Tĩnh	Tổng HCH	BIO	1994-2001	5.5	ng/g lipid wt	20 (68)	Ron river estuary Ky Anh (table 2)
219	Hà Tĩnh	Chlordane	BIO	1994-2001	20	ng/g lipid wt	20 (68)	Ron river estuary Ky Anh (table 2)
220	TT Huế	DDT	SE	2002	1.3	ng/g dry wt	69	p294
221	TT Huế	Alpha hexachlorocyclohexane	SE	2002	0.015-0.069	ng/g dry wt	69	
222	TT Huế	HCB	SE	2002	0.015-0.023	ng/g dry wt	69	
223	TT Huế	Beta hexachlorocyclohexane	SE	2002	0.087	ng/g dry wt	69	
224	TT Huế	Aldrin	SE	2002	0.054	ng/g dry wt	69	
225	TT Huế	Chlordane	SE	2002	0.023	ng/g dry wt	69	
226	Đồng Bằng sông Mekong (Mekong river Delta)	Hexachlorobenzene (HCB)	SE	1998	0.01	ng/g dry wt	96	
227	Mekong river Delta	Chlordane	BIO	1998	0.046-0.91	ng/g dry wt	96	
228	TT Huế	Aldrin	SE	2005-2007	4.57	ng/g dry wt	73	Cầu hai, mùa khô, table 3.6
229	TT Huế	Aldrin	SE	2005-2007	5.79	ng/g dry wt	73	Đầm Thủy Tú - Sông Cầu Hai, mùa khô, table 3.6

230	Đồng Bằng sông Mekong (Mekong river Delta)	Chlordane	SE	1998	0.004-0.063	ng/g dry wt	96	
231	TT Huế	Aldrin	SE	2005-2007	0.51	ng/g dry wt	73	Sông Hương, mùa khô, table 3.6
232	TT Huế	Dieldrin	SE	2005-2007	5.58	ng/g dry wt	73	Sông tư hiền, mùa khô, table 3.6
233	TT Huế	Dieldrin	SE	2005-2007	8.11	ng/g dry wt	73	Sông Cầu Hai, mùa khô, table 3.6
234	TT Huế	Dieldrin	SE	2005-2007	36.95	ng/g dry wt	73	Sông truồi - Sông Cầu Hai (table 3.6), mùa khô
235	TT Huế	Dieldrin	SE	2005-2007	1.26	ng/g dry wt	73	Sông Đại Giang - Cầu Hai, mùa khô, table 3.6
236	Mekong river Delta	Polychlorinated biphenyls (PCB)	BIO	1998	1.9-19	ng/g dry wt	96	
237	TT Huế	Dieldrin	SE	2005-2007	21.43	ng/g dry wt	73	Đầm thủy tú - Sông Cầu Hai, mùa Khô, table 3.6
238	TT Huế	Dieldrin	SE	2005-2007	0.08	ng/g dry wt	73	Đầm thủy tú, mùa khô, table 3.6
239	TT Huế	Dieldrin	SE	2005-2007	0.23	ng/g dry wt	73	Sông Hương, Mùa khô, table 3.6
240	Đồng Bằng sông Mekong (Mekong river Delta)	Polychlorinated biphenyls (PCB)	SE	1998	0.11-2	ng/g dry wt	96	
241	TT Huế	Dieldrin	SE	2005-2007	1.27	ng/g dry wt	73	Sông tam giang (table 3.6)
242	TT Huế	Dieldrin	SE	2005-2007	0.12	ng/g dry wt	73	Sông Ô lâu - tam giang, mùa khô (table 3.6)

243	Mekong river Delta	Tổng HCH	BIO	1998	0.08-0.61	ng/g dry wt	96	
244	TT Huế	Dieldrin	SE	2005-2007	4.6	ng/g dry wt	73	Sông ô Lâu (table 3.6)
245	Đồng Bằng sông Mekong (Mekong river Delta)	Tổng HCH	SE	1998	0.003-0.89	ng/g dry wt	96	
246	TT Huế	DDT	WA	2007	2.5	ng/l	73	Sông Ô Lâu - Tam Giang, n=2, table 3.4
247	TT Huế	DDT	WA	2006	1.8	ng/l	73	Sông Ô Lâu - Tam giang,n=3 (table 3.4)
248	Mekong river Delta	DDT	BIO	1998	5.4-123	ng/g dry wt	96	
249	TT Huế	DDT	SE	2005-2007	0.89±0.76	ng/g dry wt	73	Sông tư Hiền (table 3.7)
250	TT Huế	DDT	SE	2005-2007	2.19±3.37	ng/g dry wt	73	Sông Cầu Hai (table 3.7)
251	TT Huế	DDT	SE	2005-2007	1.11±1.39	ng/g dry wt	73	Sông Truồi - Sông Cầu Hai (table 3.7)
252	TT Huế	DDT	SE	2005-2007	0.19±0.19	ng/g dry wt	73	Sông Đại Giang - Sông Cầu hai (table 3.7)
253	TT Huế	DDT	SE	2005-2007	1.03±1.21	ng/g dry wt	73	Đầm Thủy tú - Sông Cầu hai (table 3.7)
254	TT Huế	DDT	SE	2005-2007	1.69±1.74	ng/g dry wt	73	Đầm thủy tú(table 3.7)
255	Đồng Bằng sông Mekong (Mekong river Delta)	DDT	SE	1998	0.32-67	ng/g dry wt	96	

256	TT Huế	DDT	SE	2005-2007	2.02±2.33	ng/g dry wt	73	Sông hương - Tam giang (table 3.7)
257	TT Huế	DDT	SE	2005-2007	0.30±0.01	ng/g dry wt	73	Sông Hương (table 3.7)
258	TT Huế	DDT	SE	2005-2007	3.19±3.16	ng/g dry wt	73	Sông Tam Giang (table 3.7)
259	TT Huế	DDT	SE	2005-2007	1.38±1.24	ng/g dry wt	73	Sông Ô Lâu - Tam Giang (table 3.7)
260	TT Huế	DDT	SE	2005-2007	1.58±2.02	ng/g dry wt	73	Sông Ô Lâu (table 3.7)
261	TT Huế	Tổng HCH	WA	2007	33.1	ng/l	73	Sông ô lâu - tam giang (n=2, table 3.4)
262	TT Huế	Tổng HCH	WA	2006	133.6	ng/l	73	Sông ô lâu - tam giang (n=3, table 3.4)
263	TT Huế	Tổng HCH	WA	2005	31.6	ng/l	73	Sông Ô lâu - tam giang, n=2, table 3.4
264	TT Huế	Tổng HCH	SE	2005-2007	2.44±2.50	ng/g dry wt	73	Sông Tư Hiền (table 3.7)
265	TT Huế	Tổng HCH	SE	2005-2007	3.73±5.10	ng/g dry wt	73	Sông Cầu Hai (table 3.7)
266	TT Huế	Tổng HCH	SE	2005-2007	3.22±4.64	ng/g dry wt	73	Sông truồi - Sông Cầu hai (table 3.7)
267	TT Huế	Tổng HCH	SE	2005-2007	0.30±0.30	ng/g dry wt	73	Sông Đại Giang - Sông Cầu hai (table 3.7)
268	TT Huế	Tổng HCH	SE	2005-2007	9.47±17.51	ng/g dry wt	73	Đầm thủy tú - Cầu Hai (table 3.7)
269	TT Huế	Tổng HCH	SE	2005-2007	3.04±3.01	ng/g dry wt	73	Đầm Thủy Tú (table 3.7)
270	TT Huế	Tổng HCH	SE	2005-2007	1.74±2.14	ng/g dry wt	73	Sông Hương - Tam Giang (table 3.7)

271	TT Huế	Tổng HCH	SE	2005-2007	4.35±3.71	ng/g dry wt	73	Sông hương (table 3.7)
272	TT Huế	Tổng HCH	SE	2005-2007	23.58±45.87	ng/g dry wt	73	Tam Giang (table 3.7)
273	Duyên Hải (Mangrove)	Tổng HCH	SE	1990	0.45-2.3	ng/g dry wt	04 (86)	
274	TT Huế	Tổng HCH	SE	2005-2007	2.85±3.31	ng/g dry wt	73	Sông ô lâu - tam giang (table 3.7)
275	TT Huế	Tổng HCH	SE	2005-2007	6.38±7.06	ng/g dry wt	73	Sông ô Lâu (table 3.7)
276	Duyên Hải (Mangrove)	DDT	SE	1990	1.1-19	ng/g dry wt	04 (86)	
277	Duyên Hải (Mangrove)	PCBs	SE	1990	2.1-9.7	ng/g dry wt	04 (86)	
278	TT Huế	Alpha hexachlorocyclohexane	WA	2007	33.4	ng/l	73	Sông truồi - cầu hai, n=2, mùa khô (table 3.4)
279	TT Huế	Alpha hexachlorocyclohexane	WA	2006	135.7	ng/l	73	Sông truồi - Cầu Hai, N=3, Mùa khô (table 3.4)
280	TT Huế	Alpha hexachlorocyclohexane	WA	2007	21	ng/l	73	Sông ô lâu- tam giang, n=2, mùa khô (table 3.4)
281	TT Huế	Alpha hexachlorocyclohexane	WA	2006	74.4	ng/l	73	Sông ô lâu - tam giang, n=3, mùa khô (table 3.4)
282	TT Huế	Alpha hexachlorocyclohexane	WA	2005	10.8	ng/l	73	Sông ô lâu - Tam Giang, n=2 (table 3.4)
283	TT Huế	Endrin	WA	2006	2.9	ng/l	73	Sông Ô lâu - tam Giang (table 3.4)
284	Duyên Hải (Mangrove)	PCBs	SE	1990	5.2	ng/g dry wt	05 (87)	
285	TT Huế	Endrin	SE	2005-2007	3.75±2.34	ng/g dry wt	73	Sông tư Hiền (table 3.7)

286	TT Huế	Endrin	SE	2005-2007	2.09±2.07	ng/g dry wt	73	Cầu Hai (table 3.7)
287	TT Huế	Endrin	SE	2005-2007	5.57±12.46	ng/g dry wt	73	Sông truồi - Cầu hai (table 3.7)
288	TT Huế	Endrin	SE	2005-2007	7.64±5.20	ng/g dry wt	73	Thủy tú - Cầu hai (table 3.7)
289	Duyên Hải (Mangrove)	DDT	SE	1990	8.5	ng/g dry wt	05 (87)	
290	TT Huế	Endrin	SE	2005-2007	0.10±0.09	ng/g dry wt	73	Đầm thủy Tú (table 3.7)
291	TT Huế	Endrin	SE	2005-2007	6.86±13.71	ng/g dry wt	73	Tam Giang (table 3.7)
292	TT Huế	Endrin	SE	2005-2007	3.46±8.32	ng/g dry wt	73	Sông Ô Lâu(table 3.7)
293	Hồ Chí Minh city	TCDD	BLO	2004	2.2-10.2	pg TEQ /g lipid wt	100	Binh My
294	Hồ Chí Minh city	PCDD/Fs	AR	2010-2015	139±84	fg I-TEQ/m3	13 (58) (90)	
295	Đồng Nai	PCDD (Dioxin)	MIL	2008-2010	9.3	pg/g TEQ lipid wt	59 (93)	In Bien Hoa
296	Đồng Nai	PCDD (Dioxin)	SO	2004	4.6-184	pg/g TEQ dry wt	91	Bien Hoa Airbase
297	Đồng Nai	PCDD (Dioxin)	SE	2004	8.6	pg/g TEQ dry wt	91	30-50 cm depth. Bien Hung Lake
298	Đồng Nai	PCDD (Dioxin)	SE	2004	92.5	pg/g TEQ dry wt	91	20-30 cm depth. Bien Hung Lake
299	Đồng Nai	PCDD (Dioxin)	SE	2004	131.9	pg/g TEQ dry wt	91	Bed (0-20cm depth). Bien Hung Lake
300	Đồng Nai	PCDD/Fs	BIO	2013-2014	7.9	pg TEQ /g lipid wt	92	Chicken egg. BG Binh Loi II
301	Đồng Nai	PCDD/Fs	BIO	2013-2014	8.2	pg TEQ /g lipid wt	92	Chicken egg. BG Binh Loi I

302	Đồng Nai	PCDD/Fs	BIO	2013-2014	5.1	pg TEQ /g lipid wt	92	Duck egg. BG Loi Hoa VII
303	Đồng Nai	PCDD/Fs	BIO	2013-2014	4.2	pg TEQ /g lipid wt	92	Chicken egg. BG Loi Hoa VI
304	Đồng Nai	PCDD/Fs	BIO	2013-2014	10.2	pg TEQ /g lipid wt	92	Duck egg. BG Loi Hoa V
305	Đồng Nai	PCDD/Fs	BIO	2013-2014	18.1	pg TEQ /g lipid wt	92	Duck egg. BG Loi Hoa IV
306	Đồng Nai	PCDD/Fs	BIO	2013-2014	6.8	pg TEQ /g lipid wt	92	Duck egg. BG Loi Hoa III
307	Đồng Nai	PCDD/Fs	BIO	2013-2014	7.8	pg TEQ /g lipid wt	92	Chicken egg. Background Loi Hoa II
308	Đồng Nai	PCDD/Fs	BIO	2013-2014	2.8	pg TEQ /g lipid wt	92	Chicken egg. Background Loi Hoa I
309	Đồng Nai	PCDD/Fs	BIO	2013-2014	3	pg TEQ /g lipid wt	92	Chicken egg. Sac Forest centre
310	Đồng Nai	PCDD/Fs	BIO	2013-2014	7.1	pg TEQ /g lipid wt	92	Chicken egg. SF border Farm B VI
311	Đồng Nai	PCDD/Fs	BIO	2013-2014	14.7	pg TEQ /g lipid wt	92	Duck egg. SF border farm B V
312	Đồng Nai	PCDD/Fs	BIO	2013-2014	7.6	pg TEQ /g lipid wt	92	Chicken egg. SF border farm b IV
313	Đồng Nai	PCDD/Fs	BIO	2013-2014	10.4	pg TEQ /g lipid wt	92	Duck egg. SF border farm B III
314	Đồng Nai	PCDD/Fs	BIO	2013-2014	16	pg TEQ /g lipid wt	92	Duck egg. SF border Fram B II
315	Đồng Nai	PCDD/Fs	BIO	2013-2014	2.4	pg TEQ /g lipid wt	92	Chicken egg. Sac Forest border farm B I
316	Đồng Nai	PCDD/Fs	BIO	2013-2014	4.3	pg TEQ /g lipid wt	92	Chicken egg. Sac Forest border Farm A.
317	Đồng Nai	PCDD/Fs	BIO	2013-2014	4.8	pg TEQ /g lipid wt	92	Chicken egg. BH former military post

318	Đồng Nai	PCDD/Fs	BIO	2013-2014	248	pg TEQ /g lipid wt	92	Chicken egg. BH former bombs store II
319	Đồng Nai	PCDD/Fs	BIO	2013-2014	221.5	pg TEQ /g lipid wt	92	Chicken egg. BH former bombs store I
320	Đồng Nai	PCDD/Fs	BIO	2013-2014	16.9	pg TEQ /g lipid wt	92	Chicken egg. BH airbase surrounding.
321	Đồng Nai	PCDD/Fs	BIO	2013-2014	89	pg TEQ /g lipid wt	92	Chicken egg. Bien Hoa airbase II
322	Đồng Nai	PCDD/Fs	BIO	2013-2014	54.5	pg TEQ /g lipid wt	92	Chicken egg. Bien Hoa Airbase I
323	Đồng Nai	PCDD/Fs	BIO	2013-2014	249	pg TEQ /g lipid wt	92	Bien Hoa airbase
324	Đồng Nai	PCDD/Fs	SO	2011-2013	142-343	pg/g TEQ dry wt	82	Pacer Ivy deep soil. 180-210 cm. Bien Hoa
325	Đồng Nai	PCDD/Fs	SO	2011-2013	6.7-8540	pg/g TEQ dry wt	82	Pacer Ivy deep soil. 150-180 cm. Bien Hoa
326	Đồng Nai	PCDD/Fs	SO	2011-1013	13-20800	pg/g TEQ dry wt	82	Pacer Ivy deep soil. 120-150 cm. Bien Hoa
327	Đồng Nai	PCDD/Fs	SO	2011-2013	8.3-196000	pg/g TEQ dry wt	82	Pacer Ivy deep soil. 90-120 cm. Bien Hoa
328	Đồng Nai	PCDD/Fs	SO	2011-2013	44-335000	pg/g TEQ dry wt	82	Pacer Ivy deep soil. 60-90 cm. Bien Hoa
329	Đồng Nai	PCDD/Fs	SO	2011-2013	13-473000	pg/g TEQ dry wt	82	Pacer Ivy deep soil. 30-60 cm. Bien Hoa
330	Đồng Nai	PCDD/Fs	BIO	2011-2013	41	pg TEQ /g lipid wt	82	Pacer Ivy Area. Duck. Bien Hoa
332	Đồng Nai	PCDD/Fs	BIO	2011-2013	190	pg TEQ /g lipid wt	82	Pacer Ivy Area. Fish. Bien Hoa
333	Đồng Nai	PCDD/Fs	SE	2011-2013	2710-14300	pg/g TEQ dry wt	82	Pacer Ivy Area

334	Đồng Nai	PCDD/Fs	SO	2011-2013	45-1271000	pg/g TEQ dry wt	82	Pacer Ivy Area
335	Đồng Nai	PCDD/Fs	SE	2011-2013	2180-27900	pg/g TEQ dry wt	82	Ponds in the vicinity. Lake 4B
336	Đồng Nai	PCDD/Fs	SE	2011-2013	385-3400	pg/g TEQ dry wt	82	Pond in the vicinity. Lake 4A
337	Đồng Nai	PCDD/Fs	BIO	2011-2013	37	pg TEQ /g lipid wt	82	Bien Hung Lake. Fish. Bien Hoa
338	Đồng Nai	PCDD/Fs	SE	2011-2013	612-35100	pg/g TEQ dry wt	82	Bien Hung Lake.
339	Đồng Nai	PCDD/Fs	BIO	2011-2013	16	pg TEQ /g lipid wt	82	G2 Lake. Fish. Bien Hoa
340	Đồng Nai	PCDD/Fs	SE	2001-2013	2600-9890	pg/g TEQ dry wt	82	G2 Lake
341	Đồng Nai	PCDD/Fs	BIO	2011-2013	14	pg TEQ /g lipid wt	82	Z1 lakes and ponds. Fish. Bien Hoa
342	Đồng Nai	PCDD/Fs	SE	2011-2013	560-5330	pg/g TEQ dry wt	82	Z1 lakes and ponds. Bien Hoa
344	Đồng Nai	PCDD/Fs	SE	2011-2013	17-4860	pg/g TEQ dry wt	82	In Bien Hoa. TEQ concentration
345	Đồng Nai	PCDD/Fs	SO	2011-2013	7.6-962000	pg/g TEQ dry wt	82	Bien Hoa airbase. TEQ concentration
346	Đà Nẵng	PCDD/Fs	BIO	2013	0.03-61	pg TEQ /g lipid wt	55 (88)	Eg: caged chickens meat and eggs, seafoods, pork, leafy vegetables, fruits and rice. (low-risk food)
347	Đà Nẵng	PCDD/Fs	BIO	2013	3.8-95	pg TEQ /g lipid wt	55 (88)	Eg: free range chicken, meat and eggs, ducks, freshwater fish, snail and beef. (high-risk food)
348	Cần Thơ	TCDD	BLO	2004	14-180	pg TEQ /g lipid wt	100	Tra Noc District

349	Hà Nội	TCDD	BLO	2002	1.2-2.3	pg TEQ /g lipid wt	100	
350	Đồng Nai	TCDD	BLO	2004	20-413	pg TEQ /g lipid wt	100	Bien Hoa
351	Đồng Nai	PCDD/Fs	BIO	2013	0.03-6.1	pg TEQ /g lipid wt	55 (88)	Eg: caged chicken meat and eggs, seafoods, pork, leafy vegetables, fruits and rice. Bien Hoa
352	Đồng Nai	PCDD/Fs	BIO	2013	3.8-95	pg TEQ /g lipid wt	55 (88)	Eg: free range chicken meat and eggs, ducks, freshwater fish, snail and beef. Bien Hoa
353	Cần Thơ	PCDD (Dioxin)	BIO	2003	0.25	pg TEQ /g lipid wt	26 (70) (102)	Tra Noc. Catfish
354	Cần Thơ	PCDD (Dioxin)	BIO	2003	0.03	pg TEQ /g lipid wt	26 (70) (102)	Tra Noc. Carp
355	Cần Thơ	PCDD (Dioxin)	BIO	2003	0.24	pg TEQ /g lipid wt	26 (70) (102)	Tra Noc. Pork
356	Cần Thơ	PCDD/Fs	BLO	1991-1992	105	pg TEQ /g lipid wt	26 (70) (102)	Tra Noc
357	Kiên Giang	PCDD/Fs	BLO	1991-1992	28	pg TEQ /g lipid wt	26 (70) (102)	In Go Cong
358	Bạc Liêu	PCDD/Fs	BLO	1991-1992	35	pg TEQ /g lipid wt	26 (70) (102)	Minh Hai
359	Hồ Chí Minh city	PCDD/Fs	BLO	1991-1992	30	pg TEQ /g lipid wt	26 (70) (102)	Chợ Rẫy
360	Đồng Nai	PCDD (Dioxin)	BIO	2003	0.095	pg TEQ /g lipid wt	26 (70) (102)	Bien Hoa. Beef
361	Đồng Nai	PCDD (Dioxin)	BIO	2003	0.91	pg TEQ /g lipid wt	26 (70) (102)	Bien Hoa. Pork
362	Đồng Nai	PCDD (Dioxin)	BIO	2003	285	pg TEQ /g lipid wt	26 (70) (102)	Bien Hoa, Duck

363	Đồng Nai	PCDD (Dioxin)	BIO	2003	33	pg TEQ /g lipid wt	26 (70) (102)	Bien Hoa. Chicken
364	Đồng Nai	PCDD (Dioxin)	BIO	2003	66	pg TEQ /g lipid wt	26 (70) (102)	Bien Hoa. Fish
365	Đồng Nai	PCDD/Fs	BLO	1991-1992	47	pg TEQ /g lipid wt	26 (70) (102)	Bien Hoa
366	Đồng Nai	PCDD/Fs	BLO	1991-1992	19	pg TEQ /g lipid wt	26 (70) (102)	Tri An (Ma Da Forest)
367	Bình Dương	PCDD (Dioxin)	BIO	2003	0.76	pg TEQ /g lipid wt	26 (70) (102)	Tan Uyen. Fish
368	Bình Dương	PCDD (Dioxin)	BIO	2003	0.45	pg TEQ /g lipid wt	26 (70) (102)	Binh My. Fish
369	Bình Dương	PCDD (Dioxin)	BIO	2003	1.05	pg TEQ /g lipid wt	26 (70) (102)	Binh My Chicken
370	Hồ Chí Minh city	Tổng HCH	MIL	2001	14	ng/g lipid wt	2 (84)	
371	Hồ Chí Minh city	DDT	MIL	2001	2300	ng/g lipid wt	2 (84)	
372	Hồ Chí Minh city	p,p'-DDT	SE	1996	0.42-98.5	ng/g dry wt	98	
373	Hồ Chí Minh city	p,p'-DDD	SE	1996	0.36-81.4	ng/g dry wt	98	
374	Hồ Chí Minh city	p,p'- DDE	SE	1996	0.98-94.1	ng/g dry wt	98	
375	Hồ Chí Minh city	PCBs	SE	1996	590.5	ng/g dry wt	98	
376	Hồ Chí Minh city	DDT	SE	1996	1.76-253.6	ng/g dry wt	98	
377	Hồ Chí Minh city	Aldrin	SE	2002	0.095	ng/g dry wt	25 (101)	
378	Hồ Chí Minh city	DDT	SE	2004	0.39-0.82	ng/g dry wt	23 (97)	Estuary. SG-DN river

379	Hồ Chí Minh city	DDT	SE	2004	0.21-23	ng/g dry wt	23 (97)	In sub-urban
380	Hồ Chí Minh city	DDT	SE	2004	21-72	ng/g dry wt	23 (97)	Sewer system. Urban
381	Hồ Chí Minh city	PCBs	SE	2004	0.49-1.2	ng/g dry wt	23 (97)	Estuary. SG-DN river
382	Hồ Chí Minh city	PCBs	SE	2004	0.33-22	ng/g dry wt	23 (97)	In sub-urban
383	Hồ Chí Minh city	PCBs	SE	2004	46-150	ng/g dry wt	23 (97)	In sewer system. Urban
384	Hồ Chí Minh city	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2004	0.01-0.065	ng/g dry wt	23 (97)	Estuary. SG-DN river
385	Hồ Chí Minh city	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2004	0.01-1.5	ng/g dry wt	23 (97)	In sub-urban
386	Hồ Chí Minh city	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2004	6.5-15	ng/g dry wt	23 (97)	In sewer system (urban)
387	Hồ Chí Minh city	Hexabromocyclododecane (HBCD)	SE	2004	0.1	ng/g dry wt	23 (97)	Estuary (SG-DN) river
388	Hồ Chí Minh city	Hexabromocyclododecane (HBCD)	SE	2004	0.1-1.6	ng/g dry wt	23 (97)	In sub-urban
389	Hồ Chí Minh city	Hexabromocyclododecane (HBCD)	SE	2004	0.94-1.9	ng/g dry wt	23 (97)	In sewer system (Urban)
390	Cần Thơ	Chlordane	SE	2003-2004	0.02-1.3	ng/g dry wt	04 (86)	In Mekong River
391	Cần Thơ	DDT	SE	2003-2004	0.01-110	ng/g dry wt	04 (86)	In Mekong River
392	Cần Thơ	PCBs	SE	2003-2004	0.039-9.2	ng/g dry wt	04 (86)	Mekong River
393	Cần Thơ	PCBs	SE	2004	0.13-4.1	ng/g dry wt	99	From Mekong River. South Vietnam

394	Cần Thơ	p,p'-DDT	SE	2003	0.01-1	ng/g dry wt	99	From Mekong River. South Vietnam
395	Cần Thơ	p,p'-DDD	SE	2003	0.01-1.2	ng/g dry wt	99	From Mekong River. South Vietnam
396	Cần Thơ	p,p'- DDE	SE	2003	0.02-2.1	ng/g dry wt	99	From Mekong river. South VIetnam
397	Cần Thơ	Chlordane	SE	2003	0.03-0.36	ng/g dry wt	99	From Mekong River, South Vietnam
398	Cần Thơ	Hexachlorobenzene (HCB)	SE	2003	0.006-0.08	ng/g dry wt	99	From Mekong river. South Vietnam
399	Cần Thơ	Tổng HCH	SE	2003	0.02-0.11	ng/g dry wt	99	From mekong river. South Vietnam.
400	Cần Thơ	DDT	SE	2003	0.05-4.4	ng/g dry wt	99	
401	Cần Thơ	PCBs	SE	2003	0.9	ng/g dry wt	99	
402	Cần Thơ	Tổng HCH	BIO	2004	0.46-25	ng/g lipid wt	81	In aquaculture feed
403	Cần Thơ	DDT	BIO	2004	6.9-40	ng/g lipid wt	81	In aquaculture feed
404	Cần Thơ	PCBs	BIO	2004	3.3-25	ng/g lipid wt	81	In aquaculture feed
405	Cần Thơ	Hexachlorobenzene (HCB)	BIO	2004	1.3	ng/g lipid wt	81	In aquaculture feed
406	Cần Thơ	Tổng HCH	BIO	2004	8.5	ng/g lipid wt	81	In aquaculture feed
407	Cần Thơ	Chlordane	BIO	2004	2.4	ng/g lipid wt	81	In aquaculture
408	Cần Thơ	DDT	BIO	2004	30	ng/g lipid wt	81	In aquaculture feed
409	Cần Thơ	PCBs	BIO	2004	13	ng/g lipid wt	81	In aquaculture feed

410	Cần Thơ	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2004	2.7	ng/g lipid wt	81	In aquaculture feed
411	Cần Thơ	Hexachlorobenzene (HCB)	BIO	2004	2.4-3.2	ng/g lipid wt	81	In dumpsite catfish
412	Cần Thơ	Hexachlorobenzene (HCB)	BIO	2004	0.07-1.8	ng/g lipid wt	81	In common catfish
413	Cần Thơ	Tổng HCH	BIO	2004	0.86-5.1	ng/g lipid wt	81	In dumpsite catfish
414	Cần Thơ	Tổng HCH	BIO	2004	0.03-1.5	ng/g lipid wt	81	In common catfish
415	Cần Thơ	Chlordane	BIO	2004	4.2-8.2	ng/g lipid wt	81	In dumpsite catfish
416	Cần Thơ	Chlordane	BIO	2004	0.01-2.6	ng/g lipid wt	81	In common catfish
417	Cần Thơ	DDT	BIO	2004	330-700	ng/g lipid wt	81	In dumpsite catfish
418	Cần Thơ	DDT	BIO	2004	7.9-150	ng/g lipid wt	81	In common fish
419	Cần Thơ	PCBs	BIO	2004	37-77	ng/g lipid wt	81	In dumpsite fish
420	Cần Thơ	PCBs	BIO	2004	0.91-27	ng/g lipid wt	81	In common fish
421	Cần Thơ	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2004	3.2-4.1	ng/g lipid wt	81	In dumpsite catfish
422	Cần Thơ	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2004	0.12-1.4	ng/g lipid wt	81	In common catfish
423	Ven biển miền Trung (Offshore central Coast)	Tổng HCH	SE	2013	0.031	ng/g dry wt	78	Ven Biển Bắc Nghệ An (E.107004'/N.19022') (Table 3.10, p56)

424	Thanh Hoá	PCBs	BIO	1994-2001	65	ng/g lipid wt	20 (68)	Lach Truong (table 2)
425	Thanh Hoá	HCB	BIO	1994-2001	0.8	ng/g lipid wt	20 (68)	Lach Truong (table 2)
426	Thanh Hoá	DDT	BIO	1994-2001	610	ng/g lipid wt	20 (68)	Lach truong (table 2)
427	Thanh Hoá	Tổng HCH	BIO	1994-2001	3.3	ng/g lipid wt	20 (68)	Lach Truong (table 2)
428	Thanh Hoá	Chlordane	BIO	1994-2001	13	ng/g lipid wt	20 (68)	(Table 2)
429	Hưng Yên	PCDF (Furan)	EM	2008	0.79-1.4	ng/g dry wt	37 (46)	(table 1)
430	Hưng Yên	PCDF (Furan)	MIL	2008	0.34-61	pg/g TEQ lipid wt	35	Bui Dau (table 1)
431	Hưng Yên	PCDF (Furan)	SE	2012-2014	0.025-1.6	pg/g TEQ dry wt	14	Downstream area, Bui Dau (table 1)
432	Hưng Yên	PCDF (Furan)	SE	2012-2014	2.2-42	pg/g TEQ dry wt	14	E-Waste-processing area, Bui Dau (table 1)
433	Hưng Yên	PCDF (Furan)	SO	2012-2014	0.21-13	pg/g TEQ dry wt	14	E-Waste-processing workshop, Bui Dau (table 1)
434	Hưng Yên	PCDF (Furan)	SO	2012-2014	2.6-120	pg/g TEQ dry wt	14	Open-burning sites, Bui Dau (table 1)
435	Hưng Yên	PCDF (Furan)	SO	2012-2014	13	pg/g TEQ dry wt	14	Footpaths in rice paddies, Bui dau (table 1)
436	Hưng Yên	PCDD (Dioxin)	EM	2008	0.14-0.6	ng/g dry wt	37 (46)	Bui dau (table 1)
437	Hưng Yên	PCDD (Dioxin)	MIL	2008	0.72-56	pg/g TEQ lipid wt	35	Bui Dau (table 1)
438	Hưng Yên	PCDD (Dioxin)	SE	2012-2014	0.38-1.6	pg/g TEQ dry wt	14	Downstream area, Bui Dau (table 1)
439	Hưng Yên	PCDD (Dioxin)	SE	2012-2014	0.79-9.2	pg/g TEQ dry wt	14	E-Waste-processing area, Bui dau (table 1)

440	Hưng Yên	PCDD (Dioxin)	SO	2012-2014	0.070-4.6	pg/g TEQ dry wt	14	E-Waste-processing workshop, Bui Dau(table 1)
441	Hưng Yên	PCDD (Dioxin)	SO	2012-2014	1.2-13	pg/g TEQ dry wt	14	Open-burning sites, Bui Dau (table 1)
442	Hưng Yên	PCDD (Dioxin)	SO	2012-2014	0.076-1.1	pg/g TEQ dry wt	14	Footpaths in rice paddies, Bui Dau (table 1)
443	Hưng Yên	PCBs	MIL	2007	1.3-1.7	ng/g lipid wt	42	Bui Dau recyclers (table 2)
444	Hưng Yên	PCBs	MIL	2007	8.4-28	ng/g lipid wt	42	median =24(a), (a): Significantly different from reference site ($p<0.05$) Bui Dau non-recyclers (table 2)
445	Hưng Yên	PCBs	MIL	2007	11.0-69.0	ng/g lipid wt	42	Dong Mai (table 2)
446	Hưng Yên	PCBs	EM	2008	0.57-3.4	ng/g dry wt	37 (46)	PCBs (table1)
447	Hưng Yên	PCBs	MIL	2008	210-7600	pg/g TEQ lipid	35	Mono-ortho PCBs (Bui Dau, table 1)
448	Hưng Yên	PCBs	MIL	2008	0.74-44	pg/g TEQ lipid	35	Non-ortho PCBs, Bui Dau (table 1)
449	Hưng Yên	PCBs	EM	2008	12	ng/g dry wt	34	Bui Dau (table 3)
450	Hưng Yên	PCBs	AR	2008	33-1800	pg m-3	34	Bui Dau (table 2)
451	Hưng Yên	PCBs	MIL	2009	28	ng/g lipid wt	22	Bui Dau (p93)
452	Hưng Yên	PCBs	MIL	2009	50	ng/g lipid wt	22	Dong Mai (p93)
453	Hưng Yên	PCBs	SE	2012-2014	0.0027-0.54	pg/g TEQ dry wt	14	Downstream area, Bui Dau (table 1)
454	Hưng Yên	PCBs	SE	2012-2014	0.67-4.9	pg/g TEQ dry wt	14	E-Waste-processing area, Bui Dau (table 1)

455	Hưng Yên	PCBs	SO	2012-2014	0.29-5.8	pg/g TEQ dry wt	14	E-Waste-processing workshop, Bui Dau (table 1)
456	Hưng Yên	PCBs	SO	2012-2014	0.55-6.6	pg/g TEQ dry wt	14	Open-burning sites, Bui Dau (table 1)
457	Hưng Yên	PCBs	SO	2012-2014	0.00078-1.7	pg/g TEQ dry wt	14	in Footpaths in rice paddies, Bui Dau (Table 1)
458	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2008	1300	ng/g dry wt	34	Bui Dau (table 3)
459	Kiên Giang	PCBs	BIO	2009	62.05	ng/g dry wt	51 (76) (104)	Tôm. Vịnh Kiên Giang
460	Kiên Giang	PCBs	BIO	2009	195.17	ng/g dry wt	51 (76) (104)	Cá. Vịnh Kiên Giang
461	Kiên Giang	PCBs	BIO	2009	406.99	ng/g dry wt	51 (76) (104)	Ngao. Vịnh Kiên Giang
462	Kiên Giang	PCBs	SE	2009	1.95-14.67	ng/g dry wt	51 (76) (104)	Vịnh Kiên Giang
463	Kiên Giang	PCBs	WA	2009	31.60-97.78	ng/l	51 (76) (104)	Vịnh Kiên Giang
464	Bà Rịa - Vũng Tàu	PCBs	BIO	2009	90.91	ng/g dry wt	51 (76) (104)	Khu vực biển ven bờ Vũng Tàu
465	Bà Rịa - Vũng Tàu	PCBs	SE	2009	1.21-9.71	ng/g dry wt	51 (76) (104)	Khu vực biển ven bờ Vũng Tàu
466	Bà Rịa - Vũng Tàu	PCBs	WA	2009	32.52-72.57	ng/l	51 (76) (104)	Khu vực ven bờ Vũng Tàu
467	Quảng Ninh	PCBs	BIO	2009	9.10-14.42	ng/g dry wt	51 (76) (104)	Tôm
468	Quảng Ninh	PCBs	BIO	2009	79.93-485.07	ng/g dry wt	51 (76) (104)	Trong ngao
469	Quảng Ninh	PCBs	SE	2009	1.13-7.91	ng/g dry wt	51 (76) (104)	Vịnh Hạ Long

470	Quảng Ninh	PCBs	WA	2009	62.31	ng/l	51 (76) (104)	Vịnh Hạ Long. Giá trị trung bình toàn vùng Vịnh Hạ Long
471	Hồ Chí Minh city	PCDF (Furan)	SE	2004	36±42	ng/g dry wt	15 (62) (95)	In Can Gio
472	Hồ Chí Minh city	PCDD (Dioxin)	SE	2004	350±160	ng/g dry wt	15 (62) (95)	In Can Gio
473	Hà Nội	PCDF (Furan)	SE	2004	140±7.1	ng/g dry wt	15 (62) (95)	
474	Hà Nội	PCDD (Dioxin)	SE	2004	390±14	ng/g dry wt	15 (62) (95)	
475	Hà Nội	PCBs	MIL	2009	46	ng/g lipid wt	22	
476	Hà Nội	PCBs	MIL	2007	20-100	ng/g lipid wt	42	
477	Hà Nội	PCBs	MIL	2007	6.7-77	ng/g lipid wt	39	In suburban/rural
478	Hà Nội	PCBs	MIL	2007	22-84	ng/g lipid wt	39	In urban
479	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2008	1.5	ng/g lipid wt	35	Bui Dau (table 1)
480	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2007	20-250	ng/g lipid wt	30 (71) (103)	median: 8.4 (a) (a): Significantly different from reference site Bui Dau recyclers (table 2)
481	Hà Nội	PCDD/Fs	EM	2008	1.1-1.8	ng TEQ/g dry wt	37 (46)	In e-waste recycling sites.
482	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2007	2.0-4.0	ng/g lipid wt	42	median: 3.2(a) (a) Significantly different from reference site Bui Dau non-recyclers (table 2)

483	Hà Nội	PCDD/Fs	EM	2008	1.9-4.5	ng TEQ/g dry wt	37 (46)	In e-waste recycling site
484	Hà Nội	PCDD/Fs	EM	2008	0.5-0.6	ng TEQ/g dry wt	37 (46)	In urban
485	Hà Nội	PCDF (Furan)	EM	2008	0.79-1.4	ng/g dry wt	37 (46)	In e-waste recycling site
486	Hà Nội	PCDF (Furan)	EM	2008	1.3-3.5	ng/g dry wt	37 (46)	In e-waste recycling site
487	Hà Nội	PCDF (Furan)	EM	2008	0.12-0.25	ng/g dry wt	37 (46)	In urban
488	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2007	0.26-1.1	ng/g lipid wt	42	Dong Mai (table 2)
489	Hà Nội	PCDD (Dioxin)	EM	2008	0.14-0.6	ng/g dry wt	37 (46)	In e-waste recycling sites
490	Hà Nội	PCDD (Dioxin)	EM	2008	0.59-1.0	ng/g dry wt	37 (46)	In e-waste recycling sites.
491	Hà Nội	PCDD (Dioxin)	EM	2008	0.27-0.47	ng/g dry wt	37 (46)	In urban
492	Hà Nội	PCBs	EM	2008	0.49-2.3	ng/g dry wt	37 (46)	In e-waste recycling sites
493	Hà Nội	PCBs	EM	2008	1.3-5.5	ng/g dry wt	37 (46)	In e-waste recycling sites.
494	Hà Nội	PCBs	EM	2008	0.54-1.1	ng/g dry wt	37 (46)	In urban
495	Hà Nội	PCBs	EM	2008	0.077-1.1	ng/g dry wt	37 (46)	In e-waste recycling sites
496	Hà Nội	PCBs	EM	2008	0.15-2.4	ng/g dry wt	37 (46)	In E-waste recycling sites.
497	Hà Nội	PCBs	EM	2008	0.036-0.056	ng/g dry wt	37 (46)	In urban.
498	Hà Nội	PCBs	EM	2008	0.57-3.4	ng/g dry wt	37 (46)	In e-waste recycling sites
499	Hà Nội	PCBs	EM	2008	1.5-7.9	ng/g dry wt	37 (46)	In E-waste recycling sites.
500	Hà Nội	PCBs	EM	2008	0.54-1.2	ng/g dry wt	37 (46)	Total PCBs, in urban.
501	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2014	520	ng/g dry wt	30 (71) (103)	Mud carp, E-waste recyclingsite, Bui Dau (table 1)
502	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2014	160	ng/g dry wt	30 (71) (103)	Climbing perch in Bui Dau (E-waste recyclingsite) (table 1)

503	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2014	1380	ng/g dry wt	30 (71) (103)	Crucian carp in Bui Dau (E-waste recyclingsite) (table 1)
504	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	433	ng/g dry wt	30 (71) (103)	Bui Dau, (table 1)
505	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2014	3270	ng/g dry wt	30 (71) (103)	Bui Dau (table)
506	Hà Nội	PCDF (Furan)	MIL	2008	2.3-6.1	pg/g TEQ lipid	35	In Thach Hoa-Thach That
507	Hà Nội	PCDD (Dioxin)	MIL	2008	8.4-22	pg/g TEQ lipid	35	In Thach Hoa- Thach That
508	Hà Nội	PCBs	MIL	2008	750-2900	pg TEQ/g lipid	35	In Thach Hoa- Thach That. Mono-ortho PCBs
509	Hà Nội	PCBs	MIL	2008	4.4-18	pg TEQ /g lipid	35	Non-ortho PCBs. In Thach Hoa- Thach That.
510	Hồ Chí Minh city	PCDD/Fs	SE	2016	200-460	ng/g dry wt	08 (56) (94)	In Saigon and Mekong River
511	Hồ Chí Minh city	PCDD/Fs	SE	2009	220-670	ng/g dry wt	08 (56) (94)	In Sai gon and Mekong River
512	Hà Nội	PCDD/Fs	SE	2010	26-140	ng/g dry wt	08 (56) (94)	
513	Hà Nội	PCBs	SO	2007	14.8-190	ng/g dry wt	08 (56) (94)	
514	Hà Nội	PCDF (Furan)	SO	2002	15-26000	pg/g TEQ dry wt	08 (56) (94)	In dumping site
515	Hà Nội	PCDD (Dioxin)	SO	2002	100-24000	pg/g TEQ dry wt	08 (56) (94)	In dumping site
516	Hà Nội	Tổng HCH	SO	2007	8.03	ng/g dry wt	08 (56) (94)	In surface soil in agricultural areas
517	Hà Nội	DDT	SO	2007	89.9	ng/g dry wt	08 (56) (94)	In surface soils in agricultural areas

518	Hà Nội	PCBs	SE	2010	1.3-384	ng/g dry wt	08 (56) (94)	In sewer system
519	Hà Nội	PCBs	SE	2001	40	ng/g dry wt	08 (56) (94)	In canals
520	Đồng Nai	Tổng HCH	SE	2004	0.012	ng/g dry wt	05 (87)	In SG-DN river estuary
521	Đồng Nai	Tổng HCH	SE	2004	0.011	ng/g dry wt	05 (87)	In SG-DN river
522	Đồng Nai	PCBs	SE	2004	0.9	ng/g dry wt	05 (87)	In SG-DN river estuary
523	Đồng Nai	PCBs	SE	2004	6.8	ng/g dry wt	05 (87)	In SG-DN river
524	Đồng Nai	DDT	SE	2004	1.2	ng/g dry wt	05 (87)	In SG-DN river estuary
525	Đồng Nai	DDT	SE	2004	5.6	ng/g dry wt	05 (87)	In SG-DN river
526	Đồng Nai	Hexachlorobenzene (HCB)	SE	2004	0.031	ng/g dry wt	05 (87)	In SG-DN river estuary
527	Đồng Nai	Hexachlorobenzene (HCB)	SE	2004	0.24	ng/g dry wt	05 (87)	In SG-DN river
528	Đồng Nai	Chlordane	SE	2004	0.029	ng/g dry wt	05 (87)	In Saigon-Dong Nai river estuary
529	Đồng Nai	Chlordane	SE	2004	0.28	ng/g dry wt	05 (87)	In Sai Gon-Dong Nai river
530	Hồ Chí Minh city	PCBs	SE	1990	5.9	ng/g dry wt	05 (87)	Outskirt
531	Hồ Chí Minh city	PCBs	SE	1990	310	ng/g dry wt	05 (87)	In urban areas
532	Hồ Chí Minh city	PCBs	SE	2004	81	ng/g dry wt	05 (87)	City Canal
533	Hồ Chí Minh city	PCBs	SE	1996	220	ng/g dry wt	05 (87)	In city canal
534	Hồ Chí Minh city	PCBs	SE	1990	7.6-630	ng/g dry wt	04 (86)	
535	Hồ Chí Minh city	Hexachlorobenzene (HCB)	SE	2004	6.6	ng/g dry wt	05 (87)	HCM city canals
536	Hồ Chí Minh city	Chlordane	SE	2004	2	ng/g dry wt	05 (87)	HCM city canals
537	Hồ Chí Minh city	PCBs	SE	2004	81	ng/g dry wt	05 (87)	HCM city canals.

538	Hồ Chí Minh city	DDT	SE	2004	37	ng/g dry wt	05 (87)	In Hochiminh city canals
539	Hồ Chí Minh city	DDT	SE	1990	46-430	ng/g dry wt	04 (86)	
540	Hà Nội	PCBs	SE	1997	11	ng/g dry wt	05 (87)	In urban area
541	Hà Nội	DDT	SE	1997	30	ng/g dry wt	05 (87)	In urban area
542	Hà Nội	DDT	SE	1995-1996	10	ng/g dry wt	05 (87)	In outskirt
543	Hà Nội	DDT	BLO	1994	1.47-87.55	ng/ml	21	In women who were diagnosed with fibrocystic disease of breast. Mean 20.95±5.14. table 3
544	Hà Nội	DDT	BLO	1994	1.18-52.25	ng/ml	21	In patients diagnosed with historically confirmed invasive adenocarcinoma of breast. Mean 15.9±3.05. Table 3
545	Hà Nội	DDT	BLO	1994	11.67-67.57	ng/ml	21	In urban. Mean 32.30±6.07. table 2
546	Hà Nội	DDT	BLO	1994	1.18-58.74	ng/ml	21	In rural. Mean 11.68±2.21
547	Hồ Chí Minh city	Hexachlorobenzene (HCB)	SE	2003-2004	0.006-0.08	ng/g dry wt	04 (86)	In Mekong River
548	Hồ Chí Minh city	Tổng HCH	SE	2003-2004	0.02-1.3	ng/g dry wt	04 (86)	In Mekong River
549	Hồ Chí Minh city	Chlordane	SE	2003-2004	0.004-19	ng/g dry wt	04 (86)	In Mekong River
550	Hồ Chí Minh city	DDT	SE	2003-2004	0.01-110	ng/g dry wt	04 (86)	In Mekong River
551	Hồ Chí Minh city	p,p'-DDT	SE	2003-2004	0.01-44	ng/g dry wt	04 (86)	In Mekong River

552	Hồ Chí Minh city	p,p'-DDD	SE	2003-2004	0.01-46	ng/g dry wt	04 (86)	In Mekong River
553	Hồ Chí Minh city	p,p'- DDE	SE	2003-2004	0.01-15	ng/g dry wt	04 (86)	In Mekong River
554	Hồ Chí Minh city	PCBs	SE	2003-2004	0.039-9.2	ng/g dry wt	04 (86)	Mekong river
555	Hà Nội	Tổng HCH	SE	1997	0.07-3.1	ng/g dry wt	04 (86)	
556	Hà Nội	PCBs	SE	1995-1996	2.2-11	ng/g dry wt	04 (86)	as arochlor 1254 mixture. Outskirt Hanoi
557	Hà Nội	PCBs	SE	1997	0.67-40	ng/g dry wt	04 (86)	as arochlor 1254 mixture. Urban area
558	Hà Nội	DDT	SE	1995-1996	7.0-14.0	ng/g dry wt	04 (86)	
559	Hà Nội	DDT	SE	1997	7.3-73	ng/g dry wt	04 (86)	
560	Hà Nội	Tổng HCH	SO	2007	9.1-239	ng/g dry wt	11	Minh Dai Commune
561	Hà Nội	DDT	SO	2007	1.8-132	ng/g dry wt	11	In Minh Dai Commune
562	Hà Nội	DDT	BIO	2007	5.1-43	ng/g wet wt	11	In Minh Dai Commune
563	Hà Nội	Tổng HCH	BIO	2007	12.0-78.0	ng/g wet wt	11	In Minh Dai Commune
564	Hà Nội	Tổng HCH	BIO	2007	8.3-66	ng/g wet wt	11	In Hoang Liet Commune
565	Hà Nội	DDT	BIO	2007	4-8.1	ng/g wet wt	11	In Hoang Liet Commune
566	Hà Nội	DDT	SO	2007	1.0-51.0	ng/g dry wt	11	In Hoang Liet Commune
567	Hà Nội	Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	WA	2011	0.5	ng/L	33	
568	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2009	7.5	ng/g lipid wt	52	Sông Nhuệ
569	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	BIO	2009	146	ng/g lipid wt	52	Sông Tô Lịch
570	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2012	0.43-61	ng/g dry wt	40	In downstream area

571	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2012	100-350	ng/g dry wt	40	In E-waste recycling area
572	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2012	2.8	ng/g dry wt	40	Upstream area
573	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	68-9200	ng/g dry wt	40	In e-waste recycling workshop
574	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	1.6-63	ng/g dry wt	40	In Open burning site
575	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	8.2	ng/g dry wt	40	In rice paddy
576	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.03-1.14	ng/g dry wt	31	In To Lich River
577	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.138-0.167	ng/g dry wt	31	In Nhue River
578	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.343-2.21	ng/g dry wt	31	In Kim Nguu River
579	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.751-17.5	ng/g dry wt	31	In Lu River
580	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.81	ng/g dry wt	31	In Set River
581	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.145-0.26	ng/g dry wt	31	In Yen So Lake
582	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2011	0.03-0.05	ng/g dry wt	31	In Den Lu Lake
583	Hồ Chí Minh city	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	12-154	ng/g dry wt	30 (71) (103)	In sewage sludge industrial factories
584	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	3.76-83.6	ng/g dry wt	30 (71) (103)	In open landfill dumping site
585	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	22.5-860	ng/g dry wt	30 (71) (103)	In Trieu Khuc E-waste recycling site

586	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2014	300	ng/g dry wt	30 (71) (103)	In laboratory
587	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2014	250	ng/g dry wt	30 (71) (103)	In office
588	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2014	25.6-69	ng/g dry wt	30 (71) (103)	In household
589	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2014	740-8740	ng/g dry wt	30 (71) (103)	In E-waste recycling site Trieu Khuc
590	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2010	20-250	ng/g lipid wt	29	In recylers from dismantling areas
591	Hồ Chí Minh city	PCDD/Fs	BLO	1991-1992	30	pg TEQ /g lipid wt	26 (70) (102)	
592	Hà Nội	PCDD/Fs	BLO	1991-1992	12	pg TEQ /g lipid wt	26 (70) (102)	
593	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2003	0.45-0.5	ng/g lipid wt	26 (70) (102)	
594	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	68	ng/g dry wt	19	e-waste dumping sites (p12782)
595	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	1.1	ng/g dry wt	19	from urban and agricultural sites (p12782)
596	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	1900	ng/g dry wt	19	e-waste recycling workshops in Bui Dau (p12782)
597	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	24	ng/g dry wt	19	open burning sites in Bui Dau (p12782)
598	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012	2.2	ng/g dry wt	19	from rice paddies in Bui Dau (p12782)
599	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2015	0.43-350	ng/g dry wt	17	Bui Dau (table 1, p60)

600	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2015	8.2	ng/g dry wt	17	Footpaths and paddy fields, Bui Dau (table 1, p60) LOQ: limit of quantification
601	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2015	1.6-63	ng/g dry wt	17	Around open burning places, Bui Dau (table 1, p60)
602	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2015	68-9200	ng/g dry wt	17	in e-waste recycling workshops, Bui Dau (table 1,p60)
603	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2012-2014	0.1-220	ng/g dry wt	16	in downstream sites (n=12), Bui Dau (p293)
604	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2012-2014	2.8-38	ng/g dry wt	16	for the upstream site (n=3), Bui Dau (p293)
605	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012-2014	0.048-12	ng/g dry wt	16	in footpaths in rice paddy sites (n=57), Bui Dau (p293)
606	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SO	2012-2014	1.6-62	ng/g dry wt	16	for the open-burning sites (n = 9), Bui Dau (p293)
607	Hưng Yên	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2012-2014	100-3800	ng/g dry wt	16	in e-waste-processing workshop sites, Bui Dau (p293)
609	Hưng Yên	Hexabromocyclododecane (HBCD)	MIL	2007	1.4-7.6	ng/g lipid wt	42	Bui Dau recycler (table 2)
610	Hưng Yên	Hexabromocyclododecane (HBCD)	MIL	2007	0.29-1.2	ng/g lipid wt	42	Bui Dau non - recycler (table 2)
611	Hưng Yên	Hexabromocyclododecane (HBCD)	MIL	2007	0.11-0.97	ng/g lipid wt	42	Dong Mai (table 2)
612	Hưng Yên	Hexabromocyclododecane (HBCD)	SO	2014	0.03-580	ng/g dry wt	36	table 1
613	Hưng Yên	Hexabromocyclododecane (HBCD)	BIO	2014	1.1	ng/g lipid wt	36	pork (table 1)

614	Hưng Yên	Hexabromocyclododecane (HBCD)	BIO	2014	0.2-4.1	ng/g lipid wt	36	river fish (table 1)
615	Hưng Yên	Hexabromocyclododecane (HBCD)	BIO	2014	540-5800	ng/g lipid wt	36	of chicken egg (table 1)
616	Hưng Yên	Hexabromocyclododecane (HBCD)	BIO	2014	25-1400	ng/g lipid wt	36	of chicken skin (table 1)
617	Hưng Yên	Hexabromocyclododecane (HBCD)	BIO	2014	330-5500	ng/g lipid wt	36	of Chicken liver (table 1)
618	Hưng Yên	Hexabromocyclododecane (HBCD)	BIO	2014	2.0-80	ng/g lipid wt	36	of chicken muscle (table 1)
619	Hưng Yên	Hexabromocyclododecane (HBCD)	EM	2008	59	ng/g dry wt	34	Bùi Dâu (table 3)
620	Hưng Yên	Hexabromocyclododecane (HBCD)	AR	2008	5.7	pg m-3	34	Bùi Dâu (table 2)
621	Thái Bình	PCBs	BIO	2005-2006	1.88-3.9	ng/g wet wt	53	Ba Lạt (p45, table 11)
622	Thái Bình	PCBs	SE	2005-2006	0.41-0.56	ng/g dry wt	53	ba Lạt (p43, table 10)
623	Thái Bình	PCBs	WA	2005-2006	0.31-0.91	ng/l	53	Ba Lạt (p42, table 9)
624	Thái Bình	PCBs	SE	2014	1.40±0.53	ng/g dry wt	47	Table 5
625	Thái Bình	DDT	BIO	2005-2006	9.00-11.28	ng/g wet wt	53	Ba Lạt (p45, table 11)
626	Thái Bình	DDT	SE	2005-2006	2.33-3.76	ng/g dry wt	53	Ba Lạt (p43, table 10)
627	Thái Bình	DDT	WA	2005-2006	1.17-6.14	ng/l	53	Ba Lạt (p42, table 9)
628	Thái Bình	Tổng HCH	BIO	2005-2006	0.11-0.38	ng/g wet wt	53	Ba Lạt (table 11, p45)
629	Thái Bình	Tổng HCH	SE	2005-2006	0.41-0.97	ng/g dry wt	53	Ba Lạt (p43, table 10)

630	Thái Bình	Tổng HCH	WA	2005-2006	0.31-0.72	ng/l	53	Ba Lạt (table 9, p42)
631	Hải Phòng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2007	0.55-13	ng/g lipid wt	42	Tràng Minh (table 2)
632	Hải Phòng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2008	420	ng/g dry wt	34	Tràng Minh
633	Hải Phòng	Tetrabromodiphenyl ether and pentabromodiphenyl ether	AR	2008	35-720	pg m-3	34	Tràng Minh (table 2)
634	Hải Phòng	Tổng HCH	BIO	2005-2006	0.28-0.34	ng/g wet wt	53	Cảng hải phòng (table 11, p45)
635	Hải Phòng	Tổng HCH	SE	2005-2006	0.21-0.39	ng/g dry wt	53	Cảng Hải Phòng (table 10, p43)
636	Hải Phòng	Tổng HCH	WA	2005-2006	0.12-0.34	ng/l	53	Cảng Hải Phòng (table 9, p42)
637	Hải Phòng	Tổng HCH	BIO	1994-2001	3.0-12	ng/g lipit wt	20 (68)	Cát Bà, Cát Hải (table 2)
638	Hải Phòng	PCDF (Furan)	MIL	2008	2.4-8.8	pg/g TEQ lipid	35	Tràng Minh (table 1)
639	Hải Phòng	PCDD (Dioxin)	EM	2008	0.59-1.0	ng/g dry wt	13 (58) (90)	Tràng Minh (table 1)
640	Hải Phòng	PCDD (Dioxin)	MIL	2008	2.6-23	pg/g TEQ lipid	35	table 1
641	Hải Phòng	PCBs	BIO	2005-2006	15.98-27.55	ng/g wet wt	13 (58) (90)	Cảng Hải Phòng (table 11, p45)
642	Hải Phòng	PCBs	SE	2005-2006	2.98-7.38	ng/g dry wt	53	Cảng hải phòng (table 10, p43)
643	Hải Phòng	PCBs	WA	2005-2006	1.34-4.58	ng/l	53	Cảng Hải phòng (table 9, p42)
644	Hải Phòng	PCBs	SE	2014	1.03±0.96	ng/g dry wt	47	(table 5, p10)
645	Hải Phòng	PCBs	MIL	2007	11.0-73.0	ng/g lipid wt	42	Tràng Minh (table 2)

646	Hải Phòng	PCBs	AR	2008	540-1000	pg m-3	34	(Table 2)
647	Hải Phòng	PCBs	MIL	2009	33	ng/g lipid wt	22	Tràng Minh (p93)
648	Hải Phòng	PCBs	SE	2003-2004	0.45-18.7	ng/g dry wt	9	Hạ Long Bay (table 1, figure 2)
649	Hải Phòng	DDT	BIO	2005-2006	1.68-5.86	ng/g wet wt	53	Cảng Hải phòng (table 11, p45)
650	Hải Phòng	DDT	SE	2005-2006	0.53-1.61	ng/g dry wt	53	Cảng Hải Phòng (table 10, p43)
651	Hải Phòng	DDT	BIO	1994-2001	300-2500	ng/g lipit wt	20 (68)	Cát Bà, Cát Hải (table 2)
652	Hải Phòng	DDT	WA	2005-2006	0.32-1.28	ng/l	53	Cảng Hải Phòng (Table 9, p42)
653	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2013	0.104-0.584	ng/g dry wt	18	In To Lich River
654	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2013	0.074-0.133	ng/g dry wt	18	In Den Lu Lake
655	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2013	0.738-1.046	ng/g dry wt	18	In Yen So Lake
659	Hải Phòng	Chlordane	BIO	1994-2001	5.0-24	ng/g lipit wt	20 (68)	Cat Bà, Cát Hải (table 2)
660	Hà Nội	DDT	SO	2014	62.27-98.66	ng/g dry wt	32	In Kieu Ky
661	Hà Nội	p,p'-DDT	SO	2014	12.09-23.49	ng/g dry wt	32	In Kieu Ky
662	Hà Nội	p,p'-DDD	SO	2014	15.43-25.97	ng/g dry wt	32	In Kieu Ky
663	Hà Nội	p,p'- DDE	SO	2014	32.86-50.92	ng/g dry wt	32	In Kieu Ky
664	Hà Nội	Tổng HCH	SO	2014	5.56-9.77	ng/g dry wt	32	In Kieu Ky
665	Hà Nội	Gamma hexachlorocyclohexane	SO	2014	0.56-0.97	ng/g dry wt	32	In Kieu Ky
666	Hà Nội	Beta hexachlorocyclohexane	SO	2014	2.35-4.19	ng/g dry wt	32	In Kieu Ky
667	Hà Nội	Alpha hexachlorocyclohexane	SO	2014	1.68-3.98	ng/g dry wt	32	In Kieu Ky
668	Hà Nội	DDT	SE	2014	48.82-89.76	ng/g dry wt	32	In Cau Bay River

669	Hà Nội	p,p'-DDT	SE	2014	4.72-20.39	ng/g dry wt	32	In Cay Bay River
670	Hà Nội	p,p'-DDD	SE	2014	13.59-23.89	ng/g dry wt	32	In Cau Bay River
671	Hà Nội	p,p'- DDE	SE	2014	30.59-45.49	ng/g dry wt	32	In Cau Bay River
672	Hà Nội	Tổng HCH	SE	2014	4.48-11.32	ng/g dry wt	32	In Cau Bay River
673	Hà Nội	Gamma hexachlorocyclohexane	SE	2014	0.43-1.39	ng/g dry wt	32	In Cau Bay River
674	Hà Nội	Beta hexachlorocyclohexane	SE	2014	2.04-4.82	ng/g dry wt	32	In Cau Bay River
675	Hà Nội	Alpha hexachlorocyclohexane	SE	2014	1.73-4.22	ng/g dry wt	32	In Cau Bay RIver
676	Hồ Chí Minh city	PCDD/Fs	SO	1999-2002	0.2-4.4	pg/g TEQ dry wt	1	In dumping site
677	Hồ Chí Minh city	PCDD/Fs	SO	1999-2002	0.3-1.28	pg/g TEQ dry wt	1	In control site
678	Hồ Chí Minh city	PCBs	SO	1999-2000	0.02-0.2	pg/g TEQ dry wt	1	In control site
679	Hồ Chí Minh city	PCBs	SO	1999-2000	0.01-1.0	pg/g TEQ dry wt	1	In dumping site
680	Hà Nội	PCDD/Fs	SO	2000	1	pg/g TEQ dry wt	1	In control site
681	Hà Nội	PCDD/Fs	SO	2000	0.4-850	pg/g TEQ dry wt	1	In dumping site
682	Hà Nội	PCBs	SO	1999-2000	0.1	pg/g TEQ dry wt	1	In control site
683	Hà Nội	PCBs	SO	1999-2000	0.22-59	pg/g TEQ dry wt	1	In dumping site
684	Hà Nội	DDT	SE	2006	17-109	ng/g dry wt	6	In Yen So Lake
685	Hà Nội	DDT	SE	2006	82-1100	ng/g dry wt	6	In Kim Nguu River
686	Hà Nội	DDT	SE	2006	215-680	ng/g dry wt	6	In Set River
687	Hà Nội	DDT	SE	2006	11-103	ng/g dry wt	6	In Lu River
688	Hà Nội	DDT	SE	2006	6.4-61	ng/g dry wt	6	In To Lich River
689	Hà Nội	DDT	SE	2006	12.0-14.0	ng/g dry wt	6	In Nhue River
690	Hà Nội	PCBs	SE	2006	20-384	ng/g dry wt	6	In Yen So River

691	Hà Nội	PCBs	SE	2006	237-328	ng/g dry wt	6	In Kim Nguu River
692	Hà Nội	PCBs	SE	2006	36-139	ng/g dry wt	6	In Set River
693	Hà Nội	PCBs	SE	2006	1.3-70	ng/g dry wt	6	In To Lich River
694	Hà Nội	PCBs	SE	2006	22-153	ng/g dry wt	6	In Nhue River
695	Hà Nội	PCBs	SE	2006	1.3-380	ng/g dry wt	6	
696	Hà Nội	PCBs	SE	1999	15-120	ng/g dry wt	6	
697	Hà Nội	DDT	SE	2006	4.4-1100	ng/g dry wt	6	
698	Hà Nội	DDT	SE	2002	42-44	ng/g dry wt	6	
699	Hà Nội	Beta hexachlorocyclohexane	SE	2006	0.2-36	ng/g dry wt	6	
700	Hà Nội	Hexachlorobenzene (HCB)	SE	2006	0.2-22	ng/g dry wt	6	
701	Hà Nội	Hexachlorobenzene (HCB)	SE	1997	0.13	ng/g dry wt	6	
702	Hà Nội	DDT	BIO	1997	5.62-863.95	ng/g dry wt	27	
703	Hà Nội	DDT	SE	1997	7.4-80.55	ng/g dry wt	27	
704	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	MIL	2007	0.24-0.8	ng/g lipid wt	42	
705	Hà Nội	Hexabromocyclododecane (HBCD)	MIL	2007	0.07-1.4	ng/g lipid wt	42	
706	Hà Nội	PCBs	EM	2008	5.4	ng/g dry wt	34	In suburban
707	Hà Nội	PCBs	EM	2008	10	ng/g dry wt	34	In urban
708	Hà Nội	PCBs	AR	2008	430-550	pg m-3	34	In urban
709	Hà Nội	PCBs	AR	2008	57	pg m-3	34	In suburban
710	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2008	120	ng/g dry wt	34	In suburban
711	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2008	230	ng/g dry wt	34	In urban
712	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	AR	2008	23-58	pg m-3	34	In urban
713	Hà Nội	Tetrabromodiphenyl ether and pentabromodiphenyl ether	AR	2008	4.6	pg m-3	34	In suburban

714	Hà Nội	Hexabromocyclododecane (HBCD)	EM	2008	6.9	ng/g dry wt	34	In suburban
715	Hà Nội	Hexabromocyclododecane (HBCD)	EM	2008	8.2	ng/g dry wt	34	In urban
716	Hà Nội	Hexabromocyclododecane (HBCD)	AR	2008	6.6	pg m-3	34	In urban
717	Hà Nội	Tổng HCH	SE	2006-2007	0.7-5.15	ng/g dry wt	44	In dry season. Kim Nguu River
718	Hà Nội	Tổng HCH	SE	2006-2007	0.3-2.83	ng/g dry wt	44	In rainy season. Kim Nguu River
719	Hà Nội	Tổng HCH	SE	2006-2007	0.7-10.17	ng/g dry wt	44	In dry season. In To Lich River
720	Hà Nội	Tổng HCH	SE	2006-2007	1.08-2.02	ng/g dry wt	44	In rainy season. In To Lich River
721	Hà Nội	Tổng HCH	SE	2006-2007	0.035-7.14	ng/g dry wt	44	In dry season. In Nhue River
722	Hà Nội	Tổng HCH	SE	2006-2007	0.035-5.38	ng/g dry wt	44	In rainy season. In Nhue River
723	Hà Nội	Hexachlorobenzene (HCB)	SE	2006-2007	0.3-1.28	ng/g dry wt	44	In dry season. Kim Nguu River
724	Hà Nội	Hexachlorobenzene (HCB)	SE	2006-2007	0.3	ng/g dry wt	44	In rainy season. Kim Nguu river
725	Hà Nội	Hexachlorobenzene (HCB)	SE	2006-2007	0.3-7.32	ng/g dry wt	44	In dry season. In To Lich river
726	Hà Nội	Hexachlorobenzene (HCB)	SE	2006-2007	0.3	ng/g dry wt	44	In rainy season. In To Lich River
727	Hà Nội	Hexachlorobenzene (HCB)	SE	2006-2007	0.025-12.63	ng/g dry wt	44	In dry season. In Nhue River
728	Hà Nội	Hexachlorobenzene (HCB)	SE	2006-2007	0.025-10.63	ng/g dry wt	44	In rainy season. In Nhue River
729	Hà Nội	Dieldrin	SE	2006-2007	0.5	ng/g dry wt	44	In dry season. In Kim Nguu River

730	Hà Nội	Dieldrin	SE	2006-2007	0.5	ng/g dry wt	44	In rainy season. In Kim Nguu River
731	Hà Nội	Dieldrin	SE	2006-2007	0.5	ng/g dry wt	44	In dry season. In To Lich River
732	Hà Nội	Dieldrin	SE	2006-2007	0.5	ng/g dry wt	44	In rainy season. In To Lich river
733	Hà Nội	Dieldrin	SE	2006-2007	0.025-5.67	ng/g dry wt	44	In dry season. In Nhue River.
734	Hà Nội	Dieldrin	SE	2006-2007	0.025-2.62	ng/g dry wt	44	In rainy season. In Nhue River
735	Hà Nội	PCBs	BIO	1997	6.0-58.0	ng/g dry wt	27	
736	Hà Nội	PCBs	SE	1997	1.0-33.0	ng/g dry wt	27	
738	Hà Nội	p,p'- DDE	SE	1997	5.17-50	ng/g dry wt	27	
739	Hà Nội	Tổng HCH	SE	1997	0.07-3.12	ng/g dry wt	27	
740	Hà Nội	Tổng HCH	BIO	1997	0.15-0.51	ng/g dry wt	27	
741	Hà Nội	Lindane	BIO	1997	0.1-0.41	ng/g dry wt	27	
742	Hà Nội	Lindane	SE	1997	0.01-0.45	ng/g dry wt	27	
743	Hà Nội	Beta hexachlorocyclohexane	BIO	1997	0.01-0.13	ng/g dry wt	27	
744	Hà Nội	Beta hexachlorocyclohexane	SE	1997	0.01-2.12	ng/g dry wt	27	
745	Hà Nội	Alpha hexachlorocyclohexane	BIO	1997	0.01-0.06	ng/g dry wt	27	
746	Hà Nội	Alpha hexachlorocyclohexane	SE	1997	0.05-0.9	ng/g dry wt	27	
747	Hà Nội	Endrin	BIO	1997	0.04	ng/g dry wt	27	
748	Hà Nội	Endrin	BIO	1997	0.2	ng/g dry wt	27	
749	Hà Nội	Endrin	SE	1997	0.1	ng/g dry wt	27	
750	Hà Nội	Dieldrin	BIO	1997	0.6	ng/g dry wt	27	
751	Hà Nội	Dieldrin	SE	1997	0.15	ng/g dry wt	27	
752	Hồ Chí Minh city	PCBs	SE	2002	33	ng/g dry wt	25 (101)	
753	Hồ Chí Minh city	HCB	SE	2002	0.014-16	ng/g dry wt	25 (101)	

754	Hồ Chí Minh city	DDT	SE	2002	36	ng/g dry wt	25 (101)	
755	Hồ Chí Minh city	p,p'- DDE	SE	2002	0.079-34	ng/g dry wt	25 (101)	
756	Hồ Chí Minh city	p,p'-DDD	SE	2002	0.023-79	ng/g dry wt	25 (101)	
757	Hồ Chí Minh city	p,p'-DDT	SE	2002	0.041-14	ng/g dry wt	25 (101)	
758	Hồ Chí Minh city	Tổng HCH	SE	2002	0.009-0.19	ng/g dry wt	25 (101)	
759	Hồ Chí Minh city	Gamma hexachlorocyclohexane	SE	2002	0.056	ng/g dry wt	25 (101)	
760	Hồ Chí Minh city	Beta hexachlorocyclohexane	SE	2002	0.11	ng/g dry wt	25 (101)	
761	Hồ Chí Minh city	Alpha hexachlorocyclohexane	SE	2002	0.009-0.048	ng/g dry wt	25 (101)	
762	Hồ Chí Minh city	Dieldrin	SE	2002	6.2	ng/g dry wt	25 (101)	
763	Hồ Chí Minh city	Chlordane	SE	2002	9	ng/g dry wt	25 (101)	
764	Hà Nội	PCBs	SE	2002	21	ng/g dry wt	25 (101)	
765	Hà Nội	HCB	SE	2002	0.034-0.23	ng/g dry wt	25 (101)	
766	Hà Nội	Tổng HCH	SE	2002	0.48-0.6	ng/g dry wt	25 (101)	
767	Hà Nội	Tổng HCH	SE	2002	0.48-0.6	ng/g dry wt	25 (101)	
768	Hà Nội	Gamma hexachlorocyclohexane	SE	2002	0.074-0.14	ng/g dry wt	25 (101)	
769	Hà Nội	p,p'- DDE	SE	2002	20-21	ng/g dry wt	25 (101)	
770	Hà Nội	p,p'-DDD	SE	2002	15	ng/g dry wt	25 (101)	
771	Hà Nội	p,p'-DDT	SE	2002	1.9-4.9	ng/g dry wt	25 (101)	
772	Hà Nội	DDT	SE	2002	41-43	ng/g dry wt	25 (101)	
773	Hà Nội	Beta hexachlorocyclohexane	SE	2002	0.17	ng/g dry wt	25 (101)	

774	Hà Nội	Alpha hexachlorocyclohexane	SE	2002	0.16-0.21	ng/g dry wt	25 (101)	
775	Hà Nội	Dieldrin	SE	2002	0.65	ng/g dry wt	25 (101)	
776	Hà Nội	Chlordane	SE	2002	0.034-1.1	ng/g dry wt	25 (101)	
777	Hồ Chí Minh city	PCBs	MIL	2000-2001	29-2000	ng/g lipid wt	2 (84)	
778	Hồ Chí Minh city	Hexachlorobenzene (HCB)	MIL	2000-2001	1.3-10	ng/g lipid wt	2 (84)	
779	Hồ Chí Minh city	Beta hexachlorocyclohexane	MIL	2000-2001	29-200	ng/g lipid wt	2 (84)	
780	Hồ Chí Minh city	Beta hexachlorocyclohexane	MIL	2000-2001	4.1-35	ng/g lipid wt	2 (84)	
781	Hồ Chí Minh city	Chlordane	MIL	2000-2001	1.3-26	ng/g lipid wt	2 (84)	
782	Hà Nội	Tổng HCH	MIL	2000-2001	58	ng/g lipid wt	2 (84)	
783	Hà Nội	PCBs	MIL	2000-2001	26-210	ng/g lipid wt	2 (84)	
784	Hà Nội	Beta hexachlorocyclohexane	MIL	2000-2001	11-160	ng/g lipid wt	2 (84)	
785	Hà Nội	DDT	SO	2006-2007	0.03	ng/g dry wt	45	In dry season. In Tay Tuu
786	Hà Nội	DDT	SO	2006-2007	0.03	ng/g dry wt	45	In rainy season. In Tay Tuu
787	Hà Nội	DDT	SO	2006-2007	0.02	ng/g dry wt	45	In dry season in Bang Village- Hoang Liet.
788	Hà Nội	DDT	SO	2006-2007	0.02	ng/g dry wt	45	In rainy season in Bang Village- Hoang Liet
789	Hà Nội	DDT	MIL	2000-2001	480-6900	ng/g lipid wt	2 (84)	
790	Hà Nội	Hexachlorobenzene (HCB)	MIL	2000-2001	0.62-9.5	ng/g lipid wt	2 (84)	

791	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Phu Dong- Gia Lam
792	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Phu Dong- Gia Lam
793	Hà Nội	HCB	SO	2006-2007	1.24	ng/g dry wt	45	In dry season. In Trau Quy- Gia Lam.
794	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Trau Quy- Gia Lam.
795	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Dai Ang- Thanh Tri.
796	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Dai Ang- Thanh Tri
797	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Tay Tuu
798	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Tay Tuu
799	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Bang Village- Hoang Liet
800	Hà Nội	HCB	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Bang Village- Hoang Liet
801	Hà Nội	DDT	SO	2006-2007	2.05	ng/g dry wt	45	In dry season. In Phu Dong Gia Lam
802	Hà Nội	DDT	SO	2006-2007	0.02	ng/g dry wt	45	In rainy season. In Phu Dong Gia Lam
803	Hà Nội	DDT	SO	2006-2007`	0.02	ng/g dry wt	45	In dry season. In Trau Quy- Gia Lam
804	Hà Nội	DDT	SO	2006-2007	0.02	ng/g dry wt	45	In rainy season. In Trau Quy GIa Lam
805	Hải Phòng	PCDF (Furan)	EM	2008	1.3-3.5	ng/g dry wt	37 (46)	Tràng Minh (Table 1)
806	Hà Nội	DDT	SO	2006-2007	2.24	ng/g dry wt	45	In dry season. In Dai Ang Thanh Tri

807	Hà Nội	DDT	SO	2006-2007	0.02	ng/g dry wt	45	In rainy season. In Dai Ang Thanh Tri.
808	Hải Phòng	PCBs	EM	2008	1.5-7.9	ng/g dry wt	37 (46)	
809	Hà Nội	Dieldrin	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Tay Tuu.
810	Hà Nội	Dieldrin	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Tay Tuu.
811	Hà Nội	Dieldrin	SO	2006-2007	5.28	ng/g dry wt	45	In dry season. In Bang Village Hoang Liet.
812	Hà Nội	Dieldrin	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Bang Village Hoang Liet
813	Hồ Chí Minh city	HCB	SO	1999-2001	0.075-0.17	ng/g dry wt	03 (85)	In control site
814	Hồ Chí Minh city	HCB	SO	1999-2001	0.025-0.15	ng/g dry wt	03 (85)	In dumping site
815	Hà Nội	Tổng HCH	SO	1999-2001	0.11-0.16	ng/g dry wt	03 (85)	In control site
816	Hà Nội	Tổng HCH	SO	1999-2001	0.29-2.2	ng/g dry wt	03 (85)	In dumping site
817	Hồ Chí Minh city	Tổng HCH	SO	1999-2001	0.32-0.43	ng/g dry wt	03 (85)	In control site
818	Hồ Chí Minh city	Tổng HCH	SO	1999-2001	0.21-0.87	ng/g dry wt	03 (85)	In dumping site
819	Hồ Chí Minh city	Chlordane	SO	1999-2001	0.16-0.25	ng/g dry wt	03 (85)	In control site
820	Hồ Chí Minh city	Chlordane	SO	1999-2001	0.15-2.5	ng/g dry wt	03 (85)	In dumping site
821	Hồ Chí Minh city	DDT	SO	1999-2001	0.41-10	ng/g dry wt	03 (85)	In control site
822	Hồ Chí Minh city	DDT	SO	1999-2001	1.1-83	ng/g dry wt	03 (85)	In dumping site

823	Hồ Chí Minh city	PCBs	SO	1999-2001	2.5-4.4	ng/g dry wt	03 (85)	In control site
824	Hồ Chí Minh city	PCBs	SO	1999-2001	4.2-40	ng/g dry wt	03 (85)	In dumping site
825	Hà Nội	HCB	SO	1999-2001	0.01-0.013	ng/g dry wt	03 (85)	In control site
826	Hà Nội	HCB	SO	1999-2001	0.025-2.8	ng/g dry wt	03 (85)	In dumping site
827	Hà Nội	PCBs	SO	1999-2001	0.45-1.1	ng/g dry wt	03 (85)	In control site
828	Hà Nội	PCBs	SO	1999-2001	2.2-20	ng/g dry wt	03 (85)	In dumping site
829	Hà Nội	DDT	SO	199-2001	2.2-4.3	ng/g dry wt	03 (85)	In control site.
830	Hà Nội	DDT	SO	1999-2001	1.9-52	ng/g dry wt	03 (85)	In dumping site.
831	Hà Nội	Chlordane	SO	1999-2001	0.11-0.18	ng/g dry wt	03 (85)	In control-site
832	Hà Nội	Chlordane	SO	1999-2001	0.01-1.4	ng/g dry wt	03 (85)	In dumping site
833	Hà Nội	p,p'-DDT	SE	2006-2007	0.4	ng/g dry wt	44	In dry season. In Kim Nguu River
834	Hà Nội	p,p'-DDT	SE	2006-2007	0.4-7.12	ng/g dry wt	44	In dry season. In To Lich River
835	Hà Nội	p,p'-DDT	SE	2006-2007	0.3	ng/g dry wt	44	In rainy season. In Kim Nguu river
836	Hà Nội	p,p'-DDT	SE	2006-2007	0.3	ng/g dry wt	44	In rainy reason. In To Lich River
837	Hà Nội	p,p'-DDD	SE	2006-2007	0.2	ng/g dry wt	44	In dry season. In Kim Nguu River
838	Hà Nội	p,p'-DDD	SE	2006-2007	0.2-16.0	ng/g dry wt	44	In dry season. In To Lich River

839	Hà Nội	p,p'- DDE	SE	2006-2007	1.29-8.83	ng/g dry wt	44	In dry season. In Kim Nguu River
840	Hà Nội	p,p'- DDE	SE	2006-2007	0.3-5.64	ng/g dry wt	44	In dry season. In To Lich river
841	Hải Phòng	PCBs	EM	2008	23	ng/g dry wt	34	Tràng Minh (table 3)
842	Hải Phòng	PCBs	BIO	1994-2001	20-450	ng/g lipit wt	20 (68)	Cát Bà, Cát Hải (table 2)
843	Hải Phòng	HCB	BIO	1994-2001	0.5	ng/g lipit wt	53	Cát bà, Cát Hải (Table 2)
844	Hải Phòng	Lindane	SE	2014	0.10±0.02	ng/g wet wt	47	(Table 3, p8)
845	Hải Phòng	Hexabromocyclododecane (HBCD)	AR	2008	7.4	pg m-3	34	tại tràng Minh (Table 2)
846	Hải Phòng	Hexabromocyclododecane (HBCD)	MIL	2007	0.11-3.3	ng/g lipid wt	42	tại Tràng Minh (Table 2)
847	Hải Phòng	Hexabromocyclododecane (HBCD)	EM	2008	16	ng/g dry wt	34	tại Tràng Minh, Hải Phòng (Table 3)
848	Hà Nội	p,p'-DDT	SE	2006-2007	0.02-2.64	ng/g dry wt	44	In dry season. In Nhue River
849	Hà Nội	p,p'-DDT	SE	2006-2007	0.02	ng/g dry wt	44	In rainy season. In Nhue River
850	Hà Nội	p,p'-DDD	SE	2006-2007	0.2-17.27	ng/g dry wt	44	In dry season. In Nhue River
851	Hà Nội	p,p'- DDE	SE	2006-2007	0.02-8.73	ng/g dry wt	44	In Dry season. In Nhue River
852	Hà Nội	Aldrin	SE	2006-2007	0.5	ng/g dry wt	44	In dry season. In Kim Nguu River.
853	Hà Nội	Aldrin	SE	2006-2007	0.5	ng/g dry wt	44	In rainy season. In Kim Nguu River
854	Hà Nội	Aldrin	SE	2006-2007	0.5-10.86	ng/g dry wt	44	In dry season. In To Lich river

855	Hà Nội	Aldrin	SE	2006-2007	0.5	ng/g dry wt	44	In rainy season. In To Lich river
856	Hà Nội	Aldrin	SE	2006-2007	0.025	ng/g dry wt	44	In dry season. In Nhue River
857	Hà Nội	Aldrin	SE	2006-2007	0.025-4.01	ng/g dry wt	44	In rainy season. In Nhue River
858	Hà Nội	DDT	MIL	2007	46-710	ng/g lipid wt	39	In suburban/rural
859	Hà Nội	DDT	MIL	2007	390-1300	ng/g lipid wt	39	In urban
860	Hà Nội	Tổng HCH	MIL	2007	2.1-17	ng/g lipid wt	39	In suburban/rural
861	Hà Nội	Tổng HCH	MIL	2007	6.0-48.0	ng/g lipid wt	39	In urban
862	Hà Nội	Gamma hexachlorocyclohexane	MIL	2007	1.8	ng/g lipid wt	39	In suburban/rural
863	Hà Nội	Beta hexachlorocyclohexane	MIL	2007	1.9-17	ng/g lipid wt	39	In suburban/rural
864	Hà Nội	Beta hexachlorocyclohexane	MIL	2007	6.0-48.0	ng/g lipid wt	39	In urban
865	Hà Nội	Alpha hexachlorocyclohexane	MIL	2007	2.5	ng/g lipid wt	39	In suburban/rural
866	Hà Nội	Alpha hexachlorocyclohexane	MIL	2007	0.39	ng/g lipid wt	39	In urban
867	Hà Nội	Hexachlorobenzene (HCB)	MIL	2007	5.6	ng/g lipid wt	39	In suburban/rural
868	Hà Nội	Hexachlorobenzene (HCB)	MIL	2007	1.6-4.4	ng/g lipid wt	39	In urban
869	Hà Nội	p,p'-DDT	MIL	2007	0.35-15	ng/g lipid wt	39	In suburban/rural
870	Hà Nội	p,p'-DDT	MIL	2007	0.96-9.4	ng/g lipid wt	39	In urban

871	Hà Nội	p,p'- DDE	MIL	2007	38-690	ng/g lipid wt	39	In suburban/rural
872	Hà Nội	p,p'- DDE	MIL	2007	370-1300	ng/g lipid wt	39	In urban
873	Hà Nội	p,p'-DDT	MIL	2007	4.8-53	ng/g lipid wt	39	In suburban/rural
874	Hà Nội	p,p'-DDT	MIL	2007	14-70	ng/g lipid wt	39	In urban
875	Hà Nội	Chlordane	MIL	2007	0.14-2	ng/g lipid wt	39	In suburban/rural
876	Hà Nội	Chlordane	MIL	2007	0.42-2	ng/g lipid wt	39	In urban
877	Hồ Chí Minh city	p,p'-DDT	MIL	2000-2001	100-1000	ng/g lipid wt	2 (84)	
878	Hồ Chí Minh city	p,p'-DDD	MIL	2000-2001	2.7-18	ng/g lipid wt	2 (84)	
879	Hồ Chí Minh city	p,p'- DDE	MIL	2000-2001	340-16000	ng/g lipid wt	2 (84)	
880	Hà Nội	p,p'-DDT	MIL	2000-2001	34-6900	ng/g lipid wt	2 (84)	
881	Hà Nội	p,p'-DDD	MIL	2000-2001	3.0-50.0	ng/g lipid wt	2 (84)	
882	Hà Nội	p,p'- DDE	MIL	2000-2001	420-6300	ng/g lipid wt	2 (84)	
883	Hà Nội	Chlordane	MIL	2000	2.00	ng/g lipid wt	2 (84)	
884	Hà Nội	Chlordane	MIL	2000-2001	0.72-13	ng/g lipid wt	2 (84)	
885	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Phu Dong -Gia Lam
886	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Phu Dong- Gia Lam

887	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Trau Quy- Gia Lam
888	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In Rainy season. In Trau Quy- Gia Lam
889	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In dry season. In Dai Ang- Thanh Tri.
890	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Dai Ang- Thanh Tri
891	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In Dry season. In Tay Tuu
892	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Tay Tuu,
893	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	in dry season. In Bang Village, Hoang Liet.
894	Hà Nội	Aldrin	SO	2006-2007	0.025	ng/g dry wt	45	In rainy season. In Bang Village, Hoang Liet
895	Hà Nội	Aldrin	SE	2002	0.008	ng/g dry wt	25 (101)	
896	Hà Nội	p,p'-DDT	BIO	1997	0.73-6.3	ng/g dry wt	27	
897	Hà Nội	p,p'-DDD	BIO	1997	0.43-41.5	ng/g dry wt	27	
898	Hà Nội	p,p'- DDE	BIO	1997	4.13-89.63	ng/g dry wt	27	
899	Hà Nội	p,p'-DDT	SE	1997	0.73-10.2	ng/g dry wt	27	
900	Hà Nội	p,p'-DDD	SE	1997	1.03-27.1	ng/g dry wt	27	
901	Hà Nội	HCB	SE	1997	0.13	ng/g dry wt	27	
902	Hà Nội	Aldrin	SE	1997	0.01	ng/g dry wt	27	
903	Nam Định	PCBs	SE	2014	1.19±0.49	ng/g dry wt	47	in Cửa Đáy Kim Sơn
904	Nam Định	PCBs	SE	2014	1.18±0.36	ng/g dry wt	47	In Ba Lat
905	Nam Định	Lindane	SE	2014	0.11±0.04	ng/g dry wt	47	in Cửa Đáy Kim Sơn
906	Nam Định	Lindane	SE	2014	0.12	ng/g dry wt	47	in Ba Lạt
907	Nam Định	Endrin	SE	2014	0.65±0.51	ng/g dry wt	47	in Cửa Đáy Kim Sơn
908	Nam Định	Endrin	SE	2014	0.31±0.09	ng/g dry wt	47	in Ba Lạt

909	Nam Định	Aldrin	SE	2014	0.05	ng/g dry wt	47	in Cửa Đáy kim Sơn
910	Nam Định	Aldrin	SE	2014	0.06	ng/g dry wt	47	In Ba Lat
911	Bắc Ninh	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	1.77-3.87	ng/g dry wt	30 (71) (103)	in formal paper production craft village
912	Bắc Ninh	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	2.82	ng/g dry wt	30 (71) (103)	In formal paper production craft village
913	Bắc Ninh	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	2.63-3.28	ng/g dry wt	30 (71) (103)	In informal paper production craft village
914	Bắc Ninh	Tetrabromodiphenyl ether and pentabromodiphenyl ether	SE	2014	2.96	ng/g dry wt	30 (71) (103)	In informal paper production craft village
915	Quảng Ninh	DDT	BIO	2005-2006	2.44-5.86	ng/g wet wt	53	VInh Hạ Long
916	Quảng Ninh	DDT	SE	2005-1006	0.19-2.06	ng/g dry wt	53	VInh Hạ Long
917	Quảng Ninh	DDT	WA	2005-2006	0.56-1.17	ng/l		Vịnh Hạ Long
918	Quảng Ninh	DDT	SE	2014	12.3	ng/g dry wt	43	Minh Chau Beach
919	Quảng Ninh	DDT	SE	2007	163	ng/g dry wt	43	Minh Chau Beach
920	Quảng Ninh	Lindane	SE	2014	0.09±0.01	ng/g dry wt	47	Vịnh Cửa Lục
921	Quảng Ninh	Lindane	SE	2014	0.10±0.02	ng/g dry wt	47	In Đồng Rui Quảng Ninh
922	Quảng Ninh	Lindane	SE	2014	0.1±0.01	ng/g dry wt	47	In Mong Cai
923	Quảng Ninh	PCBs	BIO	2005-2006	23.13-37.38	ng/g wet wt	53	Vịnh Hạ Long
924	Quảng Ninh	PCBs	SE	2005-2006	4.17-10.07	ng/g dry wt	53	Vinh Ha Long

925	Quảng Ninh	PCBs	WA	2005-2006	2.81-6.77	ng/l	53	Vinh Ha Long
926	Quảng Ninh	PCBs	SE	2014	2.00±1.67	ng/g dry wt	47	Vịnh Cửa Lục
927	Quảng Ninh	PCBs	SE	2014	1.00±0.4	ng/g dry wt	47	In Đồng Rui Quảng Ninh
928	Quảng Ninh	PCBs	SE	2014	1.52±0.93	ng/g dry wt	47	In Mong Cai
929	Quảng Ninh	Gamma hexachlorocyclohexane	SE	2014	0.08	ng/g dry wt	43	Minh Chau Beach
930	Quảng Ninh	p,p'- DDE	SE	2014	1.2	ng/g dry wt	43	Minh Chau Beach
931	Quảng Ninh	p,p'-DDD	SE	2014	3.41	ng/g dry wt	43	Minh Chau Beach
932	Hà Nội	p,p'-DDT	SE	2014	7.8	ng/g dry wt	43	Minh Chau Beach
933	Quảng Ninh	Gamma hexachlorocyclohexane	SE	2007	0.15	ng/g dry wt	43	Minh Chau Beach
934	Quảng Ninh	p,p'- DDE	SE	2007	5.76	ng/g dry wt	43	Minh Chau Beach
935	Quảng Ninh	p,p'-DDD	SE	2007	25.3	ng/g dry wt	43	Minh Chau Beach
936	Quảng Ninh	p,p'-DDT	SE	2007	132	ng/g dry wt	43	Minh Chau Beach
937	Quảng Ninh	PCBs	SE	2014	8	ng/g dry wt	43	Minh Chau Beach, Bai Tu Long Bay
938	Quảng Ninh	PCBs	SE	2007	13	ng/g dry wt	43	Minh Chau Beach, Bai Tu Long
939	Quảng Ninh	HCB	BIO	2005-2006	0.21-0.28	ng/g wet wt	53	Vịnh Hạ Long
940	Quảng Ninh	HCB	SE	2005-2006	0.31-0.37	ng/g dry wt	53	VỊnh Hạ Long

941	Quảng Ninh	HCB	WA	2005-2006	0.1-0.24	ng/l	53	VỊnh Hạ Long
942	Quảng Ninh	p,p'-DDT	BIO	2005-2006	0.74-1.64	ng/g wet wt	53	VỊnh Hạ Long
943	Quảng Ninh	p,p'-DDD	BIO	2005-2006	0.66-2.14	ng/g wet wt	53	Vịnh Hạ Long
944	Quảng Ninh	p,p'- DDE	BIO	2005-2006	1.7-3.24	ng/g wet wt	53	Vịnh Hạ Long
945	Quảng Ninh	Gamma hexachlorocyclohexane	BIO	2005-2006	0.24-0.32	ng/g wet wt	53	Vịnh Hạ Long
946	Quảng Ninh	p,p'-DDT	SE	2005-2006	0.42-0.76	ng/g dry wt	53	Vịnh Hạ Long
947	Quảng Ninh	p,p'-DDD	SE	2005-2006	0.26-0.44	ng/g dry wt	53	Vịnh Hạ Long
948	Quảng Ninh	p,p'- DDE	SE	2005-2006	0.19-0.59	ng/g dry wt	53	Vịnh Hạ Long
949	Quảng Ninh	Gamma hexachlorocyclohexane	SE	2005-2006	0.21-0.42	ng/g dry wt	53	Vịnh Hạ Long
950	Quảng Ninh	p,p'-DDT	WA	2005-2006	0.35-0.5	ng/l	53	Vịnh Hạ Long
951	Quảng Ninh	p,p'-DDD	WA	2005-2006	0.18-0.26	ng/l	53	Vịnh Hạ Long
952	Quảng Ninh	p,p'- DDE	WA	2005-2006	0.2-0.3	ng/l	53	Vịnh Hạ Long
953	Quảng Ninh	Gamma hexachlorocyclohexane	WA	2005-2006	0.18-0.46	ng/l	53	Vịnh Hạ Long
954	Quảng Ninh	Beta hexachlorocyclohexane	WA	2005-2006	0.04-0.18	ng/l	53	Vịnh Hạ Long
955	Quảng Ninh	Alpha hexachlorocyclohexane	WA	2005-2006	0.05-0.16	ng/l	53	Vinh Ha Long
956	Quảng Ninh	Tổng HCH	BIO	2005-2006	0.21-0.39	ng/g wet wt	53	Vịnh Hạ Long

957	Quảng Ninh	Tổng HCH	SE	2005-2006	0.21-0.5	ng/g dry wt	53	Vịnh Hạ Long
958	Hải Phòng	Endrin	SE	2014	0.05±0.01	ng/g dry wt	47	(page 3, table 3)
959	Hải Phòng	Aldrin	SE	2014	0.05±0.01	ng/g dry wt	47	tại Sông Ba Lạt (P8, Table 3)
960	Thái Bình	PCBs	WA	2005-2006	1.40±0.53	ng/l	53	tại sông Ba lạt
961	Thái Bình	Lindane	SE	2014	0.10±0.01	ng/g dry wt	47	
962	Thái Bình	Chlordane	WA	2005 - 2006	0.31-0.72	ng/l	53	Tại cửa sông Ba Lạt
963	Thái Bình	Endrin	SE	2014	0.44±0.12	ng/g dry wt	47	
964	Quảng Ninh	Tổng HCH	WA	2005-2006	0.18-0.46	ng/l	53	Vinh Ha Long
965	Quảng Ninh	Beta hexachlorocyclohexane	SE	2014	0.2	ng/g dry wt	43	In Minh Chau Beach Bai Tu Long Bay
966	Quảng Ninh	Beta hexachlorocyclohexane	SE	2007	0.39	ng/g dry wt	43	In Minh Chau Beach Bai Tu Long Bay
967	Quảng Ninh	Alpha hexachlorocyclohexane	SE	2014	0.05	ng/g dry wt	43	In Minh Chau Beach- Bai Tu Long Bay
968	Quảng Ninh	Alpha hexachlorocyclohexane	SE	2007	0.01	ng/g dry wt	43	In Minh Chau Beach
969	Quảng Ninh	Endrin	SE	2014	0.36±0.08	ng/g dry wt	47	In Cua Luc
970	Quảng Ninh	Endrin	SE	2014	0.59±0.30	ng/g dry wt	47	in Dong Rui
971	Quảng Ninh	Endrin	SE	2014	0.58±0.23	ng/g dry wt	47	In Mong Cai
972	Quảng Ninh	Aldrin	SE	2014	0.05±0.01	ng/g dry wt	47	In Cua Luc
973	Quảng Ninh	Aldrin	SE	2014	0.05±0.01	ng/g dry wt	47	In Dong Rui

974	Quảng Ninh	Aldrin	SE	2014	0.05	ng/g dry wt	47	In Mong Cai
975	Phú Thọ	DDT	BIO	2007	5.1-14	ng/g wet wt	11	In Minh Dai Commune
976	Phú Thọ	DDT	SO	2007	1.8-132	ng/g dry wt	11	
977	Bắc Giang	MoBPCCDD/Fs	EM	2013	0.25	ng/g dry wt	38	
979	Thái Bình	Aldrin	SE	2014	0.05	ng/g dry wt	47	
981	Bắc Giang	PCBs	EM	2013	190	ng/g dry wt	38	In workshop at Thuyen Village
982	Bắc Giang	PCBs	EM	2013	19-2200	ng/g dry wt	38	In living areas at Thuyen Village
983	Bắc Giang	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2013	280	ng/g dry wt	38	In living area
984	Bắc Giang	Tetrabromodiphenyl ether and pentabromodiphenyl ether	EM	2013	260-1100	ng/g dry wt	38	In ELV workshop
985	Sơn La	PCDD/Fs	AR	2010-2015	8.3-34.3	fg I-TEQ/m3	13 (58) (90)	